R. J. SEATOR.

MOTOR FOR REGULATORS.

APPLICATION FILED APR. 25, 1918.

1,329,553.

Patented Feb. 3, 1920.

3 SHEETS—SHEET 1.

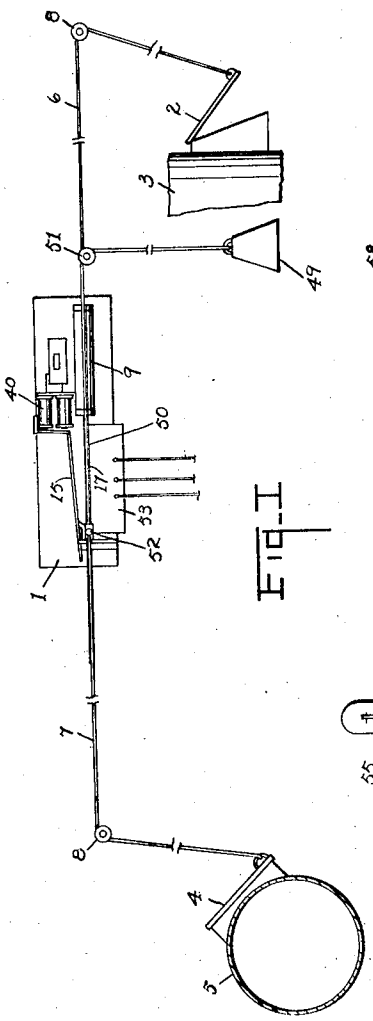


Fig. I

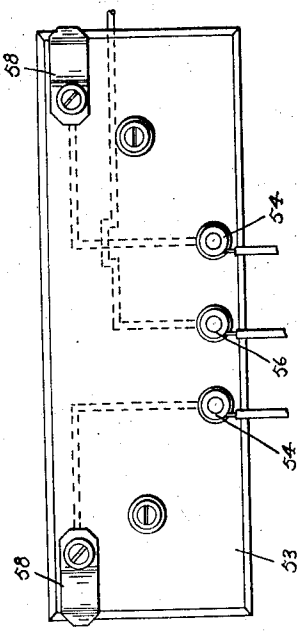


Fig. VIII

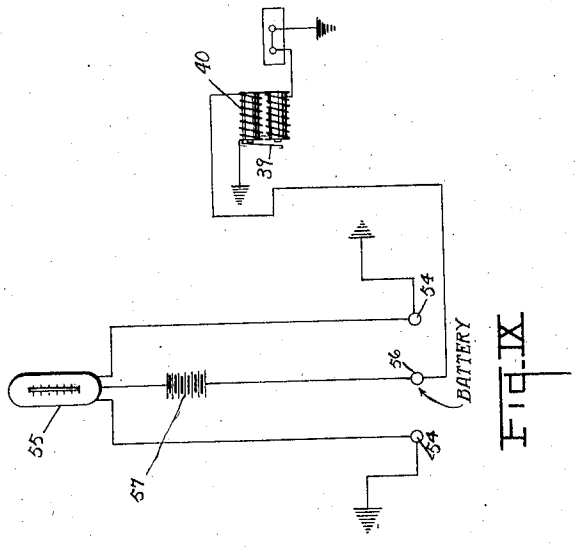


Fig. IX

Witnesses

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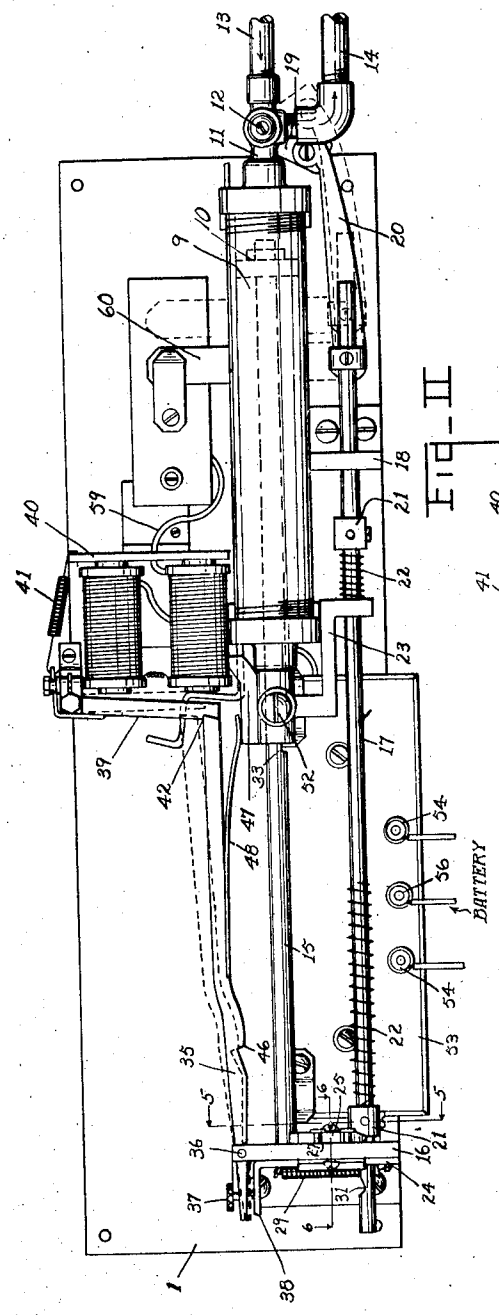


Fig. II

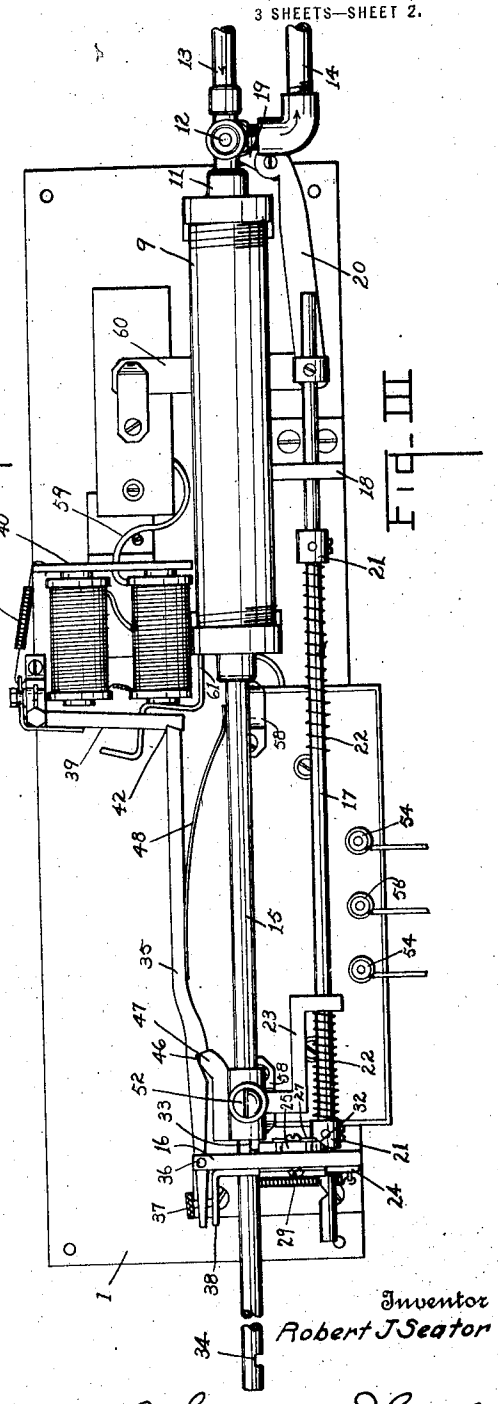


Fig. III

Witnesses

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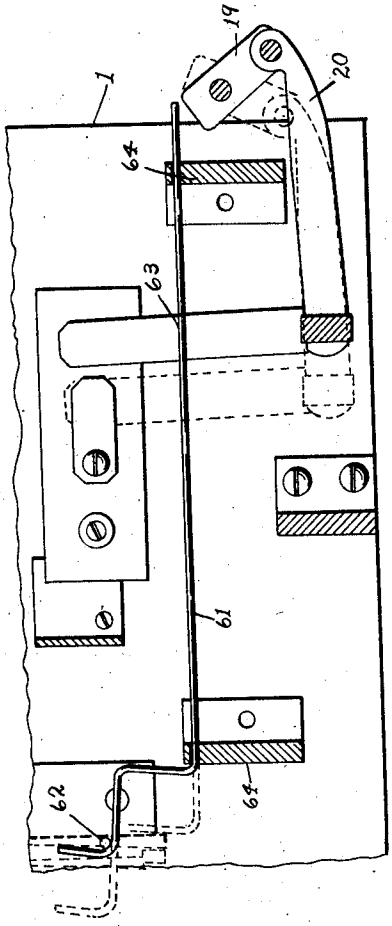
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3 SHEETS—SHEET 3.



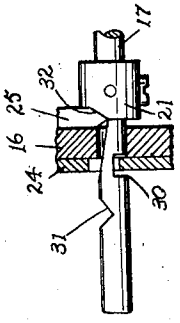


Fig. IV A

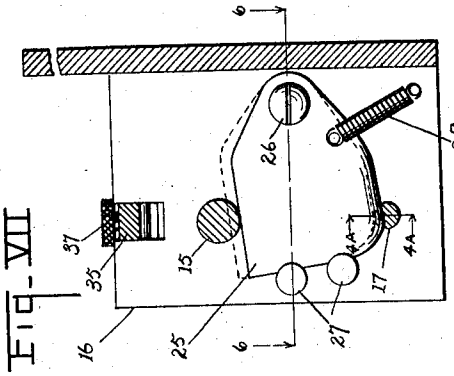


Fig. V

Fig. VII

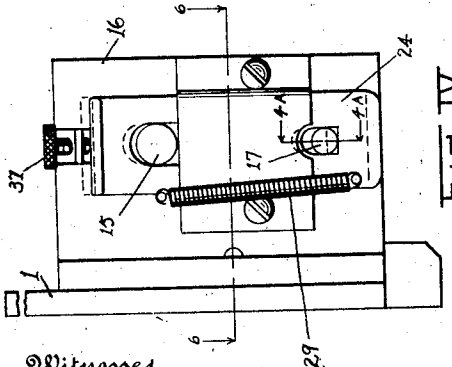


Fig. IV

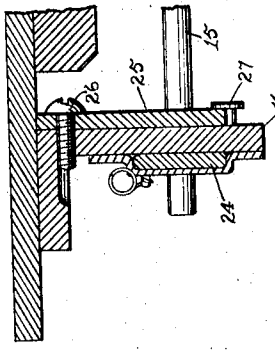


Fig. VI

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.

1,329,553. Specification of Letters Patent. Patented Feb. 3, 1920.

Application filed April 25, 1918. Serial No. 230,619.

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 use in regulating furnaces and I have shown the same in an embodiment intended for that purpose. My improvements, however, are desirable for other uses and may be readily embodied in structures designed for other uses.

The main objects of this invention are:

First, to provide an improved motor actuated by weight and hydraulic power.

Second, to provide an improved motor which is very positive in its action and not likely to get out of repair.

Third, to provide an improved motor in which the electric current is cut off in the event of the regulator becoming inoperative through failure of the hydraulic pressure.

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

I accomplish the objects of this 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.

Fig. II is a front view of my improved regulator with the plunger in its initial or retracted position, the releasing position of the armature and actuating and actuated parts being indicated by dotted lines.

Fig. III is a front view similar to that of Fig. II with the plunger in its extended position.

Fig. IV is an end elevation looking to the left of Figs. II and III.

Fig. IV^A is a detail section on a line corresponding to line 4^A—4^A of Figs. IV and V, showing details of the actuating rod locking and controlling means.

Fig. V is an enlarged detail transverse section on a line corresponding to line 5—5 of Fig. II.

Fig. VI is an enlarged detail section on a line corresponding to line 6—6 of Figs. IV and V.

Fig. VII is a detail view partially in longitudinal section, showing details of the cut-out for the valve connection, the cut-out switch and the armature retaining means.

Fig. VIII is a detail view showing details of the electrical connection.

Fig. IX 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 or support 1 adapted to be in turn mounted upon a wall or post or other support in proper relation to the parts to be controlled.

In Fig. I 2 represents the draft damper of a furnace 3, and 4 the check draft or damper of the furnace smoke pipe 5. These dampers are connected to the motor by the cables 6 and 7 passing over suitable guide pulleys 8.

I mount a cylinder 9 on the base plate 1, the cylinder being provided with a plunger 10, shown conventionally by dotted lines in Fig. II. At its outer end the cylinder is provided with an inlet and exhaust connection 11 controlled by the valve 12, the pipe 13 being connected to a suitable water supply under pressure, such as a city system, while the pipe 14 carries away the exhaust.

The plunger rod 15 reciprocates through a supporting plate 16. The actuating rod 17 is slidably supported parallel to the plunger rod by means of this plate 16 and a bracket 18. The actuating rod is connected to the lever 19 of the valve by means of the link 20.

The actuating rod is provided with stops 21 which limit its movement. I mount actuating springs 22 on the rod adapted to be engaged by the tappet or arm 23 on the plunger rod, so that the springs are placed under

compression toward the end of the stroke of the plunger and power stored to actuate the rod when it is released. The actuating rod is locked and controlled by the locking slide 24 and the control dog 25, the slide being slidably mounted on the outer side of the supporting plate 16, while the control dog 25 is pivotally mounted on the inner side, the dog being mounted on the pivot 26 and supported at its outer edge by the stud 27. A spring 28 is provided for holding the pivoted dog 25 yieldably against the actuating rod 17 and a spring 29 is provided for actuating the locking slide 24.

The actuating rod is provided with a notch-like keeper 30 with which the locking slide 24 coacts and with spaced notch-like keepers 31 and 32 with which the control dog 25 coacts. The keepers 31 and 32 have beveled faces so that the control dog is forced out of engagement therewith by the actuating springs of the actuating rod when the control dog is free to retract, the control dog being normally held in engaging position by the plunger rod 15.

To permit the release of the control dog the plunger rod 15 is provided with notch-like recesses 33 and 34 positioned so that the control dog may be retracted or released when the plunger is at the ends of its stroke, but not intermediate such position.

The locking slide 24 is released by means of the trip lever 35 pivoted at 36 and provided with an adjusting screw 37 engaging the arm 38 on the slide,—see Figs. II and III. The trip lever extends along the side of the plunger rod and is controlled by the armature 39 of the electromagnet 40, the armature being held in its retracted position by the spring 41. The details of the electromagnet form no part of this invention and they are, therefore, not further described herein.

The armature 39 is provided with a notch 42 adapted to receive the end of the lever 35. The lever 35 has a keeper 46 with an inclined face coacting with the lug 47 on the plunger rod for holding the plunger in its extended position,—see Fig. III. A blade spring 48 is mounted on the lever so that it is engaged by the lug 47 and placed under stress when the plunger is in its retracted position, as shown in Fig. II, so that when the armature is actuated to release the lever the spring throws the lever out to the position indicated by dotted lines in Fig. II and trips or releases the locking member 24. The return weight 49 is supported by the cable 50 passed over the guide pulley 51 to a pin 52 on the plunger rod. The pull of the weight on the plunger, owing to the inclined form of the face of the keeper 46, serves to disengage the plunger from the trip lever. The cables 6 and 7 are connected to the pin 52.

For convenience in making the electrical connections I mount an insulated plate 53 on the base plate 1. The plate 53 is provided with binding posts 54 to which the temperature controlled device, shown conventionally at 55, Fig. IX, is connected. The binding post 56 is connected to the source of current, as the battery 57, Fig. IX.

The binding posts 54 are connected to spring contacts 58 mounted on the plate 53 so as to be engaged by the tappet 23 on the plunger rod 15 when the plunger is at the ends of its stroke, the circuit being broken during the stroke of the plunger.

The lead 59 of the electromagnet is controlled by the cut-out switch 60, the movable member of which is carried by the actuating rod 17. This cut-out switch is opened only while the valve 12 is open to admit water to the cylinder. The advantage of the cut-out switch is that in the event of there being a failure of water supply to actuate the plunger this switch being open prevents the exhausting of the battery or the consumption of current. The circuit being broken at this time, it is necessary to provide means for holding the armature in its trip lever releasing position, and this I accomplish by means of the retaining rod 61 adapted to engage a pin 62 on the armature, the rod being secured at 63 to the movable member of the cut-out switch and guided to reciprocate through the cylinder supports 64. When, however, the plunger is actuated to its extended position by the hydraulic pressure the valve, through the mechanism described, is closed to cut off the water supply and this cut-out switch is also closed, the parts being then locked with the plunger rod in its extended position until the armature is actuated through variations in temperature.

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

Assuming the parts to be in the position shown by full lines in Fig. II and connected to the furnace draft and check as shown in Fig. I, the draft would be closed and check open, that is, it will be in the reverse position from that shown in Fig. I. When the control device 25 is actuated, as by variation in temperature, it closes the electromagnet circuit through one or the other of the binding post connections 54,—see the diagrammatic illustration of Fig. IX—and the armature is actuated releasing the trip lever 35. On its releasing movement the trip lever 35 releases the locking dog 24. As the dog 25 is then opposite the notch 34, it may be moved back into the notch by the actuating rod 17 which is actuated upon the releasing of the dog 24 by the power stored in the actuating spring 22. This movement of the actuating rod closes the exhaust and opens the inlet. The water acting on the

plunger carries it to its outer position shown in Fig. II, which movement places the outer spring 22 under stress. When the limit of the stroke of the plunger is reached, the notch 33 is brought opposite the dog 25 and the actuating rod spring is then able to return the actuating rod, opening the exhaust and closing the pressure connection, parts then being in position shown in Fig. III, in which position the trip lever has engaged the lug 47, and the circuit having been broken during the passage of the plunger from one contact 58 to the other, the armature is released and locks the trip lever. The parts are held as shown in Fig. III until the armature is again actuated by the circuit being closed by the control member, the trip lever is released and the weight returns the plunger to its initial position as shown in Fig. II. During this return stroke the circuit is broken and the armature again engages the trip lever for the succeeding actuation.

My improved regulator is entirely automatic, that is, there is no weight or motor to wind. It may be very easily installed and this by unskilled workmen, as the operative parts are all assembled upon the base plate, which may be mounted on any suitable support. I have illustrated and described my improvements in an embodiment which I consider practical. I have not attempted to illustrate or describe various structural modifications 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 regulator, the combination of a cylinder provided with inlet and exhaust connections, a valve controlling said connections adapted when in one position to connect the cylinder with the inlet and when in another position with the exhaust, a plunger, a plunger rod, a weight for returning said plunger, an actuating rod connected to said valve, actuating springs on said actuating rod, a tappet on said plunger rod adapted to place said springs under stress by the stroke of the plunger so that when released the actuating rod is actuated thereby, a locking member for said actuating rod, a trip lever therefor having a keeper coacting with a lug on said plunger rod for holding it in its extended position, said keeper having an inclined face so that when said lever is released the actuating weight disconnects the lug and keeper, an electromagnet comprising an armature constituting a lock for said lever, said lever being provided with a spring which is put under stress by the return of the plunger so that the lever is actuated when released by the armature, a spring actuated control dog for said actuating rod, said rod having spaced beveled keepers coacting with said dog, said plunger rod constituting means for holding said dog in engagement and permitting the release of said dog only at the ends of the stroke of the plunger whereby the actuating rod is held with its actuating springs under compression until the completion of the stroke of the plunger, and electrical connections for said electromagnet comprising a contact member on the plunger rod and a pair of coacting spring contact members positioned to be engaged thereby at the ends of the stroke of the plunger whereby the circuit is broken during the stroke of the plunger, a cut-out switch operatively connected to said actuating rod to be opened when the plunger is in its retracted position, and an armature retaining member actuated by said actuating rod to retain the armature in its closed position when the plunger is in its retracted position.

2. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, a valve controlling said connections adapted when in one position to connect the cylinder with the inlet and when in another position with the exhaust, a plunger, a plunger rod, a weight for returning said plunger, an actuating rod connected to said valve, actuating springs on said actuating rod, a tappet on said plunger rod adapted to place said springs under stress by the stroke of the plunger so that when released the actuating rod is actuated thereby, a locking member for said actuating rod, a trip lever therefor having a keeper coacting with a lug on said plunger rod for holding it in its extended position, said keeper having an inclined face so that when said lever is released the actuating weight disconnects the lug and keeper, an electromagnet comprising an armature constituting a lock for said lever, said lever being provided with a spring which is put under stress by the return of the plunger so that the lever is actuated when released by the armature, a spring actuated control dog for said actuating rod, said rod having spaced beveled keepers coacting with said dog, said plunger rod constituting means for holding said dog in engagement and permitting the release of said dog only at the ends of the stroke of the plunger whereby the actuating rod is held with its actuating springs under compression until the completion of the stroke of the plunger, and electrical connections for said electromagnet comprising a cut-out switch operatively connected to said actuating rod to be opened when the plunger is in its retracted position, and an armature retaining member actuated by said actuating rod to retain the armature in its closed posi-

tion when the plunger is in its retracted position.

3. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, a valve controlling said connections adapted when in one position to connect the cylinder with the inlet and when in another position with the exhaust, a plunger, a plunger rod, a weight for returning said plunger, an actuating rod connected to said valve, actuating springs on said actuating rod, a tappet on said plunger rod adapted to place said springs under stress by the stroke of the plunger so that when released the actuating rod is actuated thereby, a locking member for said actuating rod, a trip lever therefor having a keeper coacting with a lug on said plunger rod for holding it in extended position, said keeper having an inclined face so that when said lever is released the actuating weight disconnects the lug and keeper, an electro-magnet comprising an armature constituting a lock for said lever, said lever being provided with a spring which is put under stress by the return of the plunger so that the lever is actuated when released by the armature, and a spring actuated control dog for said actuating rod, said rod having spaced beveled keepers coacting with said dog, said plunger rod constituting means for holding said dog in engagement and permitting the release of said dog only at the ends of the stroke of the plunger whereby the actuating rod is held with its actuating springs under compression until the completion of the stroke of the plunger.

4. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, a valve controlling said connections adapted when in one position to connect the cylinder with the inlet and when in another position with the exhaust, a plunger, a plunger rod, a weight for returning said plunger, an actuating rod connected to said valve, actuating springs on said actuating rod, a tappet on said plunger rod adapted to place said springs under stress by the stroke of the plunger so that when released the actuating rod is actuated thereby, a locking member for said actuating rod, a trip lever therefor having a keeper coacting with a lug on said plunger rod for holding it in its extended position, said keeper having an inclined face so that when said lever is released the actuating weight disconnects the lug and keeper, an electromagnet comprising an armature constitnting a lock for said lever, and a spring actuated control dog for said actuating rod, said rod having spaced beveled keepers coacting with said dog, said plunger rod constituting means for holding said dog in engagement and permitting the release of said dog only at the ends of the stroke of the plunger whereby the actuating rod is held with its actuating springs under compression until the completion of the stroke of the plunger.

5. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, a valve controlling said connections adapted when in one position to connect the cylinder with the inlet and when in another position with the exhaust, a plunger, a plunger rod, a weight for returning said plunger, an actuating rod, actuating springs on said actuating rod, a tappet on said plunger rod adapted to place said springs under stress by the stroke of the plunger so that when released the actuating rod is actuated thereby, a locking means for said actuating rod comprising a trip lever, said lever constituting means for holding said plunger in its extended position, an electromagnet comprising an armature operatively associated with said lever, means for holding said actuating rod with its springs under compression until the completion of the stroke of the plunger, and electrical connections for said electromagnet comprising a contact member on the plunger rod and a pair of coacting spring contact members positioned to be engaged thereby at the ends of the stroke of the plunger whereby the circuit is broken during the stroke of the plunger, a cut-out switch operatively connected to said actuating rod to be opened when the plunger is in its retracted position, and an armature retaining member actuated by said actuating rod to retain the armature in its closed position when the plunger is in its retracted position.

6. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, a valve controlling said connections adapted when in one position to connect the cylinder with the inlet and when in another position with the exhaust, a plunger, a plunger rod, a weight for returning said plunger, an actuating rod, actuating springs on said actuating rod, a tappet on said plunger rod adapted to place said springs under stress by the stroke of the plunger so that when released the actuating rod is actuated thereby, a locking means for said actuating rod comprising a trip lever, said lever constituting means for holding said plunger in its extended position, an electromagnet comprising an armature operatively associated with said lever, means for holding said actuating rod with its springs under compression until the completion of the stroke of the plunger, and electrical connections for said electromagnet comprising a cut-out switch operatively connected to said actuating rod to be opened when the plunger is in its retracted position, and an armature retaining me[illegible] ac-

tuated by said actuating rod to retain the armature in its closed position when the plunger is in its retracted position.

7. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, a valve controlling said connections adapted when in one position to connect the cylinder with the inlet and when in another position with the exhaust, a plunger, a plunger rod, a weight for returning said plunger, an actuating rod, actuating springs on said actuating rod, a tappet on said plunger rod adapted to place said springs under stress by the stroke of the plunger so that when released the actuating rod is actuated thereby, a locking means for said actuating rod comprising a trip lever, said lever constituting means for holding said plunger in its extended position, an electromagnet comprising an armature operatively associated with said lever, and means for holding said actuating rod with its springs under compression until the completion of the stroke of the plunger.

8. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating rod, a plunger, a plunger rod, 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 released the actuating rod is actuated by the springs, a locking member for said actuating rod, a trip lever therefor having a keeper coacting with a lug on said plunger rod for holding it in its extended position, said keeper having an inclined face so that when said lever is released the actuating weight disconnects the lug and keeper, an electromagnet comprising an armature constituting a lock for said lever, said lever being provided with a spring which is put under stress by the return of the plunger so that the lever is actuated when released by the armature, a spring actuated control dog for said actuating rod, said rod having spaced beveled keepers coacting with said dog, said plunger rod constituting means for holding said dog in engagement and permitting the release of said dog only at the ends of the stroke of the plunger whereby the actuating rod is held with its actuating springs under compression until the completion of the stroke of the plunger, and electrical connections for said electromagnet comprising a contact member on the plunger rod and a pair of coacting spring contact members positioned to be engaged thereby at the ends of the stroke of the plunger whereby the circuit is broken during the stroke of the plunger, a cut-out switch operatively connected to said actuating rod to be opened when the plunger is in its retracted position, and an armature retaining member actuated by said actuating rod to retain the armature in its closed position when the plunger is in its retracted position.

9. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating rod, a plunger, a plunger rod, 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 released the actuating rod is actuated by the springs, a locking member for said actuating rod, a trip lever therefor having a keeper coacting with a lug on said plunger rod for holding it in its extended position, said keeper having an inclined face so that when said lever is released the actuating weight disconnects the lug and keeper, an electromagnet comprising an armature constituting a lock for said lever, said lever being provided with a spring which is put under stress by the return of the plunger so that the lever is actuated when released by the armature, a spring actuated control dog for said actuating rod, said rod having spaced beveled keepers coacting with said dog, said plunger rod constituting means for holding said dog in engagement and permitting the release of said dog only at the ends of the stroke of the plunger whereby the actuating rod is held with its actuating springs under compression until the completion of the stroke of the plunger, and electrical connections for said electromagnet comprising a cut-out switch operatively connected to said actuating rod to be opened when the plunger is in its retracted position, and an armature retaining member actuated by said actuating rod to retain the armature in its closed position when the plunger is in its retracted position.

10. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating rod, a plunger, a plunger rod, 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 released the actuating rod is actuated by the springs, a locking member for said actuating rod, a trip lever therefor having a keeper coacting with a lug on said plunger rod for holding it in its extended position, said keeper having an inclined face so that when said lever is released the actuating weight disconnects the lug and keeper, an electromagnet comprising an armature constituting a lock for said lever, said lever being provided with a spring which is put under stress by the return of the plunger so that the lever is actu-

ated when released by the armature, and a spring actuated control dog for said actuating rod, said rod having spaced beveled keepers coacting with said dog, said plunger rod constituting means for holding said dog in engagement and permitting the release of said dog only at the ends of the stroke of the plunger whereby the actuating rod is held with its actuating springs under compression until the completion of the stroke of the plunger.

11. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating member, a plunger, a plunger rod, 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 released the actuating member is actuated by the springs, a locking means for said actuating member comprising a trip lever, an electromagnet comprising an armature operatively associated with said lever, means for holding said actuating member with its springs under compression until the completion of the stroke of the plunger including the plunger rod, and electrical connections for said electromagnet comprising a contact member on the plunger rod and a pair of coacting spring contact members positioned to be engaged thereby at the ends of the stroke of the plunger whereby the circuit is broken during the stroke of the plunger, a cut-out switch operatively connected to said actuating rod to be opened when the plunger is in its retracted position and an armature retaining member actuated by said actuating rod to retain the armature in its closed position when the plunger is in its retracted position.

12. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating member, a plunger, a plunger rod, 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 released the actuating member is actuated by the springs, a locking means for said actuating member comprising a trip lever, an electromagnet comprising an armature operatively associated with said lever, means for holding said actuating member with its springs under compression until the completion of the stroke of the plunger including the plunger rod, and electrical connections for said electromagnet comprising a cut-out switch operatively connected to said actuating rod to be opened when the plunger is in its retracted position, and an armature retaining member actuated by said actuating rod to retain the armature in its closed position when the plunger is in its retracted position.

13. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating member, a plunger, a plunger rod, 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 released the actuating member is actuated by the springs, a locking means for said actuating member comprising a trip lever, an electromagnet comprising an armature operatively associated with said lever, and means for holding said actuating member with its springs under compression until the completion of the stroke of the plunger including the plunger rod.

14. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said connections comprising an actuating member, a plunger, a plunger rod, 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 released the actuating member is actuated by the springs, a locking means for said actuating member comprising a trip lever, said lever constituting means for holding said plunger in its extended position, an electromagnet comprising an armature operatively associated with said lever, and means for holding said actuating member with its springs under compression until the completion of the stroke of the plunger including the plunger rod.

15. In a regulator, 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 released the actuating member is actuated by the springs, means for controlling said actuating member comprising an electromagnet, means for holding said actuating rod with its springs under compression until the completion of the stroke of the plunger, and electrical connections for said electromagnet comprising a cut-out switch operatively connected to said actuating member to be opened when the plunger is in its retracted position, and an armature retaining member actuated by said actuating member to retain the armature in its closed position when the plunger is in its retracted position.

16. In a regulator, the combination of a cylinder provided with inlet and exhaust connections, means for controlling said con-

nections 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 released the actuating member is actuated by the springs, means for locking said actuating member at the end of its stroke, automatic means for releasing said locking means, and means for holding said actuating rod with its springs under compression until the completion of the stroke of the plunger.

17. In a regulator, 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 released the actuating member is actuated by the springs, means for controlling said actuating member comprising an electromagnet, and means for holding said actuating member with its springs under compression until the completion of the stroke of the plunger.

18. In a regulator, 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 released the actuating member is actuated by the springs, and means for controlling said actuating member comprising an electromagnet.

19. In a regulator, 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 locking said actuating member at the end of its stroke, and means for placing said springs under stress by the stroke of the plunger so that when released the actuating member is actuated by the springs.

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

ROBERT J. SEATOR. [L. S.]

Witnesses:
LU A. DUDLEY,
ROY M. LUDLUM.