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1,445,389.

W. F. CLARK.
ELECTRIC PRESSURE REGULATOR.
FILED JULY 19, 1918.

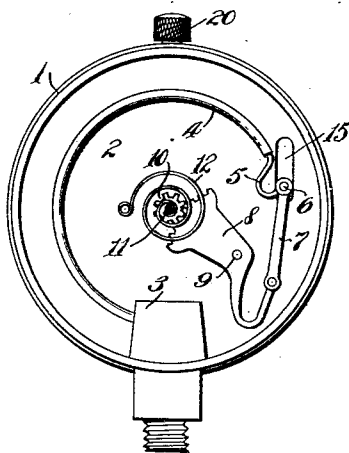


Fig. 1.

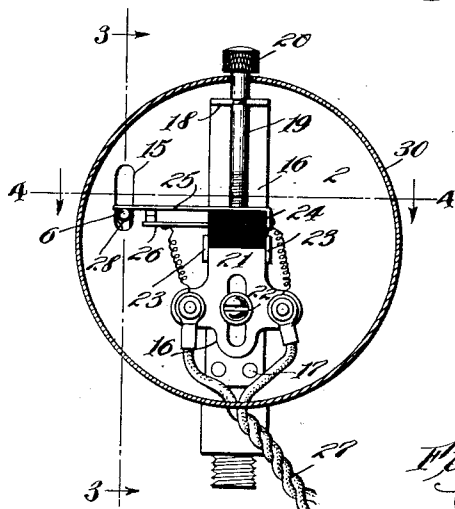


Fig. 2.

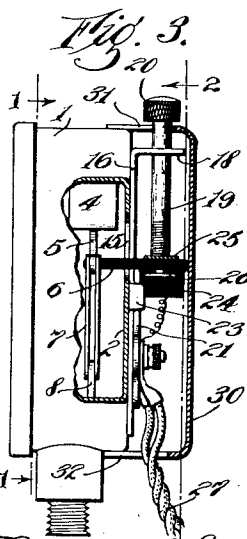


Fig. 3.

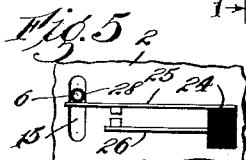


Fig. 5.

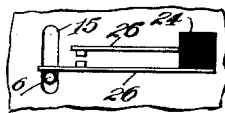


Fig. 7.

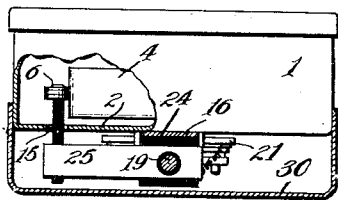


Fig. 4.

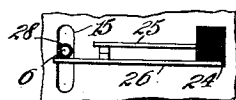


Fig. 6.

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UNITED STATES PATENT OFFICE.

WARREN F. CLARK, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
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ELECTRIC PRESSURE REGULATOR.

Application filed July 19, 1918. Serial No. 245,602.

To all whom it may concern:

Be it known that I, WARREN F. CLARK, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Electric Pressure Regulators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to regulating apparatus and especially to an apparatus responsive to changes of pressure to open or close an electric circuit. Devices of this character are of great utility in numberless ways: as for sounding a warning signal upon excessive or insufficient boiler pressure; for turning off or on a gas flame depending upon the pressure or temperature conditions in a boiler or water heater; for turning on or off an electric heating device; for controlling steam vulcanizers, coffee urns, household radiators, and wherever temperature or pressure control is desired.

The objects of my invention are the provision of a device of this character which shall be cheap, simple, reliable and practical; that will make and break either a small current or a large current; that can be adjusted to operate at different temperatures without loss of efficiency; wherein the temperature or pressure corresponding to the make and break is immediately ascertainable; wherein the contact points always bear the same relation to each other thus prolonging their life and improving their operation; whereby with a very minor change of construction the current can be turned either on or off with either increase or decrease of pressure as may be desired; and wherein all moving parts are housed and concealed to prevent derangement, dust accumulation, or danger of fire; while further objects of my invention will become apparent as the description proceeds.

In the drawings accompanying and forming part of this application I have shown one embodiment of my said invention although it will be apparent that the same can be constructed in numerous physical forms without departure from my inventive idea. In these drawings Fig. 1 is a front elevation of a common Bourdon-type pres-

sure gauge having its dial removed in accordance with the section line 1—1 in Fig. 3; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 3 and showing the construction and mode of operation of my improvements; Figs. 3 and 4 are sectional views on the lines 3—3 and 4—4 respectively of Fig. 2; and Figs. 5, 6, and 7, are detail views showing modified arrangements of the parts of my improved regulator to permit variations in the manner of its operation.

In the construction of my improved regulator I preferably start with a commercial, Bourdon-type, pressure-gauge, since these are well-known, easily-obtainable, inexpensive, accurate, and reliable. Each of these devices consists essentially of a casing 1, generally cylindrical in shape, with a rigid back 2 and an open front. Mounted in the side wall of this casing is a hollow stud 3 to which is attached the curved tube 4 whose expansion upon increasing pressure serves to operate the indicating appliances. This tube is provided at its free end with a bracket 5 carrying a cross-pin 6 which is connected by a link 7 with a toothed sector 8, pivoted at 9. The teeth of this sector mesh with a pinion 10 carried by a staff 11 to which is attached the pointer (not shown). A coil spring 12, generally of very slight strength, serves to return the pointer to zero position and to take up all back-lash in the gears and looseness in the joints. From this it will be seen that the position of the pin 6 is the most accurate pressure-indication of the entire apparatus, the functions of the parts 7 to 12 inclusive being merely to render that position visible.

Inasmuch as this mechanism is generally delicate and is ordinarily not guaranteed by the maker after the casing has once been opened, it is desirable that no contact points or other electrical mechanism be introduced inside this case. Accordingly I form the rearward wall 2 with an elongated slot 13, and I extend the pin 6 so as to cause it to project through this slot, while to the rear of the wall 2 I affix in any suitable manner a pair of contacts so arranged as to become closed or opened (as the case may be) by the movement of this pin along its slot consequent upon variations in the pressure within the Bourdon tube. Inasmuch as it is fre-

quently desirable to change the point at which this operation occurs, it is desirable that the contacts should be movable, and the most convenient plan I have so far conceived for effecting these various objects is shown in Figs. 2, 3, and 4, wherein 16 indicates a metal strip affixed to the outer face of the wall 2 in a position substantially parallel to the slot 15 and held in place by screws 17 or in any other suitable manner. One end of this strip is turned up as at 18 and slotted or apertured for the reception of the adjusting screw 19 whose end is provided with a knurled head 20. Slidably mounted upon the strip 16 is the carriage 21, here shown as slotted for the reception of the securing screw 22, and also guided in its movements by the ears 23. Secured to this carriage is the block 24 of insulating material in which the bolt 19 is threaded and to which are attached the contact springs 25, 26. These springs are provided with suitable contact points of any approved substance and are connected by suitable lead wires with the cable 27. All of these parts are preferably made so as to lie closely adjacent to the wall 2 and are housed within a pressed sheet metal cover 30 which is applied to the casing 1 and held thereto by friction, although additional securing means could be employed if desired. I have shown this cover as having slots 31 and 32 for the reception respectively of the screw 19 and cable 27; but in some instances it will be found preferable not to extend the adjusting screw outside of the cover, or possibly to dispense with adjustment; and in some cases, the internal binding posts will be omitted or carried to some other location than upon the carriage as shown. I have shown the pin 6 as provided with a sleeve of insulating material 28 so that the gauge will not become grounded by contact with the spring.

In Fig. 2 I have shown the spring 25 as the longer and as located above the pin 6 so that the contact points will be separated upon increase of pressure, the points being normally in contact; this is the arrangement desired in connection with devices wherein certain minimum elevated pressures or temperatures are desired to be kept, as in steam vulcanizers, coffee urns, steam boilers, drug and candy-store water heaters, etc.

In Fig. 5 I have shown the spring 25 as the longer but as located beneath the pin 6 so that the contact points will be brought together with decrease of pressure, the points being normally separated; this is peculiarly useful as a telltale on steam boilers, either for land or marine use, and as a regulator for refrigerating apparatus, as well as for many other uses.

In Fig. 6 I have shown the spring 26 as the longer and as located beneath the pin 6

so that the contact points will be separated by decrease of temperature or pressure, the points being normally in contact; and in Fig. 7 I have shown the spring 26 so that the contact points will be approached by increase of pressure, the points being normally separated. Innumerable uses will occur to those skilled in the art for all of the above arrangements, and it will be seen that the same can be effected by a mere reversal of parts without the slightest change of construction.

In order to change the temperature at which the device operates it is necessary merely to turn the screw 19 in the appropriate direction, which causes both contacts to move along together so that the actuation of the mechanism, at whatever point it occurs, takes place under exactly the same position and hence without loading the gauge-operation or rendering its visual indications inaccurate. It will also be seen that the contact points always bear the same relation to each other, and are neither shifted nor turned under any conditions, wherefore their seating facilities are not impaired as in previous devices of this nature.

I have used the words temperature and pressure herein substantially interchangeably because of the fact that, although the gauge operates primarily by variations of pressure, still this pressure can be employed either directly, as when the device is attached to a steam radiator, steam boiler, steam vulcanizer, or the like, or the pressure can be made an indirect indicator of temperature by filling the tube with some volatile substance or by attaching the gauge to a small bulb having such a substance therein. By suitably choosing that substance depending upon the range of temperature to be controlled, the device can be made of practically universal application.

It will be understood however, that I do not confine myself to the features of construction herein illustrated and described, except as the same are specifically recited in the claims hereto annexed or rendered necessary by the prior state of the art.

Having thus described my invention what I claim is:—

1. In a device of the character described, a casing having therein a pair of chambers separated by a slotted wall, a Bourdon tube located in one chamber, mechanism inside said chamber operatively attached to the free end of said tube whereby pressure is indicated visually, a pair of electric contacts located in the other chamber, and a rigid member carried by the free end of said tube and projecting through said slot and operatively related to said contacts.

2. In a device of the character described, a substantially cylindrical casing having a

dial at one end and a back plate at the other end, a Bourdon tube in said casing, mechanism operatively attached to the free end of said tube whereby pressure is indicated visually, a pair of electric contacts carried by the other side of said back plate from said tube and insulated therefrom, and operating means for said contacts traversing said back plate and operatively connected to the free end of said tube.

3. The combination with a gauge having a cylindrical case formed with a closed back and an open front and having a Bourdon tube therein, of a second casing attached to the rear of said first case and forming a chamber, and regulating mechanism located

in said chamber and operatively connected with said Bourdon tube.

4. The combination with a gauge having a cylindrical case formed with a closed back and an open front and having a Bourdon tube therein, of a cup-shaped, sheet-metal cap pressed upon the rearward part of said case and forming a chamber, the back of said gauge case having an aperture therein, regulating mechanism located in said chamber, and operating means traversing said aperture and connected to the Bourdon tube and to the regulating mechanism.

In testimony whereof, I hereunto affix my signature.

WARREN F. CLARK.