R. J. SEATOR.

MOTOR FOR REGULATORS.

APPLICATION FILED MAY 17, 1920.

1,378,625.

Patented May 17, 1921.

3 SHEETS—SHEET 1.

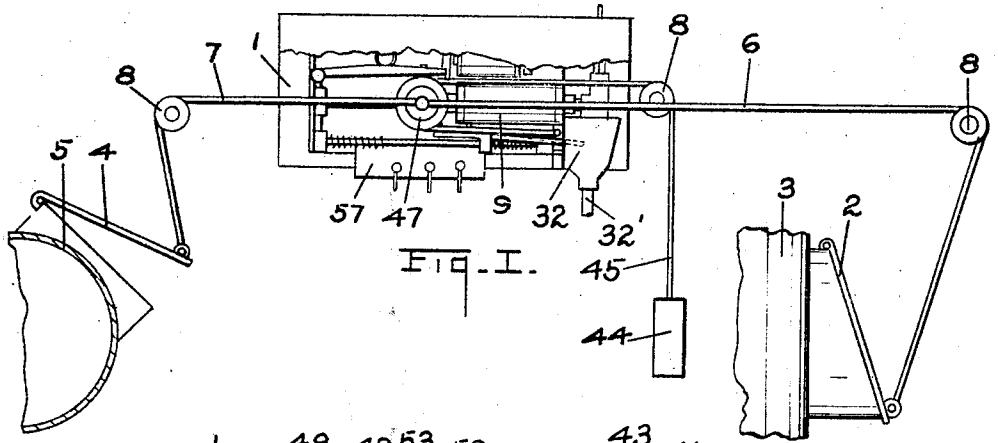


Fig. I.

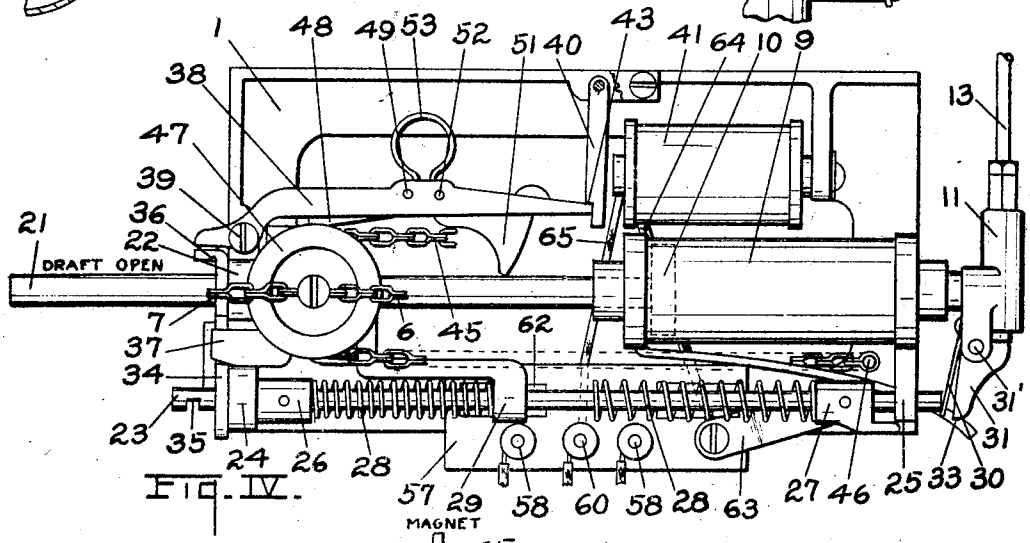


Fig. IV.

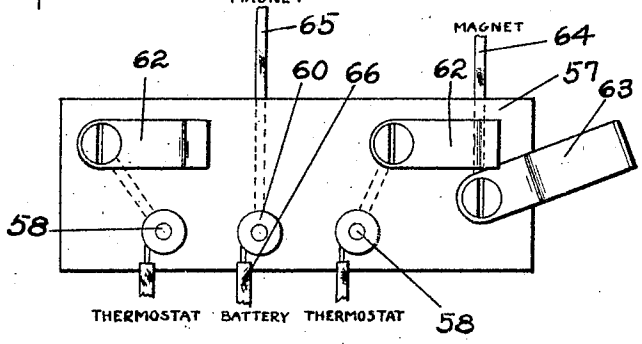


Fig. X.

Witnesses

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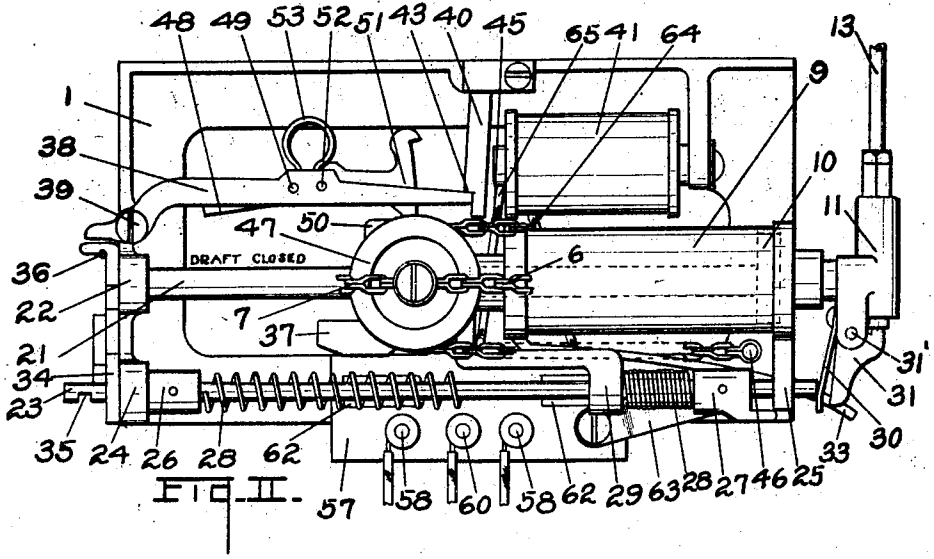


FIG. II.

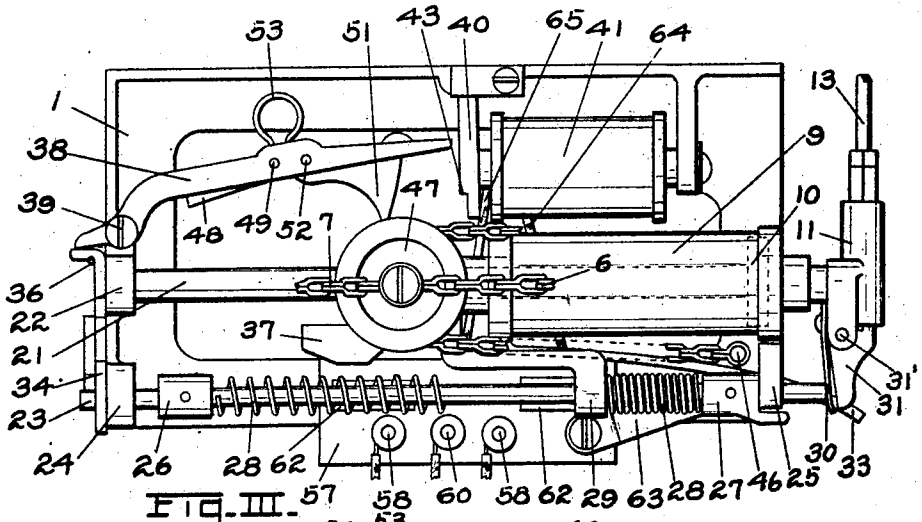


FIG. III.

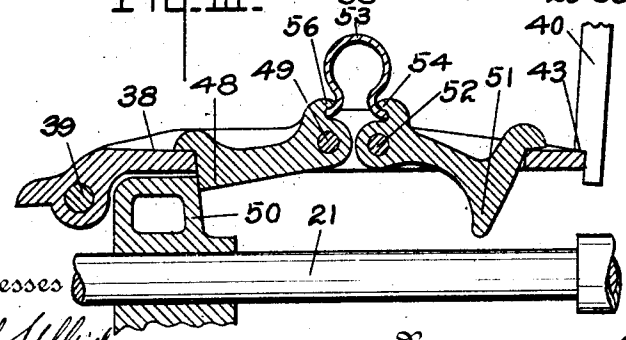


FIG. IX.

Witnesses

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3 SHEETS—SHEET 3.

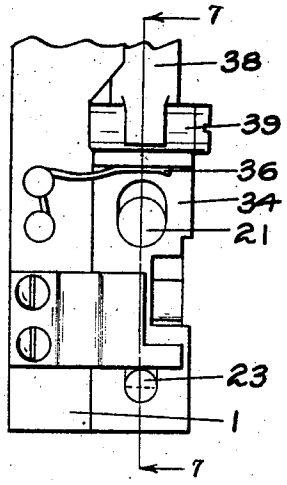


FIG. V.

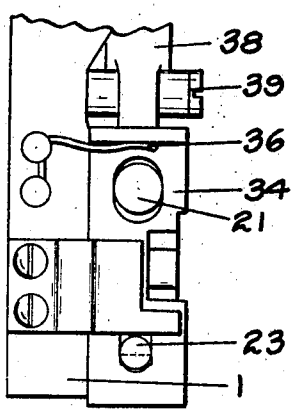


FIG. VI.

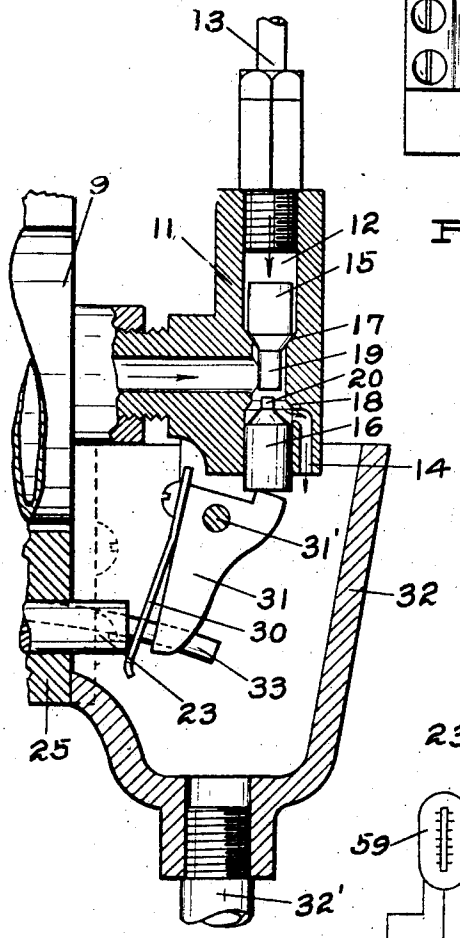


FIG. VIII.

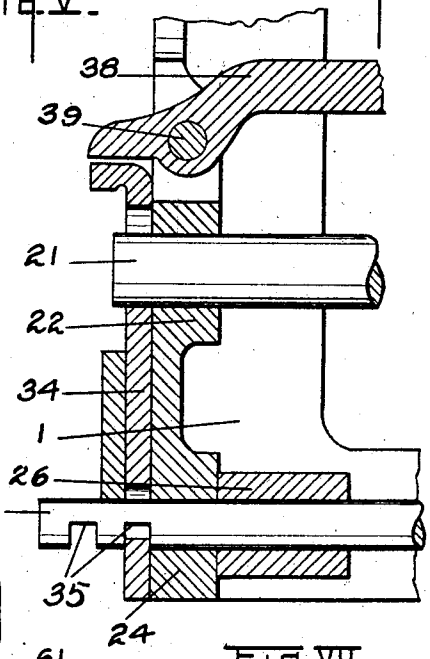


FIG. VII.

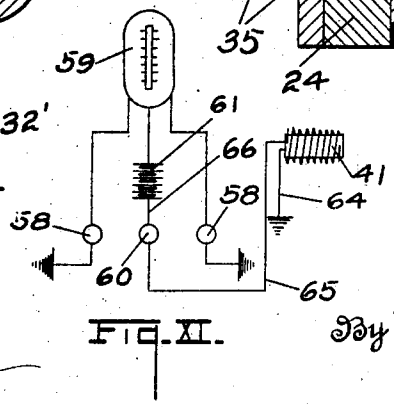


FIG. XI.

Witnesses

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UNITED STATES PATENT OFFICE.

ROBERT J. SEATOR, OF BATTLE CREEK, MICHIGAN, ASSIGNOR OF ONE-HALF TO HERBERT MATTHEWS, OF BATTLE CREEK, MICHIGAN.

MOTOR FOR REGULATORS.

1,378,625. Specification of Letters Patent. Patented May 17, 1921.

Application filed May 17, 1920. Serial No. 381,878.

To all whom it may concern:

Be it known that I, ROBERT J. SEATOR, a citizen of the United States, residing at Battle Creek, county of Calhoun, State of Michigan, have invented certain new and useful Improvements in Motors for Regulators, of which the following is a specification.

This invention relates to improvements in motors for regulators.

My improved motor is especially designed by me for regulating furnaces and I have shown the same in an embodiment adapted for that purpose. My improvements are, however, desirable for use and may be readily embodied in structures designed for other uses.

My present improvements are an adaptation of and in some respects an improvement upon the structure shown in my Letters Patent No. 1,329,553, issued February 3, 1920.

The main objects of this invention are:

First, to provide an improved motor for regulators which is very positive in its action.

Second, to provide an improved motor actuated by weight and hydraulic power which is simple and economical in structure and durable and not likely to get out of repair.

Further objects, and objects relating to structural details will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification. The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is clearly illustrated in the accompanying drawing forming a part of this specification in which:

Figure I is a diagrammatic view of a structure embodying the features of my invention illustrated in operative relation to a furnace, the parts being shown mainly in conventional form and without regard to proportion.

Fig. II is a front view of my improved regulator with the plunger in its initial or retracted position and the inlet valve closed and exhaust valve opened, the waste connection being omitted.

Fig. III is a front view corresponding to that of Fig. II, with the locking dog trip lever released, the exhaust valve closed and the inlet valve opened, the plunger, however, still remaining in its initial position.

Fig. IV is a front elevation corresponding to that of Figs. II and III with the plunger in its actuated or extended position and the exhaust valve opened and the inlet valve closed.

Fig. V is a detail end elevation looking from the left of Fig. II, with the parts in the position shown therein.

Fig. VI is a detail end elevation similar to Fig. V, with the locking dog released or in the position shown in Fig. III.

Fig. VII is an enlarged detail vertical section on a line corresponding to line 7—7 of Fig. V.

Fig. VIII is an enlarged detail view of the control valves, partially in vertical section.

Fig. IX is an enlarged detail view partially in vertical longitudinal section showing details of the control means.

Fig. X is a detail view showing details of the electrical connections.

Fig. XI is a diagrammatic view of the electrical connections.

In the drawing similar reference characters refer to similar parts throughout the several views, and the sectional views are taken looking in the direction of the little arrows at the ends of the section lines.

Referring to the drawing, I preferably mount the parts upon a base plate 1 adapted to be mounted upon a wall or other support in proper relation to the furnace dampers or other parts to be controlled. In Fig. I, 2 represents the draft damper of a furnace 3, and 4 the check draft or damper of a furnace smoke flue 5. These dampers are connected to the motor by means of the cables 6 and 7 passing over the guide pulleys 8.

A hydraulic cylinder 9 is mounted on the base plate 1, the cylinder being provided with a plunger 10 indicated by dotted lines in Figs. II, III and IV. At its outer end, the cylinder 9 is provided with a valve casing 11 having an inlet passage 12 to which the inlet pipe 13 is connected and a discharge passage 14—see Fig. VIII.

The inlet is controlled by the valve 15

while the outlet is controlled by the valve 16. These valves are of the plunger type and are oppositely disposed to coact with conical seats 17 and 18 respectively. The valves are provided with stem-like portions 19 and 20 which engage when the exhaust valve is closed to lift the inlet valve from its seat. The means for controlling the valves will be disclosed as the description proceeds.

The plunger rod 21 reciprocates through a supporting bearing 22 on the base plate. The actuating rod 23 is mounted for reciprocating movement in bearings 24 and 25 on the base plate. The actuating rod is provided with stops 26 and 27 which limit its stroke. The actuating springs 28 are mounted on the rod to be engaged by the tappet or arm 29 on the plunger rod so that the springs are placed under compression toward the ends of the stroke of the plunger and power stored to actuate the rod when it is released.

The rod is adapted to engage the blade spring 39 on the valve lever 31 which is pivoted at 31′ to engage the exhaust valve 16 as shown in Fig. VIII. When in the position shown in Fig. III, the lever 30 is actuated to close the exhaust valve and open the inlet valve. Gravity tends to open the exhaust valve and close the inlet valve as does also the water pressure so that when the actuating rod is returned to the position shown in Figs. IV and VIII, the exhaust valve opens and the inlet valve closes.

A drip cup 32 is positioned below the discharge passage 14, a drain pipe 32′ being connected to the drip cup. A vent and drain pipe 33 is connected to the inner end of the cylinder 10 and delivers to the drip cup 32. This pipe 33 takes care of any water that may pass the plunger and provides a vent for the inner end of the cylinder.

The actuating rod is controlled by the locking dog or member 34 which is slidably mounted on the end of the base plate to coact with notch-like keepers 35 in the rod—see Fig. VII. A spring 36 urges the locking member to its engaging position. This locking member 34 is released by means of the trip 37 on the plunger and the trip 38 pivoted on the base plate at 39 and controlled by the armature 40 of the electromagnet 41.

As the details of the electromagnet form no part of the invention, they are not illustrated or described herein.

The armature 40 is provided with a notch 43 adapted to receive the end of the trip lever 38. When the trip lever is released by the armature and actuated to the position shown in Fig. III, the locking member is disengaged and the actuating rod is actuated by the right hand spring 28 to the position shown in Fig. III, in which position the exhaust valve is closed and the inlet valve opened.

The water flowing into the cylinder actuates the plunger against the pull of the weight 44 which is connected by the cable 45 to a post 46 on the base, the cable passing over the pulley 47 on the plunger rod.

The tappet or arm 29 engages the actuating spring 28 at the left placing the same under stress or compression so that when the trip arm 37 on the plunger rod releases the locking dog 34, the actuating rod is actuated to release the exhaust valve allowing the inlet valve to close and the cylinder to exhaust.

The return weight would at once return the plunger to its initial position were it not engaged by the detent 48 which is pivoted at 49 on the trip lever 38 to engage the keeper 50 on the plunger rod—see Fig. IX— so that the plunger is held in its extended position until the armature 40 is again actuated when the pull of the weight is sufficient to release the detent, the coacting faces of the detent and keeper being slightly inclined as shown in Fig. IX.

As the plunger moves to its initial position, it engages the lever 51 which is pivoted at 52 on the trip lever raising the same to the position shown in Fig. II and applying stress to the bowed spring 53 one end of which engages a lug 54 on the lever 51 and the other engages a corresponding lug 56 on the detent 48. With this spring under stress, when the armature is again actuated to release the trip lever, it is thrown up by the action of the spring on the lever 51 to the position shown in Fig. III and this actuates the locking member 34 to release the actuating rod so that it is actuated by the right hand spring 28 to close the exhaust valve and open the inlet valve as described.

When the plunger is again moved to its extended or actuated position the trip lever drops down as shown in Fig. IV so that it is reëgaged by the armature and the detent 48 engages and holds the plunger in its extended position.

For convenience in making the electrical connections, I mount an insulated plate 57 on the base plate 1. The plate 57 is provided with binding posts 58 to which the temperature control device 59, shown conventionally in Fig. XI is connected. The binding post 60 is connected to the source of current as the battery 61. The binding posts 58 are connected to the spring contacts 62 mounted on the plate 57 so as to be engaged by the tappet 29 on the plunger rod when the plunger rod is at the ends of its stroke, the circuit being broken during the stroke of the plunger.

A third contact 63 is provided to coact with the stop 27 on the actuating rod. This contact 63 is connected to the electromagnet

by the connection 64, the electromagnet being also connected to the binding post 60 by the connection 65 which binding post also is connected to the battery by the connection 66. The connection for the binding post 58 to the right hand magnet is through the contacts 62 and 63, the parts engaging with the contacts when in the position shown in Fig. II, the connections being broken when the parts are in the position shown in Fig. III so that should they remain in this position through lack of water pressure to actuate the plunger, the battery is not run down.

With the parts arranged as illustrated and described, the operation of the device is as follows:

Assuming the parts to be in the position shown in Fig. II, upon the actuation of the armature 40, the trip lever 38 is thrown upwardly to the position shown in Fig. III by the lever 51 actuated by the spring 53. This movement of the trip lever releases the locking dog 34 of the actuating rod 23. The actuating rod being released, its actuating spring 28 at the right hand end being under compression as shown in Fig. II, moves the actuating rod toward the right and closes the exhaust valve and opens the inlet valve, and the water flowing into the cylinder, actuates the plunger.

When the plunger passes from beneath the lever 51, the trip lever drops down and is reëngaged by the armature and the actuating rod locking dog is released engaging the outer keeper of the actuating rod and holding it in its actuated position until the plunger has placed the left hand actuating spring 28 under stress. Its trip 37 releases the locking dog allowing the actuating rod to release the valve lever, opening the drain or exhaust valve and closing the inlet valve. The plunger is retained in its actuated position by the detent 48 on the trip lever until the trip lever is again released by the actuation of the armature from the thermostat or temperature control means, when the weight returns the plunger to the position shown in Fig. II, which completes the cycle of movement.

My improved regulator is entirely automatic, that is, there is no weight or motor to wind. It may be very easily installed even by an unskilled workman, as the parts are all assembled upon the base plate which may be mounted on any suitable support and connections made to the dampers to be operated.

I have not attempted to illustrate or describe certain modifications in structural details which I contemplate as I believe the disclosure made will enable those skilled in the art to which my invention relates to embody or adapt the same as may be desired.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a structure of the class described, the combination of a cylinder, oppositely seating inlet and exhaust valves for said cylinder, the exhaust valve being adapted to open the inlet valve when the exhaust valve is closed, a pivoted valve actuating lever engaging said exhaust valve, a plunger, a weight for returning said plunger, a reciprocatingly mounted actuating rod adapted to engage said valve lever, said actuating rod being provided with a pair of stops limiting its movement, actuating springs on said actuating rod, a tappet on said plunger adapted to place said springs under stress by the stroke of the plunger so that when the actuating rod is released it is actuated thereby, a locking member for said actuating rod, a trip on said plunger coacting with said locking member on the out-stroke of the plunger, a trip lever also coacting with said locking member and provided with a detent for said plunger, an electromagnet comprising an armature constituting a lock for said trip lever, an actuating spring for said trip lever placed under stress by the return of the plunger to its initial position, and electrical connections for said electromagnet comprising three relatively fixed contact members, two of which are electrically connected to said electromagnet, a contact member on said plunger adapted to coact with the third of said relatively fixed contact members and with one of the pair connected with the electromagnet, said actuating rod being adapted to coact with the other of said pair to complete the circuit when the parts are in their initial position, the circuit being broken when the actuating rod is in position to open the inlet valve.

2. In a structure of the class described, the combination of a cylinder provided with inlet and exhaust connections, a plunger, a weight for returning said plunger, a reciprocatingly mounted actuating rod, said actuating rod being provided with a pair of stops limiting its movement, actuating springs on said actuating rod, a tappet on said plunger adapted to place said springs under stress by the stroke of the plunger so that when the actuating rod is released it is actuated thereby, a locking member for said actuating rod, a trip on said plunger coacting with said locking member on the out-stroke of the plunger, a trip lever also coacting with said locking member and provided with a detent for said plunger, an electromagnet comprising an armature constituting a lock for said trip lever, an actuating spring for said trip lever placed under stress by the return of the plunger to its initial position, and electrical connections for said electromagnet comprising three relatively fixed contact members, two

of which are electrically connected to said electromagnet, a contact member on said plunger adapted to coact with the third of said relatively fixed contact members and with one of the pair connected with the electromagnet, said actuating rod being adapted to coact with the other of said pair to complete the circuit when the parts are in their initial position, the circuit being broken when the actuating rod is in position to open the inlet valve.

3. In a structure of the class described, the combination of a cylinder, oppositely seating inlet and exhaust valves for said cylinder, the exhaust valve being adapted to open the inlet valve when the exhaust valve is closed, a pivoted valve actuating lever engaging said exhaust valve, a plunger, a weight for returning said plunger, a reciprocatingly mounted actuating rod adapted to engage said valve lever, said actuating rod being provided with a pair of stops limiting its movement, actuating springs on said actuating rod, a tappet on said plunger adapted to place said springs under stress by the stroke of the plunger so that when the actuating rod is released it is actuated thereby, a locking member for said actuating rod, a trip on said plunger coacting with said locking member and provided with a detent for said plunger, an electromagnet comprising an armature constituting a lock for said trip lever, and an actuating spring for said trip lever placed under stress by the return of the plunger to its initial position.

4. In a structure of the class described, the combination of a cylinder provided with inlet and exhaust connections, a plunger, a weight for returning said plunger, a reciprocatingly mounted actuating rod, said actuating rod being provided with a pair of stops limiting its movement, actuating springs on said actuating rod, a tappet on said plunger adapted to place said springs under stress by the stroke of the plunger so that when the actuating rod is released it is actuated thereby, a locking member for said actuating rod, a trip on said plunger coacting with said locking member on the out-stroke of the plunger, a trip lever also coacting with said locking member and provided with a detent for said plunger, an electromagnet comprising an armature constituting a lock for said trip lever, and an actuating spring for said trip lever placed under stress by the return of the plunger to its initial position.

5. In a structure of the class described, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating member, a plunger, a weight for returning said plunger, actuating springs for said actuating rod, means for placing said springs under stress by the stroke of the plunger so that when the actuating rod is released it is actuated thereby, a locking member for said actuating member, a trip on said plunger coacting with said locking member on the out-stroke of the plunger, a trip lever also coacting with said locking member and provided with a detent for said plunger, an electromagnet comprising an armature constituting a lock for said trip lever, an actuating spring for said trip lever placed under stress by the return of the plunger to its initial position, and electrical connections for said electromagnet comprising three relatively fixed contact members, two of which are electrically connected to said electromagnet, a contact member on said plunger adapted to coact with the third of said relatively fixed contact members and with one of the pair connected with the electromagnet, said actuating member being adapted to coact with the other of said pair to complete the circuit when the parts are in their initial position, the circuit being broken when the actuating member is in position to open the inlet valve.

6. In a structure of the class described, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating member, a plunger, a weight for returning said plunger, a control means for said actuating members comprising an electromagnet, and electrical connections for said electromagnet comprising three relatively fixed contact members, two of which are electrically connected to said electromagnet, a contact member on said plunger adapted to coact with the third of said relatively fixed contact members and with one of the pair connected with the electromagnet, said actuating member being adapted to coact with the other of said pair to complete the circuit when the parts are in their initial position, the circuit being broken when the actuating member is in position to open the inlet valve.

7. In a structure of the class described, the combination of a cylinder, oppositely seating inlet and exhaust valves for said cylinder, the exhaust valve being adapted to open the inlet valve when the exhaust valve is closed, a pivoted valve actuating lever engaging said exhaust valve, said lever having a spring mounted thereon, an actuating member adapted to engage said spring, a plunger, a weight for returning said plunger, actuating springs for said actuating member, means for placing said springs under stress by the stroke of the plunger so that when the actuating member is released it is actuated thereby, a locking member for said actuating member, a trip on said plunger coacting with said

locking member on the out-stroke of the plunger, and a trip lever coacting with said locking member and constituting a means for holding said plunger in its actuated position.

8. In a structure of the class described, the combination of a cylinder, oppositely seating inlet and exhaust valves for said cylinder, the exhaust valve being adapted to open the inlet valve when the exhaust valve is closed, a pivoted valve actuating lever engaging said exhaust valve, an actuating member coacting with said lever, a plunger, a weight for returning said plunger, actuating springs for said actuating member, means for placing said springs under stress by the stroke of the plunger so that when the actuating member is released it is actuated thereby, a locking member for said actuating member, a trip on said plunger coacting with said locking member on the out-stroke of the plunger, and a trip lever coacting with said locking member and constituting a means for holding said plunger in its actuated position.

9. In a structure of the class described, the combination of a cylinder, oppositely seating alined inlet and exhaust valves for said cylinder, the exhaust valve being adapted to open the inlet valve when the exhaust valve is closed, a pivoted valve actuating lever engaging said exhaust valve, said lever having a spring mounted thereon, an actuating member adapted to engage said spring, a plunger, a weight for returning said plunger, and means for controlling said actuating member comprising said plunger, a trip member and an electromagnet controlling said trip member.

10. In a structure of the class described, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating member, a plunger, a weight for returning said plunger, actuating springs for said actuating member, means for placing said springs under stress by the stroke of the plunger so that when the actuating rod is released it is actuated thereby, a locking member for said actuating member, a trip on said plunger coacting with said locking member on the out-stroke of the plunger, a trip lever also coacting with said locking member, an electromagnet comprising an armature constituting a lock for said trip lever, a detent pivotally mounted on said trip lever for holding said plunger in its actuated position, an actuating lever for said trip lever pivotally mounted thereon to be engaged by said plunger when the plunger is at the end of its stroke, and an actuating spring for said trip lever acting on said detent and adapted to be placed under stress by said trip actuating lever so that upon the actuation of the armature the trip lever is actuated to release the actuating rod locking member.

11. In a structure of the class described, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating member, a plunger, a weight for returning said plunger, a locking member for said actuating member, a trip on said plunger coacting with said locking member on the out-stroke of the plunger, a trip lever also coacting with said locking member, an electromagnet comprising an armature constituting a lock for said trip lever, a detent pivotally mounted on said trip lever for holding said plunger in its actuated position, an actuating lever for said trip lever pivotally mounted thereon to be engaged by said plunger when the plunger is at the end of its stroke, and an actuating spring for said trip lever acting on said detent and adapted to be placed under stress by said trip actuating lever so that upon the actuating of the armature the trip lever is actuated to release the actuating rod locking member.

12. In a structure of the class described, the combination of a cylinder, a plunger, a weight for returning said plunger, a control means comprising a trip lever, an electromagnet comprising an armature constituting a lock for said trip lever, a detent pivatally mounted on said trip lever for holding said plunger in its actuated position, an actuating lever for said trip lever pivotally mounted thereon to be engaged by said plunger when the plunger is at the end of its stroke, and an actuating spring for said trip lever acting on said detent and adapted to be placed under stress by said trip actuating lever so that upon the actuation of the armature the trip lever is actuated to release the actuating rod locking member.

In witness whereof I have hereunto set my hand and seal in the presence of two witnesses.

ROBERT J. SEATOR. [L. S.]

Witnesses:
HOWARD W. CAVANAGH,
JOHN CONROY.