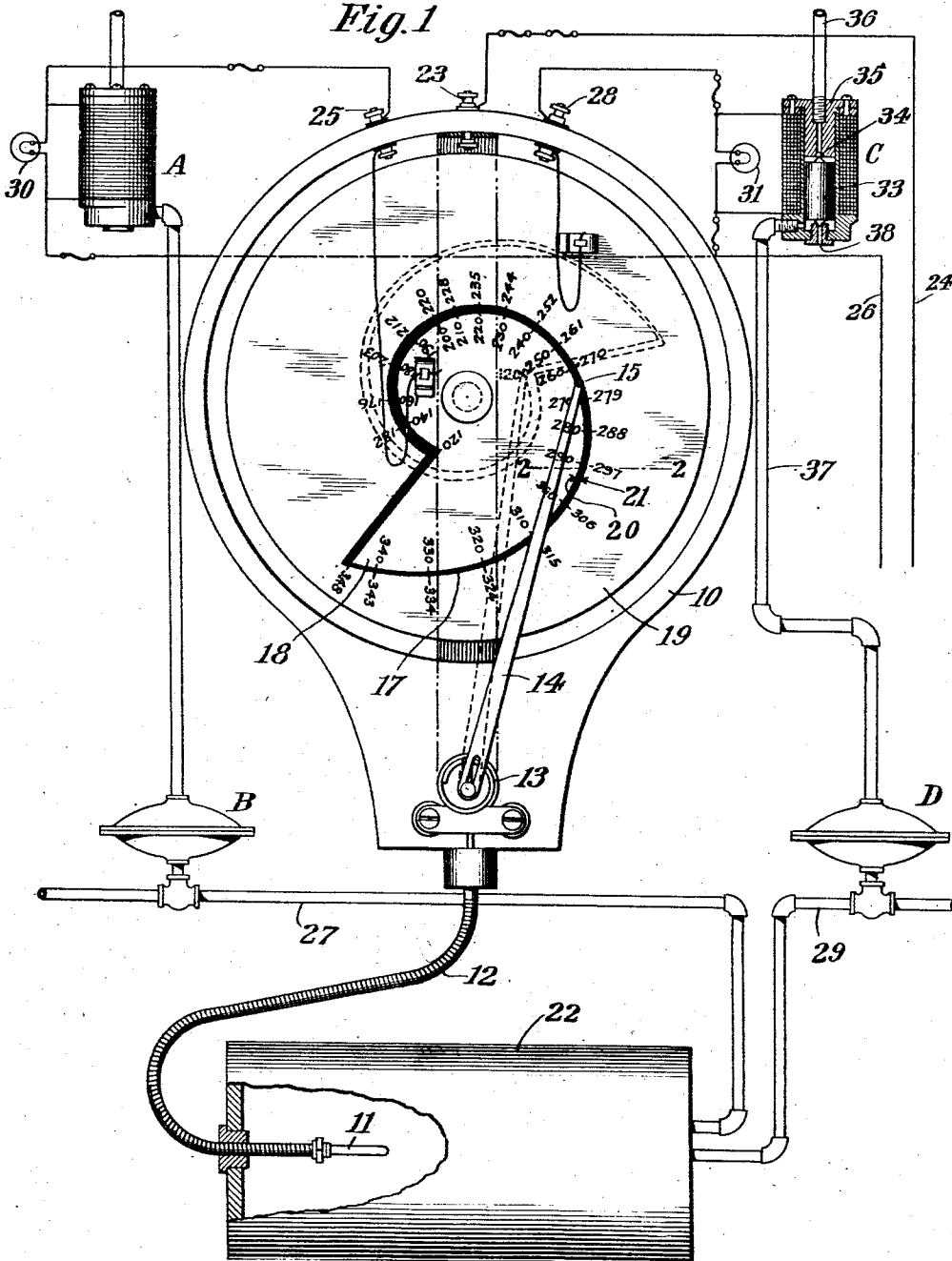


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DEVICE FOR SETTING UP AND MAINTAINING PREDETERMINED CONDITIONS IN VARIOUS MEDIUMS.
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1,320,580.

Patented Nov. 4, 1919.



Witnesses:

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Francis Boyle

18 *Fig. 2* Albert A. Somerville, Inventor

19

17 16

By his Attorney
E. M. Robinson

UNITED STATES PATENT OFFICE.

ALBERT A. SOMERVILLE, OF FLUSHING, NEW YORK, ASSIGNOR TO AMERICAN RUBBER COMPANY, A CORPORATION OF MASSACHUSETTS.

DEVICE FOR SETTING UP AND MAINTAINING PREDETERMINED CONDITIONS IN VARIOUS MEDIUMS.

1,320,580.

Specification of Letters Patent.

Patented Nov. 4, 1919.

Substitute for application Serial No. 875,246, filed December 3, 1914. This application filed February 15, 1917. Serial No. 148,800.

To all whom it may concern:

Be it known that I, ALBERT A. SOMERVILLE, a citizen of the United States, residing at Flushing, Long Island, county of Queens, and State of New York, have invented certain new and useful Improvements in Devices for Setting Up and Maintaining Predetermined Conditions in Various Mediums, of which the following is a full, clear, and exact description.

This invention relates to devices for setting up and maintaining predetermined conditions in various media. It is more particularly directed to an automatic device for setting up and maintaining predetermined temperature pressure, vacuum, or other conditions at the surface or in the interior of a chamber.

One of the objects of the invention is to provide a simple device of the kind mentioned, in which any variations from the desired predetermined conditions may be quickly and efficiently compensated and the system restored to the normal. Another object is to provide a device of the kind mentioned in which regulation of a plurality of agents causing predetermined desired variations may be effected by the same control-member.

This application is a continuation of my former application, Serial No. 875,246, filed December 3, 1914.

In the accompanying drawing wherein one of the various possible embodiments of the invention is shown:

Figure 1 is a diagrammatic view of the device adapted to control the temperature of a mill or calender roll, and

Fig. 2 is a fragmentary, cross-sectional view taken on the line 2-2, Fig. 1, showing the construction of the chart-like control plate.

Briefly stated, my invention consists in the combination of automatic means for applying characteristically different agents such as steam and cold water, to a medium such as the interior chamber of a mill or calender roll, and a control device for regu-

lating the automatic means comprising a member, in the present embodiment shown as a chart-like member similar to the chart employed in the Bristol recording devices, this member being adapted to provide a predetermined condition of temperature or other condition in the medium, a follower or tracer-finger coacting with the chart-like member and directly determining the operation of the automatic means for application of the fluids to the mill or similar roll, and a device, here shown as a heat sensitive device affected by conditions in the interior of the roll, serving to control the follower-member.

The apparatus shown in the drawing includes an adaptation of certain parts of a Bristol recording device or similar apparatus with which are combined the various control devices as set forth above for effecting the desired results.

Referring now specifically to the drawings, there is shown an automatic solenoid-valve mechanism comprising two solenoids A and C which are connected by the feed wires 24 and 26 with an outside source of current and which are alternatively operated by connections passing through the plate control-member as hereinafter set forth. Each of the solenoid members is identical and a description of one will suffice for both. Air is adapted to be supplied to each of the solenoids through inlet-pipes 36, each of which is attached to a head of the solenoid and which communicates with the interior of the solenoid by means of a channel passing through the head. This channel terminates in a valve-seat 34. The plunger valve-head 33 which is of magnetic material is adapted to move up and down within the chamber and is provided at either end with cone-shaped closure members, one of which is adapted to seat in the valve-seat 34 and the other of which is adapted to seat in a valve-seat positioned at the inner extremity of a nipple 38 constituting an outlet port at the base of the solenoid.

Adjacent the outlet port is a second outlet port communicating with a pipe 37. The solenoids are adapted to communicate respectively through pipes 37 with the diaphragm control valves B and D. The valve B is adapted to regulate a supply of steam passing through a line 27 to the mill roll 22. The valve D is adapted to regulate a supply of cold water or other cooling fluid passing through line 29 to the roll.

A control device for regulating the solenoid valves, in this embodiment shown as a chart-like plate having an appearance similar to the chart of a Bristol recorder, is provided. This plate provides a series of contours which preferably constitute the boundary lines of zones of conducting material. These zones are separated by a disk 17 of non-conducting material upon which is formed, as shown more clearly in Fig. 2, a circuitous irregularly curved rib upon which is placed, flush with the upper face of the rib, concentric conducting plates 18 and 19. The inner plate has an outer edge conforming to the shape of the inner edge 20 of the rib, and the outer plate has an inner edge corresponding to the outer edge 21 of the rib. Through the inner plate and the disk 17 passes an aperture adapted to receive the ordinary spindle of the mechanism which is, preferably, revolved by clock work.

The rib is so formed that the edges 20 and 21 thereof coincide with respectively plotted curves representing time-temperature, time-pressure or other curves based upon the occurrence of phenomena of predetermined rates. As shown in the drawings, the width of the insulating rib varies so that a varying number of degrees of temperature-pressure or the like are traversed in passing from one curve of the rib to the other one.

The plate 18 at the center of the control member and which, as shown, lies against the curve representing the lower temperature to be maintained, is electrically connected with the solenoid A by means of a clip connected to the plate to which is attached a loose wire secured to a binding post 25 which is attached to, but isolated from the outer frame 10 of the instrument.

From binding post 25 the line passes through the solenoid which is connected in parallel with a lamp 30 to prevent sparking. From the solenoid A, a connection is made through the line 26 with one side of the current supply. The connection with the other side will be hereinafter set forth.

The plate 19 is adapted to be connected in a similar manner through a clip, loose wire, binding-post 28 connected to but isolated from the frame 10 and through a line which connects the solenoid C in parallel with a lamp 31 which also prevents spark-

ing. The line passes from the solenoid in a similar manner to the line 26.

A follower-finger 14 is adapted to swing back and forth across the control member and through its pen-like contact point 15 to contact successively with the conducting and non-conducting portions thereof, thereby establishing and disestablishing connection with the solenoid-valve mechanism and the source of current.

Connection with the source of current supply and the solenoid-valve mechanism through the line 24 is made through the binding post 23 attached to the frame 10 but isolated therefrom and a metallic strip electrically connected to the binding post and to the pivotal point of the follower-finger 14.

The motion of the follower-finger back and forth across the control plate is secured through a helical or spiral pressure tube 13 of the Bourdon type. This tube is connected by means of a vulcanizing tube with a bulb 11 fitted with a sensitive gas, vapor or liquid, and mounted in the roll 22, adapted to respond to changing conditions therein.

The operation of the above device is as follows: Assuming that the heating of the roll has commenced and the chart-like control-member and pen have been set at the initial temperature, namely, at the point marked 120 in dotted lines, the roll or other device which is being heated will reach the temperature 120. Thereafter as long as the follower-member 14 travels on the conducting plate 18, steam will be admitted to the inclosure 22. Admission of the steam will be permitted through the energization of solenoid A through which the current flows from line 24, binding post 23, follower-member 14, plate 18, binding post 25, and thence to the line 26. Under said energization the plunger 33 will be drawn up to seal the port 34, allowing air passing from the diaphragm-valve B to exhaust to the atmosphere through the pipe 37 and port 38. The diaphragm-valve being relieved of air pressure opens under the pressure in the steam line admitting steam to the vulcanizer. Thereafter, due to various external agencies, for example, in connection with mill rolls, the friction of the rubber on the rolls or similar heat-developing action may cause a too rapid rise of the temperature of this roll. At such time the follower-member will, under the action of the pressure tube 13 be carried off the plate 18 in a direction from the center of the control-member toward the periphery. It will first pass to the non-conducting rib on the disk 17 and thereby the circuit heretofore mentioned, will be broken, cutting off the supply of steam. The valve-mechanism at the time of the interruption of the current operates through the dropping of the plunger 33

which exposes the port 34 thereby establishing communication between the source of air supply and the diaphragm-valve, port 38 being sealed. The plunger is of a size to permit the passage of air thereabout.

If the temperature continues to rise after shutting off of the steam the follower-finger will bring the contact point upon the conducting plate 19 thereby closing the circuit through the solenoid C and applying cold water, lowering the temperature of the bulb. The circuit including the solenoid C will be established from the line 24 through the binding post 23, follower-finger 14, plate 19, binding post 28 through the solenoid and back to the wire 26. Upon lowering the temperature in the roll by admission of cold water the pen will travel backwardly on to the rib of the insulating member 17 and thence to the plate 18 whereupon steam will be again admitted.

The temperature within the medium is thus maintained close to the time temperature path, set out on the chart. The width of the strip of insulating material 17 between the edges 20 and 21 determines the temperature of variation between the maximum and minimum of any particular position of the pen and this temperature of variation depends upon the range of the recording thermometer or other sensitive device employed. In practice the pen fluctuates across the strip of insulating material between the plates 18 and 19 so that the make and break of the circuits controlling the steam and cooling agent go on practically continuously, that is, the steam and cold water are separately admitted every few moments.

If the apparatus is desired to maintain a constant temperature at the bulb, the confronting edges 20 and 21 of the electrical conducting plates may be made concentric circles, the size thereof depending upon the range of the instrument and the temperature desired at the bulb. Or this result may be accomplished by stopping the clock work mechanism ordinarily used to revolve the chart by means of a mechanical stop set at a proper point, or otherwise, while the confronting edges 20 and 21 of the electrical conducting plates may be made concentric spirals and the chart adjusted and clamped in such position on the clock face of the instrument that the pen will rest on that part of the path corresponding to the desired temperature at the bulb.

It will thus be seen that the apparatus is adapted to regulate quickly and efficiently variations from the conditions which it is desired to maintain in the chamber, and furthermore that the control of the various fluids is effected through the use of a single control member.

As many apparently widely different em-

bodiments of this invention may be made without departing from the spirit thereof, it is to be understood that I do not intend to limit myself to the specific form of the invention as set forth except as indicated in the appended claims.

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

1. In a device of the kind described, in combination, automatic means for applying characteristically different agents to a medium and a control device for regulating said automatic means comprising a member adapted to provide a predetermined condition in said medium, a follower-member directly operated upon by said member and directly determining the operation of said automatic means and a device sensitive to conditions in said medium and controlling said follower-member.

2. In a device of the kind described, in combination, automatic means for applying alternatively an agent to set up a condition in a medium and an agent to change the condition so set up and a control device for regulating said automatic means comprising a member adapted to provide a predetermined condition in said chamber, a follower-member directly operated upon by said member and directly determining the operation of said automatic means, and a device sensitive to conditions in said medium and controlling said follower-member.

3. In a device of the kind described, in combination, automatic means for applying characteristically different substances to a medium and a control device for regulating said automatic means comprising a member having a plurality of contours adapted to provide a predetermined condition in said medium, a follower-member coacting therewith and directly determining the operation of said automatic means and a device sensitive to conditions in said medium and controlling said follower-member.

4. In a device of the kind described, in combination, an automatically operated valve mechanism for applying characteristically different substances to a medium and a control device for regulating said automatic mechanism comprising a member adapted to provide a predetermined condition in said medium, a follower-member in contact with said member and directly determining the operation of said valve-mechanism and a device sensitive to conditions in said medium and controlling said follower-member.

5. In a device of the kind described, in combination, automatic electrical means for applying characteristically different substances to a medium and a control device for regulating said automatic means comprising a member having a plurality of

contours formed at the junction of zones of conducting and non-conducting material adapted to provide a predetermined condition in said medium, a follower-member
5 establishing and disestablishing communication with said automatic electrical means and a source of current through said zones, and a device sensitive to conditions in said medium and controlling said follower-member.
10 ber.

6. In a device of the kind described, in combination, automatic electrical means for applying characteristically different substances to a medium and a control device
15 for regulating said automatic means comprising a member having a plurality of contours formed by the edges of a band of non-conducting material, establishing a range of desired conditions in the medium and plates of conducting material, a follow-
20 member establishing and disestablishing communication with said automatic electrical means and a source of current through said conducting plates and a device sensitive to conditions in said chamber and controlling said follower-member.
25

7. In a device of the kind described, in combination, an automatic solenoid-valve mechanism for applying characteristically
30 different substances to a medium and a control plate for regulating said mechanism having a circuitous band of non-conducting material establishing a range of predetermined conditions in a medium and separating concentric plates of conducting material,
35 a follower-finger adapted to swing back and forth across said plate and to contact successively with the conducting and non-conducting portions thereof, thereby establishing and disestablishing communication with
40 the solenoid valve mechanism and a source of current to allow the passage through the mechanism of one or another of said substances, and a device sensitive to the conditions of said substances in said medium
45 and serving to swing said follower-finger back and forth across said plate.

8. In a device of the kind described, in combination, an automatic solenoid-valve
50 mechanism for applying fluids of differing characteristics to a medium and a chart-like control plate for regulating said mechanism having a series of conducting and non-conducting portions in electrical connection with
55 said solenoid-valve mechanism, a follower-finger adapted to swing back and forth and to contact successively with the conducting and non-conducting portions of said plate and serving to establish and disestablish connection thereby with said solenoid-valve
60 mechanism and a source of current and a Bourdon tube member operating upon said follower-finger in accordance with changing conditions in said medium thereby to
65 swing said finger back and forth across said

plate to admit one or another of said substances.

9. In a device of the kind described, in combination, an automatic solenoid-valve mechanism for applying a hot fluid and a
70 cold fluid to a medium and a chart-like control plate for regulating said mechanism having a series of conducting and non-conducting portions in electrical connection with said solenoid-valve mechanism, a follower-
75 finger adapted to swing back and forth and to contact successively with the conducting and non-conducting portions of said plate and serving to establish and disestablish connection thereby with said solenoid-
80 valve mechanism and a source of current, and a heat sensitive device connected with said medium operating upon said follower finger in accordance with changing conditions in said chamber, thereby to swing said
85 finger back and forth across said plate to apply alternately heating or cooling fluid.

10. In a device of the kind described, in combination, automatic means for applying characteristically different substances to a
90 medium and a control device for regulating said automatic means comprising a rotatable member adapted to provide a predetermined condition in said medium, a follower-member in contact with said member and directly
95 determining the operation of said automatic means, a device sensitive to conditions in said medium and controlling said follower-member, and a clock-mechanism for rotating said rotatable member.
100

11. In a device of the kind described, in combination, automatic electrical means for applying characteristically different substances to a medium and a control device for
105 regulating said automatic means comprising a rotatable member having a plurality of contours formed at the junction of zones of conducting and non-conducting material adapted to provide a predetermined condition in said chamber, a follower-member
110 establishing and disestablishing communication with said automatic electrical means and a source of current through said zones, a device sensitive to conditions in said medium and controlling said follower-member,
115 and a clock-control mechanism for rotating said rotatable member.

12. In a temperature-regulating device, the combination with a temperature-responsive device and means for changing the temperature of a device to be regulated, of a
120 movable member having conductors thereon the contours of which conform to the desired time-temperature characteristics of the device to be regulated, and means dependent
125 upon the relative positions of the temperature-responsive device and the movable member for controlling the means for changing the temperature.

13. The combination with electro-respon- 130

sive mechanism and a temperature responsive device, of a movable member having two spaced conductors thereon, said conductors being of such shape that the space
5 between the same corresponds to a predetermined time-temperature characteristic, non-conducting material in said space, time-controlled means for moving said movable member, and means whereby the temperature re-

sponsive device is caused to cooperate with 10 the movable member to control the electro-responsive mechanism in accordance with the predetermined time-temperature characteristic.

Signed at New York, N. Y., this 12th day 15 of December, 1916.

ALBERT A. SOMERVILLE.