S. N. JORDAN.

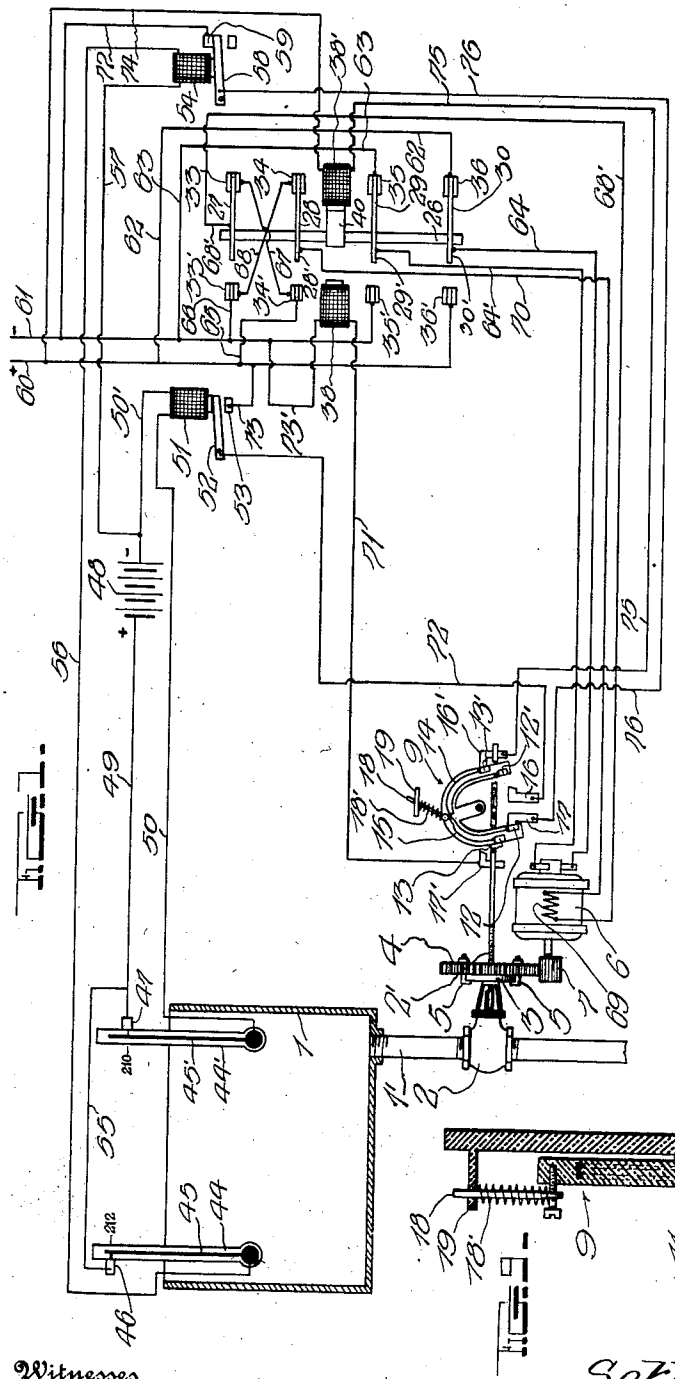
AUTOMATIC TEMPERATURE CONTROLLING SYSTEM.

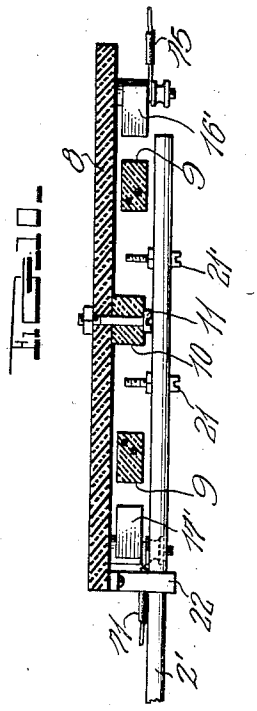
APPLICATION FILED FEB. 25, 1915.

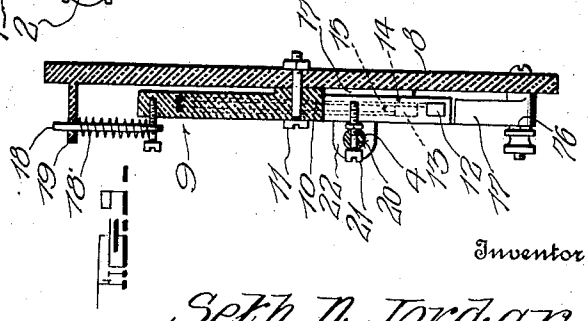
1,162,071.

Patented Nov. 30, 1915.

3 SHEETS—SHEET 1.







Witnesses

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3 SHEETS—SHEET 2.

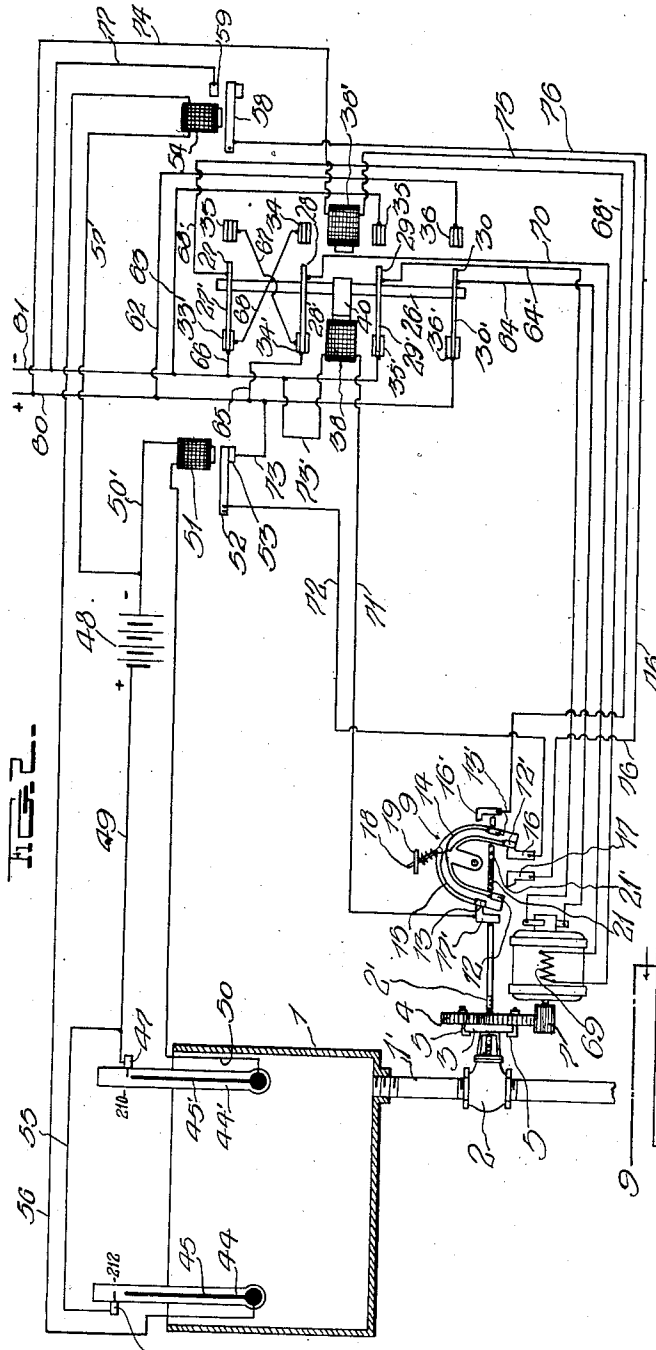


FIG. 2.

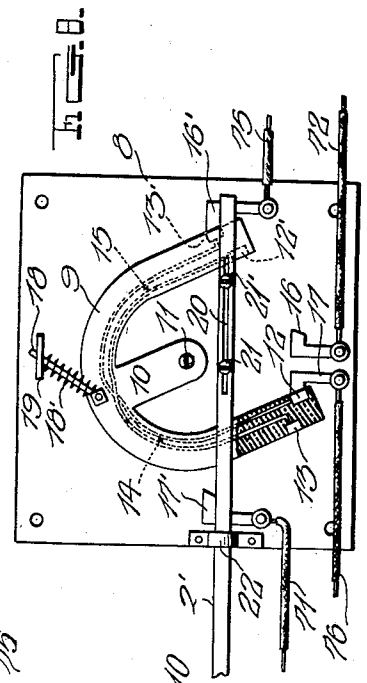


FIG. 8.

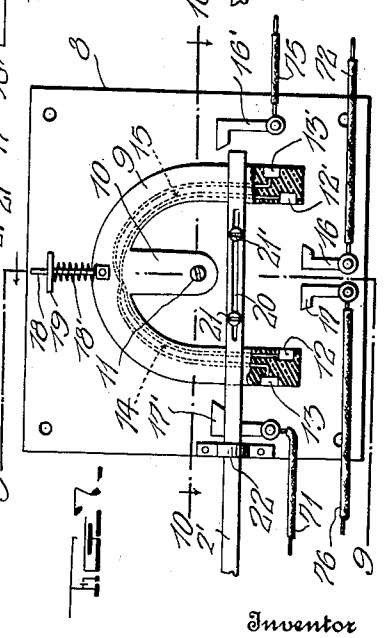


FIG. 7.

Witnesses

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3 SHEETS—SHEET 3.

FIG. 5.

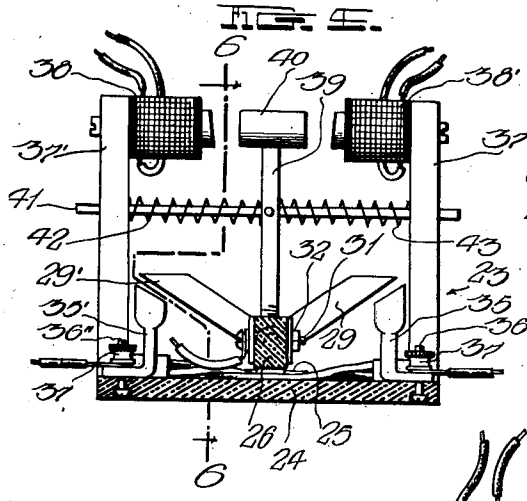


FIG. 7.

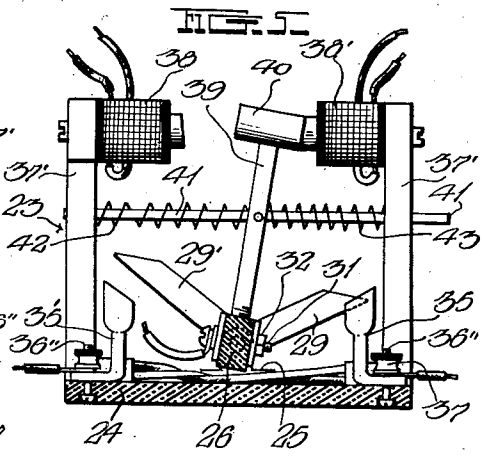


FIG. 6.

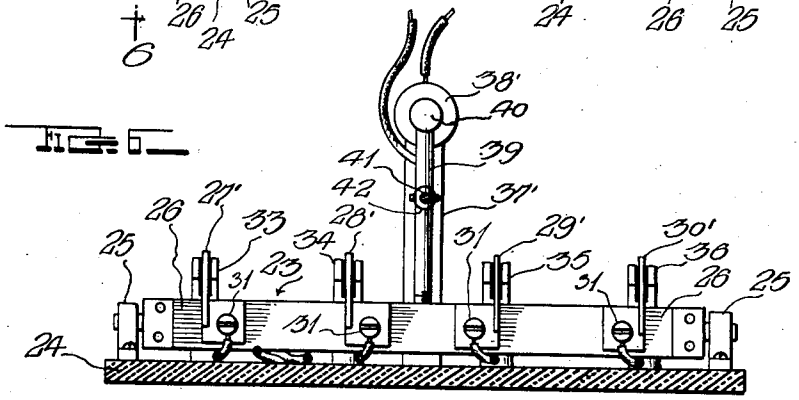
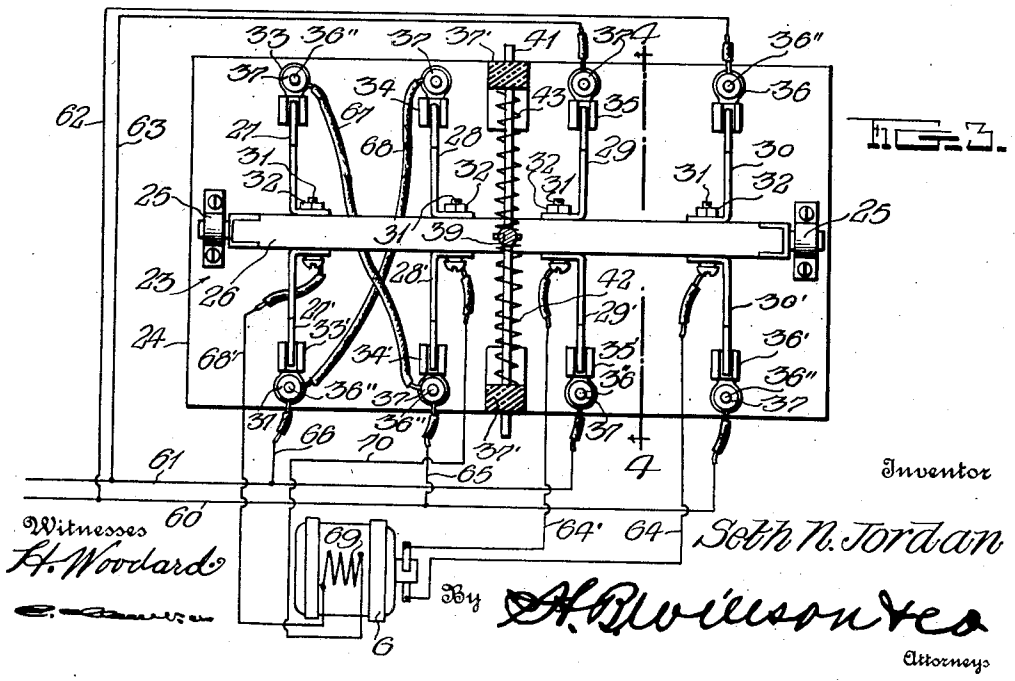


FIG. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

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AUTOMATIC TEMPERATURE-CONTROLLING SYSTEM.

1,162,071. Specification of Letters Patent. Patented Nov. 30, 1915.

Application filed February 25, 1915. Serial No. 10,484.

To all whom it may concern:

Be it known that I, SETH N. JORDAN, a citizen of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Automatic Temperature-Controlling Systems; and I do 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.

This invention appertains to a system of thermostatic control.

One object of this invention is to provide a system of this character wherein a given substance may be maintained at an approximately constant temperature or the liquid contents of a receptacle at a substantially constant level.

Another and further object is to provide a novel switch mechanism for regulation of the motor utilized in the system.

Another and still further object is the provision of a mechanism controlled by the movement of a valve to open and close the motor circuit.

With these and other objects in view, the invention consists of certain novel details of construction, combination and arrangement of parts more fully hereinafter set forth and claimed.

In the accompanying drawings in which corresponding parts are indicated by similar reference numerals: Figure 1 is a diagrammatic view illustrating the mercurial column positioned for closing the valve and cutting off the steam supply; Fig. 2 is a diagrammatic view illustrating the mercurial columns in a position for opening the valve and supplying additional steam; Fig. 3 is a top plan view of the double throw switch employed in my system and showing diagrammatically the connection of the switch with the source of supply and motor; Fig. 4 is a transverse vertical section of the double throw switch taken on the line 4—4 of Fig. 3; Fig. 5 is a similar view showing the switch in actuated position; Fig. 6 is a central vertical section of the switch taken on the line 6—6 of Fig. 4; Fig. 7 is a front elevation of a valve controlled switch, parts being broken away and shown in section; Fig. 8 is a similar view illustrating the switch in actuated position; Fig. 9 is a vertical transverse section taken on the line 9—9 of Fig. 7; Fig. 10 is a horizontal section taken on the line 10—10 of Fig. 7.

This invention is primarily developed to meet a deficiency in the present status of the dyeing industry by reducing to a minimum, the amount of heat energy wasted in the treatment of dye stuffs. In treating certain dye stuffs, it is necessary that the temperature of the same be maintained constant or at least approximately so at 210° to 212° Fahrenheit. It frequently happens however, that the temperature rises far beyond these points which results in a waste of steam with a possibility of spoiling the dye stuffs being treated. It is to be understood however, that I do not wish to limit myself to this particular art as my system could be utilized as a means for refilling a boiler when the water therein has dropped below a predetermined level. In fact, this system might be advantageously employed in any instance where the supply of a medium to a receptacle is controlled by a valve.

Briefly stated, my invention contemplates placing a valve in the length of a steam pipe which supplies steam to a receptacle, which valve is opened and closed by a motor, that is, operating the motor in one direction will close the valve thus cutting off the supply of steam, while operation of the motor in the opposite direction will open the valve and allow steam to be supplied. This motor which is connected to a suitable source of supply, has included in its circuit, a pole changer, the movement of which is controlled by a pair of electromagnets so that when one of the magnets is energized, the pole changer will be actuated so as to operate the motor in one direction and when the other electromagnet is energized, the pole changer will be actuated in the opposite direction to reverse the motor which thus permits the valve to be opened and closed as will be readily understood without further description.

The energization of the two magnets above referred to for actuating the pole changer depends on the temperature of the receptacle contents and when the temperature of the latter in one instance reaches 212° Fahrenheit, one of the electro-magnets for actuating the pole changer will be energized and when it drops below 210° Fahrenheit, the other electro-magnet controlling the pole

changer will be energized. As it is necessary to break the motor circuit when the valve is closed, there is also provided a member so arranged with respect to the valve as to coöperate with the latter and open the motor circuit when said valve is closed and also break said circuit when the valve has been fully opened.

Referring more particularly to the accompanying drawings, my invention in its present embodiment consists of a vat 1 having a steam supply pipe 1′ communicating therewith. The steam supply pipe 1′ has a valve 2 which latter is provided with an externally threaded extended stem 2′. This stem 2′ passes through an annular flange 3 secured to the housing of the valve and has threaded thereon a gear 4. To maintain the gear 4 in fixed position with respect to the valve housing it is provided with the L-shaped fingers 5 which coöperate with the flange 3 as is clearly shown in Fig. 1 of the drawings. Moreover, to prevent rotary movement on the part of the valve stem, the latter is keyed to the valve housing as will be readily understood without further description.

Adjacent the free end of the valve stem 2′ is a switch board 8 having suitable openings in the corners thereof (and formed of soapstone or other insulating material) for fastening elements by means of which it may be secured in proper relation with respect to said valve stem. Pivotally mounted upon the switch board 8 is a movable contact 9 in the form of a yoke or U-shaped member. This movable contact 9 has a tongue 10 depending from the center of its arcuate shaped portion and provided at its extremity with an opening through which passes a pivot bolt 11. The legs of the movable contact 9 are provided with two inner and two outer contacts 12 and 12′ and 13 and 13′, said contacts being suitably connected by conductors 14 and 15 respectively. These conductors may be in the form of wires embedded in the outer surface of the movable contact (which of course, as understood, will be composed of insulating material) or may be in the form of metal strips. However, this is merely a detail of construction and is immaterial.

Secured to the switch board 8 are four stationary contacts 16 and 16′, 17 and 17′, said contacts being so disposed with respect to each other and to the contacts on the movable member 9 as to have the stationary contact 17 coöperate with the contact 12 and the stationary contact 16′ coöperate with the contact 13′ when the movable member 8 is operated in one direction, and when the latter is moved in the opposite direction to have the stationary contact 16 coöperate with the contact 12′ and the stationary contact 17′ coöperate with the contact 13.

Pivotally connected to the arcuate shaped portion of the movable contact member 9 is a guide rod 18 which reciprocates through a guide 19. Arranged upon the guide rod 18 is a spring 18′ which normally maintains the contacts on the movable member 9 in engagement with certain of the stationary contacts. In fact, it will be seen that from the manner in which the movable member 9 is mounted, as soon as said movable member is moved beyond a plane passed through the center of the switch board, the spring 18′ will tend to force the movable member 9 in one direction or the other as the case might be.

In order that the movement of the valve 2 may control that of the movable contact member 9, the extended stem of said valve is slotted longitudinally contiguous to its end as at 20 and provided with a pair of laterally projecting set screws 21 and 21′ which are adjustably mounted in the slot 20. A guide 22 secured to the face of the switch board 8 maintains the stem 2′ in proper relation with respect to the movable contact 9. By arranging the set screws in the manner shown, it will be seen that when the valve is moved to a closed position, the set screw 21 will contact with one leg of the movable contact 9 to actuate the latter whereas if the valve is moved in opposite direction to open the same, the set screw 21′ will contact with the other leg and actuate the movable contact 9 in the opposite direction as will be readily understood without further description.

To reverse the motor whenever desired, there is included in the circuit of the latter, a pole changer 23 consisting of a base of insulating material 24 having thereon two journals 25 which receive the trunnions on a shaft 26 and pivotally support the same. Projecting from each side of the shaft 26 which is formed of insulating material are four knife blades 27, 28, 29, 30, 27′, 28′, 29′ and 30′, the opposite blades of each pair being connected by bolts 31 passing through the shaft 26 and the right angularly extended portion of the various blades as clearly shown in Fig. 3, said bolts being maintained in place by nuts 32 threaded on the ends thereof. The bolts 31 in addition to fastening the switch plates to the shaft 26 also serve as binding posts.

The foregoing constitutes what may be termed the movable contacts of my switch. To coöperate with the free ends of the various knife blades projecting from the shaft 26, I provide a plurality of stationary contacts 33, 34, 35, 36, 33′, 34′, 35′ and 36′. These stationary contacts are right-angular in configuration and have their upper portions bifurcated, the legs of the horizontal portions being apertured to receive suitable screws 36″ upon which are threaded caps 37,

thus providing binding posts as will be readily seen upon referring to Fig. 4.

Rising vertically from the upper surface of the base 24 are two oppositely disposed standards 37′ each of which is provided contiguous to its upper end, with an inwardly extending electro-magnet indicated at 38 and 38′.

To provide an armature for the two magnets 38 and 38′, the shaft 26 is provided with a right-angularly disposed upright 39 which is provided at its upper end with a laminated core 40 which is disposed intermediate the core of magnets 38 and 38′ and will be attracted by one or the other depending on which of the same is energized. To normally maintain the core 40 in a neutral position and the switch blades on the shaft disengaged from the stationary contacts, the upright 39 is provided with a horizontally disposed guide rod 41 which has its extremities disposed in registering openings formed in the uprights 37′. Upon the guide rod 41 are two compression springs 42 and 43 which it will be apparent, will normally maintain the laminated core 40 in a neutral position when both magnets are deënergized.

In order that the electro-magnets 38 and 38′ may be energized at predetermined conditions, so as to actuate the pole changer, there is provided a thermostatic controlling means consisting of two mercurial tubes 44 and 44′ which are adapted to be disposed in the contents of the vat or container 1. These tubes of course are suitably graduated and provided with mercurial columns 45 and 45′. Upon the tube 44 opposite the graduation thereon indicative of 212° Fahrenheit, is mounted a contact 46 and upon the tube 44′ opposite the graduation indicating 210° is a contact 47. A battery 48 has its positive pole connected by a conductor 49 to the contact 47 on the tube 44′, the bulbous portion of the latter having projecting therethrough one end of a conductor 50, the other extremity of which is connected to one terminal of electro-magnet 51, the other terminal of which is connected to the negative pole of battery 48 by a conductor 50′ from which it will be seen that when the mercury column in the tube 44′ reaches a point beyond 210°, a circuit will be completed through electro-magnet 51 so as to energize the armature 52 of the latter and disengage said armature from its contact 53 above which it is disposed.

To enable the mercury in column 44 to complete a circuit through an electro-magnet 54, the conductor has extending therethrough, a conductor 55 which is connected to contact 46 on the tube 44, the bulbous portion of the latter having extended therethrough one end of a conductor 56, the other end of which is connected to one terminal of the electro-magnet 54, the other terminal of the latter being connected by a conductor 57 to conductor 50′ so that when the mercurial column in tube 44 reaches 212° Fahrenheit, the circuit will be completed from the battery 48 through electro-magnet 54 so as to energize the latter and cause the same to attract its armature 58, which thereby brings said armature into contact with the stationary contact 59 for a purpose hereinafter to be set forth.

In order to properly include the pole changer in the circuit of motor 6, the following connections are essential: the positive and negative leads 60 and 61 extending from a suitable source of supply are connected to the binding post on contacts 35′ and 36′ of the pole changer 23 whereas the branch leads 62 and 63 extending from the conductor 60 and 61′ are connected to the opposite stationary contacts 35 and 36. Connected to the binding post of the knife blades 29′ and 30′ are the conductors 64 and 64′, the free ends of which are connected to the motor brushes, owing to the fact that bolts 31 connect the blades 29 and 29′, 30 and 30′, it will be seen that if the blades 29 and 30 are brought into engagement with contacts 35′ and 36′ current will flow through the lead 60, contact 36′, blade 30′, conductor 64 to one brush of the motor 6 from the other brush thereof through conductor 64′, blade 29′, contact 35′ to the negative lead 61 but however, if the blades 29′ and 30′ are disengaged from contacts 35′, 36′ and the contacts 29 and 30 brought into engagement with contacts 35 and 36, then current will flow from the positive lead 60 through the conductor 62 to the contact 36 through the blade 30, bolt 31 to conductor 64, through the latter to one brush of the motor from whence it will flow from the opposite brush through conductor 64, bolt 31, plate 29, contact 35, conductor 63 to the negative lead 61. The arrangement just described provides the proper armature connections for the motor. To connect the field of said motor to the source of supply and at the same time have the connections so arranged that the direction of the current through the field may be reversed, a conductor 65 extends from the positive lead 60 to the stationary contact 34′, the adjacent stationary contact 33′ being connected to the negative lead 61 by a conductor 66. Conductors 67 and 68 join the stationary contacts 33 and 34 with contacts 33′ and 34′ for a purpose hereinafter to be set forth.

Connected to the bolt 31 joining blades 27 and 27′, is a conductor 68′ which has its free end connected to one end of the motor field 69, the other end of the latter being connected by a conductor 70 to bolt 31 joining the blades 28 and 28′ respectively so that if the blades 27′ and 28′ are brought into engagement with the stationary contacts

33′ and 34′, a current will flow from the positive lead 60 through conductor 65, switch blade 28′ through conductor 70, motor field 69, conductor 68′, switch blade 27′, stationary contact 33′, conductor 66 to the negative lead 61, but if on the other hand, the blades 27′ and 28′ are then disengaged from the stationary contacts 33′ and 34′ and the knife blades 27 and 28 brought into engagement with stationary contacts 33 and 34, then the current will flow from positive lead 60 through the conductor 65, stationary contact 34′, conductor 67, stationary contact 33, switch blade 27, bolt 31, conductor 68′, through the field 69, thence through conductor 70 to bolt 31 which connects the two blades 28 and 28′, through blade 28, stationary contact 34, conductors 68 and 66 to the negative lead 61.

From the above circuit connections, it will be obvious that actuation of the pole changer to the right will cause the motor to operate in one direction whereas actuation of the pole changer to the left will cause said motor to operate in a reverse direction.

To enable either of magnets 38 and 38′ to be energized when desired, said magnet 38 has one terminal connected by a conductor 71 to contact 17′ on the switch board 8 the coacting contact 16 thereon being connected by a conductor 72 to one end of the armature 52 controlled by the electro-magnet 51, the contact of the armature 52 being connected by a conductor 73 to positive lead 60 of the source of supply, the other lead 61 being connected by conductor 73′ to the far terminal of magnet 38. Thus it will be seen when magnet 51 is deënergized, the armature 52 will rest upon contact 53 and the movable contact 9 having its contact plates 13 and 12′ respectively in engagement with contact 17′ and 16 so that a circuit will be completed through electro-magnet 38 so as to energize the latter and cause the same to attract the laminated core 40 of the pole changer, thus starting the motor 6 into operation. On the other hand, in order to energize the electro-magnet 38′, the latter has one terminal connected to the positive lead 60 by a conductor 74, the other terminal thereof being connected by a conductor 75 to stationary contact 16′ on the switch board 8, the coöperating stationary contact 17 being connected by a conductor 76 to one end of armature 58 controlled by electro-magnet 54, while the contact with which the armature 58 is adapted to be engaged is connected by a conductor 77 to the negative lead 61 so that when armature 58 is brought into engagement with contact 59 by reason of the energization of electro-magnet 54, a circuit will be established from the positive lead 60 through conductor 74, electro-magnet 38′, conductor 75, contact 16′, conductor 14 on the movable contact 9, stationary contact 17, conductor 76, armature 58, contact 59 to the negative lead 61 so that the core 40 will be attracted, which will consequently actuate the pole changer so as to operate the motor in a direction contrary to that in which it was operated when the pole changer was moved in the opposite direction.

From the foregoing, it will be seen that if assuming the parts to be in the position shown in Fig. 1 and the valve opened, the mercury rises in the mercurial column 45 to 212° Fahrenheit, a circuit will be immediately established from the battery 48 through electro-magnet 54 so as to cause the latter to attract its armature and thus complete a circuit through the electro-magnet 38′ of the pole changer, causing the latter to be actuated toward the right and establish such connections as will cause the electric motor to rotate in a direction necessary to close the valve. As the valve is just about closed, the stud 21 on the valve stem 2′ will contact with the movable contact 9 to actuate the same which will deënergize the electro-magnet 38′ release the core 40 and permit the spring 42 to return the same to a neutral position, thus opening the motor circuit and stopping said motor. However, it is to be understood in this connection, that the gear 5 will be constructed as to have sufficient weight to act as a fly wheel and completely close the valve after the motor has been shut down. After the steam supply has been shut off for a while, the mercury of course will drop and as the mercury in the tube 44′ drops below 210° Fahrenheit, the magnet 51 will be deënergized and its armature dropped into contact with the contact 53. This it will be seen energizes the magnet 38 so that it attracts the core 40, actuates the pole changer and establishes such connections for the motor as will enable the latter to operate in a direction required to open the valve. As the valve opening reaches its maximum, the stud 21′ will engage the leg of movable contact 9 so as to actuate the latter and cause the deënergization of electro-magnet 38 so that the latter releases the core 40 and permits the spring 42 to bring said core to neutral position which thus shuts down the motor.

In respect to the movable contact 9 which opens and closes the circuits of the two electro-magnets 38 and 38′, it will be noted that upon opening the circuit of one magnet, say for instance 38, it partially reëstablishes the circuit of the other magnet 38′ and vice-versa.

Having now described my invention, it will be seen that I have provided a system which is extremely simple, easy to install, inexpensive to produce as well as one which will positively maintain a liquid heated by steam at an approximately constant temperature.

Although in the foregoing, I have stated certain elements as best adapted to perform the functions set forth, it is obvious that various changes in form, proportion and in the minor details of construction may be resorted to, without departing from the spirit or sacrificing any of the principles of the invention.

Notwithstanding the fact that I have described the application of my invention in connection with a dye vat, it is to be understood that the same may be used to advantage for controlling the sprinkler systems now employed for fire extinguishing purposes, or for the purpose of maintaining a constant temperature in hot houses and the like.

I claim:

1. In a system of the character specified, the combination with a valve and a source of electrical supply, of a motor connected with said source of supply and operatively associated with said valve, of a pole changer included in the circuit of said motor and comprising a plurality of coöperating movable and stationary contacts, the former being mounted upon a horizontally disposed shaft, an extension secured to said shaft, means in connection with said extension to normally maintain said movable contacts in disengaged relation with respect to the stationary contacts, an armature carried by said extension, an electro-magnet disposed on each side of said armature to move the latter in opposite directions and actuate said movable contacts to reverse said motor, and bring said valve in open and closed position, thermostatically controlled means for the respective electro-magnets at predetermined temperatures, and means influenced by the movement of said valve to deënergize said electro-magnets substantially as and for the purpose set forth.

2. In a system of the character described, the combination with a valve and a source of electrical supply, of a motor connected with said source of supply and operatively associated with said valve, a normally open pole changing switch included in the circuit of said motor whereby to cause the latter to operate in opposite directions, said pole changing switch including stationary contacts and a movable member having thereon a plurality of coöperating contacts, a pair of electro-magnets, an armature carried by said movable member and interposed between said electro-magnets, whereby said movable member may be actuated in opposite directions, an energizing circuit for each of said electro-magnets, each of said circuits having therein two brakes, one being normally closed, thermostatically controlled means for closing one of said brakes, and additional means controlled by the movement of said valve to open the normally closed brake to deënergize said electro-magnets substantially as and for the purpose set forth.

3. In a system of the character described, the combination with a valve and a source of electrical supply, of a motor operatively associated with said valve and connected with said source of supply, of a pole changing switch arranged in the circuit of said motor and including a plurality of stationary contacts, a movable member, a plurality of contacts thereon for coöperation with said stationary contacts, a pair of oppositely disposed standards, an electro-magnet secured to each of the latter contiguous to the upper end thereof, an extension carried by said movable member, an armature on the free end of said extension, means to normally maintain said armature in equi-distance from the course of said electro-magnets whereby the contacts on said movable member are disposed in disengaged relation with respect to said stationary contacts, an energizing circuit for each of said electro-magnets, each of said circuits having therein two brakes, one of the latter being normally closed, thermostatically controlled means for closing the other brakes in the respective circuits at predetermined temperatures, whereby to energize said electro-magnets and actuate the contacts on said movable member whereby to cause said motor to operate in opposite directions and bring said valve to open and closed positions, and additional means controlled by the movement of said valve to open said normally closed brake in the circuit of each of said electro-magnets to deënergize the latter, substantially as and for the purpose set forth.

4. In a system of the character described, the combination with a valve having an extended stem, and a gear mounted thereon, of a motor, a pinion thereon meshing with the gear on said stem, a source of supply connected with said motor, a pole changer included in the circuit of the latter, a pair of electromagnets coöperating with said pole changer, and controlling the movement thereof, whereby to cause said motor to operate in opposite directions and bring said valve to open and closed positions, and energizing circuits for each of said electromagnets, the respective circuits of the latter having therein two brakes, one of the latter being normally closed, the other open, thermostatically controlled means to close the normally open brake in each of said circuits, and additional means for opening the normally open brake in the circuits of said electromagnets to deënergize the latter, said means comprising a U-shaped pivoted member having contacts on the inner and outer edges of its legs, conductors connecting said contacts, a plurality of stationary contacts disposed in the path of the contacts on said pivoted members, spring means to normally

maintain certain of the contacts on said pivoted member in engagement with certain of the stationary contacts, and means carried by said stem to actuate said pivoted member in opposite directions as said valve is brought to open and closed positions, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

SETH N. JORDAN.

Witnesses:
FREDERIC B. LEEDS,
CORA A. MCGANNAN.