No. 856,417. PATENTED JUNE 11, 1907.

J. A. OLSON.

ELECTRICAL CONTROLLER FOR STEAM PLANTS, &c.

APPLICATION FILED MAR. 20, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

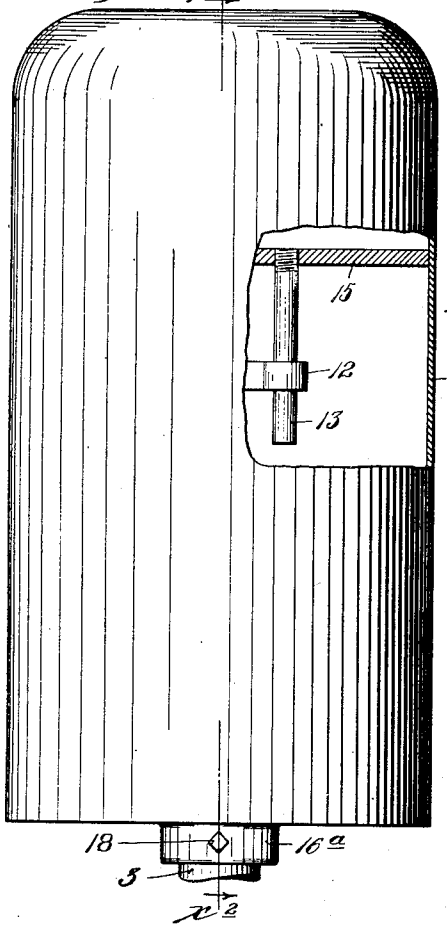


Fig. 2.

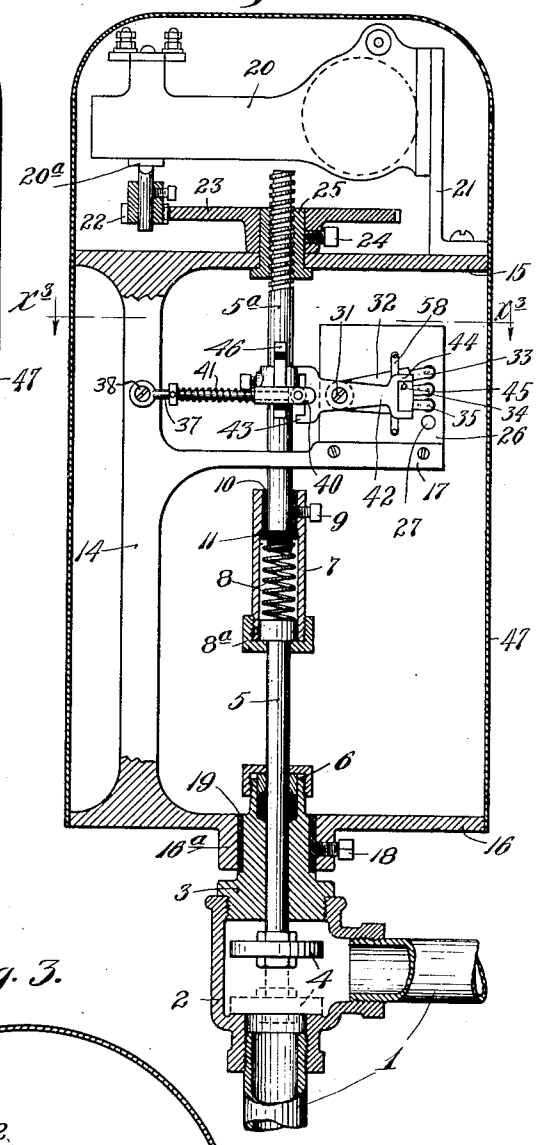
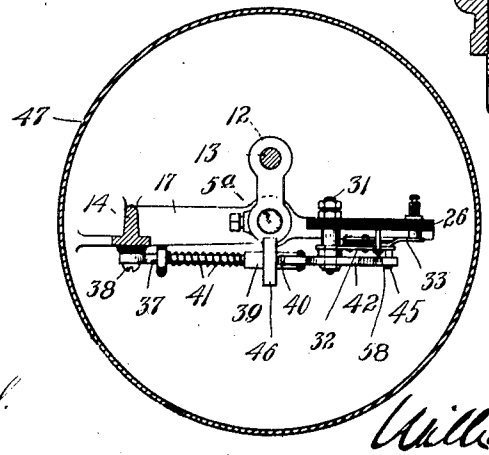


Fig. 3.



Witnesses.

E. W. Jeppesen.

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Inventor:

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2 SHEETS—SHEET 2.

Fig. 5.

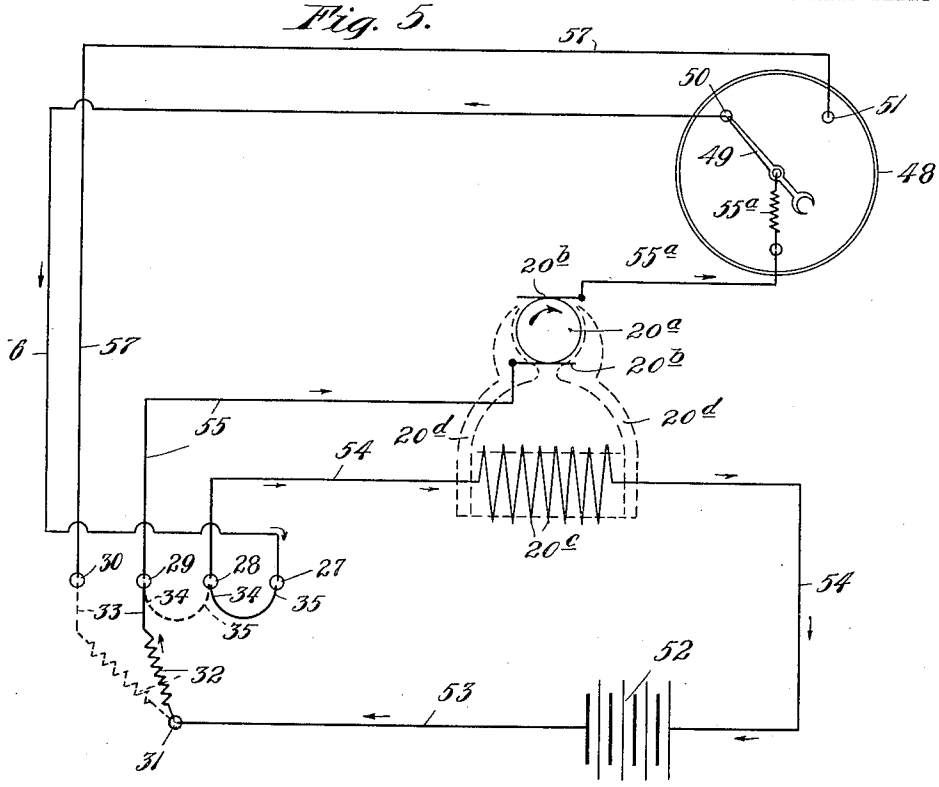


Fig. 4.

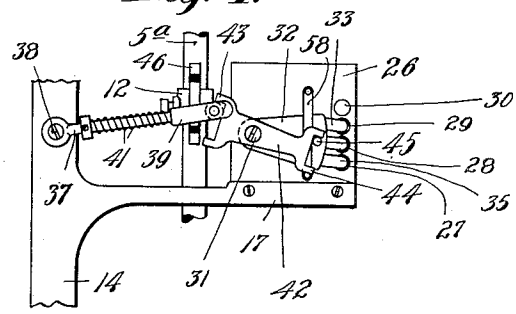
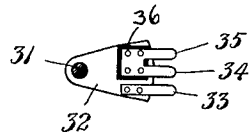


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN A. OLSON, OF MINNEAPOLIS, MINNESOTA.

ELECTRICAL CONTROLLER FOR STEAM PLANTS, &c.

No. 856,417. Specification of Letters Patent. Patented June 11, 1907.

Application filed March 20, 1905. Serial No. 251,028.

To all whom it may concern:

Be it known that I, JOHN A. OLSON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Electric Controllers for Steam Plants, &c.; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide an improved electrical controller, adapted for use as an automatic heat regulator, and for other purposes, and to this end, it consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

The invention applied to open and close a valve of a steam or hot water heating system, is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a view in side elevation, with some parts broken away, showing the improved automatic heat regulator. Fig. 2 is a vertical section taken approximately on the line x^2x^2 of Fig. 1. Fig. 3 is a horizontal section taken through the device on the line x^3x^3 of Fig. 2. Fig. 4 is a detail in elevation, showing a reversing switch, and a spring "kicker" for moving the same. Fig. 5 is a view in diagram, illustrating the wiring of the device, and Fig. 6 is a view of the reversing switch with the parts turned upside down.

The numeral 1 indicates one of the steam or water circulating pipes of a heating system, shown as having horizontal and vertical sections connected by a T-coupling 2, affording a valve seat, and having at its upper end a plug 3. Circulation through the pipe 1 is adapted to be cut off by a valve 4, the stem 5 of which works vertically upward through the plug 3 and through a stuffing box 6, shown as applied to said plug. In this application of the invention, the valve stem 5, has a supplemental section 5^a, the upper end of which is threaded.

For an important purpose, which will presently appear, the supplemental valve stem or extension 5^a is yieldingly connected to said stem 5, such connection being preferably made by a sleeve 7, and a spring 8. Said sleeve 7 is rigidly connected to the stem section 5^a by a set screw 9, and a bushing 10 of insulating material is preferably placed around said stem within said sleeve. At its lower end, the said sleeve 7 has a detachable cap nut 8^a that engages the headed upper end of the stem 5, as best shown in Fig. 2. The spring 8 reacts against the head of the stem 5 and against an insulating washer 11 which is placed against the end of the stem section 5^a. The stem section 5^a is held against rotation by a bracket 12 rigidly secured thereto, and working slidably on a vertical guide stud 13 supported by a frame 14. This frame 14 has a disk-like upper plate 15, a similar lower plate 16, and an intermediate shelf or arm 17. The said plate 16 has a hub 16^a that telescopes over the plug 3, and is rigidly secured thereto by a set screw 18. An insulating bushing 19 is interposed between the plug 3 and the hub 16^a, for a purpose which will presently appear.

The numeral 20 indicates a small reversible electric motor which, as shown, is directly supported by a bracket 21 mounted on the upper plate 15 of the main supporting bracket 14. Of the parts of this motor, it is only necessary to particularly designate the commutator 20^a, the brushes 20^b the field magnet 20^c and the pole pieces 20^d of said field magnet. The commutator 20^a carries a spur pinion 22 that meshes with a spur gear 23. This spur gear 23 is rigidly, but detachably secured, as shown, by a set screw 24, to a hub-like nut 25. This nut 25 works on the threaded end of the valve stem section 5^a, is loosely journaled in the plate 15, and below said plate, is flanged so that it is held against endwise movement. As is evident, under rotary movements of the gear 23, acting on the valve stem through the rotary nut 25, the valve 4 may be raised and lowered, according to the direction of movement of said gear. The direction of rotation of said gear, of course, depends upon the direction of rotation of the motor armature.

Rigidly secured to the shelf 17 of the bracket 14, is a plate 26 of insulating material, and secured to this plate is a row of four fixed contact posts 27, 28, 29, and 30. Pivoted to the insulating plate on the stud 31 is a vibrating switch lever 32. This switch lever has one contact finger 33 that is electrically connected therewith, and it carries two other contact fingers 34 and 35 that are insulated therefrom by a spacing block 36 of suitable insulating material. The two fingers 34 and 35 are electrically connected with each other, preferably by being formed from

the same piece of metal, as shown in Fig. 6. These contact fingers, 33, 34 and 35, coöperate with the four contact posts just noted, in a manner which will presently be described. One extreme position of the switch lever 32 and its fingers is illustrated in Fig. 2, and the other extreme position thereof is indicated in Fig. 4. To quickly move said switch lever from one extreme position to the other, at the proper times, and under the control or action of the valve stem 5—5ª, a so-called "spring kicker" is provided. This spring kicker involves an oscillatory bolt 37 which is pivoted to the bracket 14 at 38, and at its free end, has a telescopically movable head 39, the outer end of which is pronged and preferably carries a small roller 40. A spring 41 reacts against a collar on said bolt 37 and against said head 39, to yieldingly force the latter outward.

A lever 42 is pivoted at its intermediate portion on the stud 31 before noted. At its end, adjacent to the roller 40, the lever 42 is provided with an approximately straight surface with which said roller engages, and this surface terminates in laterally spaced lugs 43. At its other end, said lever is provided with laterally spaced lugs 44 that act as tappets, to alternately engage a stud or projection 45 on said switch lever 32.

The valve-stem section 5ª carries a pair of laterally projecting longitudinally spaced tappet lugs 46, located one on each side of the free end of the rod 37, and engageable alternately with the head 39. The exact relation of these parts just described will more fully appear in the description of the operation.

A thin shell or housing 47, preferably formed of wood fiber, or other insulating material, is detachably secured to the plates 15 and 16 of the bracket 14, and incloses the parts of the apparatus so far described.

For automatically closing and opening the circuits to the field and armature of the motor, under varying temperatures, I provide a thermostat. This thermostat may be of any suitable form, such as a standard thermometer having a pointer which is arranged to be vibrated, usually over a dial, by thermally actuated devices, not necessary for the purposes of this case to consider. In Fig. 5, this thermostat or thermometer is indicated in diagram, the case being designated by the numeral 48 and the pointer thereof being designated by the numeral 49. The numerals 50 and 51 designate contacts applied to the face of the thermostat, one on each side of the free end of the pointer 49, and in position to be engaged thereby. It may be assumed that the pointer 49 will engage the contact 50 under a low temperature, and will engage the contact 51 under a high temperature.

The wiring which is illustrated only in Fig. 5, is preferably as follows: The numeral 52 indicates the battery, which is connected by a lead 53 to the stud 31 which affords the lever pivot before described. The battery 52 is also connected to the binding post 28 by a lead 54 that includes the coil of the motor field magnet 20ᶜ. The binding post 29 is connected by a wire 55 to one of the commutator brushes 20ᵇ, and the other commutator brush is connected by a wire 55ª to the pointer 49 of the thermostat or thermometer. The contact post 27 is connected by a wire 56 to the contact 50 of the thermostat, while the contact post 30 is connected by a wire 57 to the contact 51 of said thermostat.

In Fig. 2, the valve must be assumed to be moving upward under the action of the motor, the armature of which is then rotating in the direction indicated by the arrow marked on Fig. 5. This movement of the motor is occasioned by a low temperature which has caused the pointer 49 to engage the contact 50, thereby closing the circuit through the field and armature of the motor, as clearly shown by full lines in the diagram view, Fig. 5.

Tracing the closed circuit at this time, we may assume that the current flows, as indicated by arrows, to-wit, through the wire 53, through the lever 32 and finger 33 of the contact post 29, thence through the wire 55 to one contact brush 20ᵇ, through the armature of the motor, thence out through the other brush and the wire 55ª to the pointer 49 of the thermostat, from thence through the wire 56 to the contact post 27, thence through the contact fingers 34 and 35 to the contact post 28, and from thence through the lead 54 and the coil of the field magnet 20ᶜ back to the battery.

When the valve stem is moved slightly farther upward than shown in Fig. 2, the lower tappet 46 thereof will have forced the bolt 37 outward of its dead center with respect to its pivot, and the pivot of the lever 42, and when this occurs, the spring 41, acting on the sliding head 39, causes the said head to act upon the adjacent end of the tappet lever 42, and thereby throw the latter, with a very quick action, into the position shown in Fig. 4. This movement of said tappet lever 42, by engagement of its upper tappet lug 44 with the stud 45 on the switch lever 32, throws said switch lever and its contact fingers, with a quick movement, into the position indicated in Fig. 4, thereby shifting the contact fingers 33, 34 and 35 thereof, into contact with the contact posts 29, 28 and 27, respectively, as indicated by dotted lines in the diagram Fig. 5. When this action takes place, as the motor circuit is broken between the pointer 49 and the contact 51 of the thermostat, the motor will be stopped. When, however, the temperature rises so as to move the pointer 49 into

engagement with said contact 51, the motor circuit will be closed, and the current will flow through the armature of the motor in a direction reverse from that indicated by the arrows and previously traced, but will flow through the coil of the field magnet in the same direction as previously described. As is evident, this will cause the armature of the motor to rotate in a direction reverse from that indicated by the arrow marked thereon in Fig. 5, and under this direction of rotation, the valve will be closed. Under the downward movement of the valve and its stem, the switch lever 32, and its contact fingers, will be thrown back into the position indicated by full lines in Figs. 2 and 5; such movement being caused by the engagement of the upper tappet lug 46 with the head 39 on the bolt 37.

There is such clearance between the two tappet lugs 46 and the head 39, and the cooperating parts are so arranged, that under a downward movement of the valve, the switch lever 32 will not be moved until after said valve has been closed. The spring 8, of course, permits a considerable downward movement of the supplemental valve stem 5^a after the valve has been closed, and it also affords a cushion between the said parts which prevents the valve from being seated under excessive pressure.

The insulations at 10 and 19 prevent grounding of the motor circuit. The insulating case 47 covers up all of the parts that are electrically charged when the motor is in action. The current for operating the motor is, of course, supplied by the battery or source of energy 52.

To prevent accidental movement of the switch lever 32, and to hold the contact fingers thereof pressed onto the coöperating contact posts, a tension or friction bar 58 is secured at its ends to the plate 26, and presses the upper surface of said lever, under friction.

The device described, while especially adapted for use as a heat regulator for hot water, steam and hot air heating systems, is capable of many other uses. For instance, it is well adapted for use as an automatic means for regulating the supply of steam to a pump used to elevate water, and in which a float-actuated circuit closer and breaker may be used in lieu of the thermostat.

From what has been said, it will be understood that the mechanism described is capable of a great many modifications within the scope of my invention as herein set forth and claimed.

What I claim and desire to secure by Letters Patent of the United States, is as follows:—

1. In a device of the character described, the combination with a reversible motor and circuit connections thereto involving an automatic circuit maker-and-breaker and a motor reversing switch, of a reciprocating stem or plunger driven from said motor, and a spring-actuated "kicker" independent of said switch and operative on said switch, when thrown to either side of a dead center, itself arranged to be operated by said plunger, substantially as described.

2. In a device of the character described, the combination with a reversible electric motor, of a two part operating plunger, receiving reciprocating movements from said motor, the sections thereof being yieldingly connected, circuit connections to said motor involving a circuit-maker-and-breaker and a reversing switch, a tappet lever, operative on said switch, and a spring actuated "kicker" arranged to be thrown from one side to the other of a dead center, by said operating plunger, and operating in turn on said tappet lever, substantially as described.

3. In a device of the character described, the combination with a reversible motor and electrical connections thereto involving a circuit maker-and-breaker and a reversing switch, of a tappet lever operative on the said reversing switch, at the limits of its movement, an oscillating bolt having a spring pressed "kicker" head, operating on said tappet lever, when thrown to either side of a dead center, a threaded stem or plunger connected to a controller, such as a valve, a motor driven sleeve, operating as a nut on said stem, and tappets on said stem operating on the head of said bolt, to force the same first to one side and then to another of dead center, substantially as described.

4. In a device of the character described, the combination with a reversible electric motor and circuit connections thereto involving a motor reversing switch, of a pivoted tappet lever having a limited movement with respect to but operative on said reversing switch lever at the limits of its movement, and a spring pressed "kicker" operated by said motor and operating on said tappet lever when moved to either side of a dead center, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN A. OLSON.

Witnesses:
E. W. JEPPESEN,
F. D. MERCHANT.