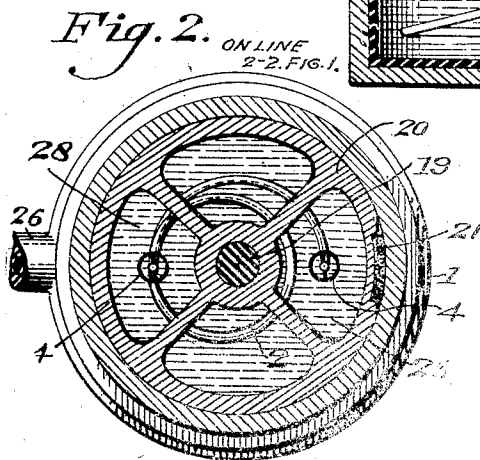
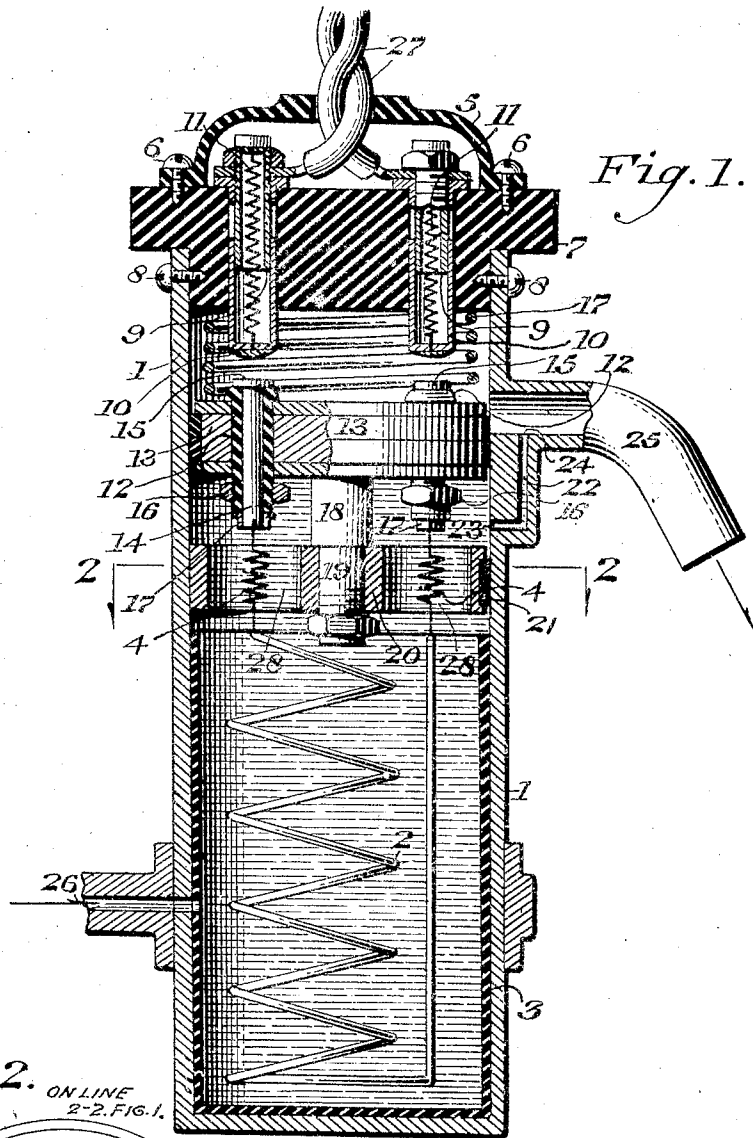


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 AUTOMATIC ELECTRIC SWITCH OR CIRCUIT CONTROLLING MECHANISM FOR ELECTRIC FLUID HEATERS
 APPLICATION FILED JUNE 12, 1919.

1,340,668.

Patented May 18, 1920.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC ELECTRIC SWITCH OR CIRCUIT-CONTROLLING MECHANISM FOR ELECTRIC FLUID-HEATERS.

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Specification of Letters Patent.

Patented May 18, 1920.

Application filed June 12, 1919. Serial No. 303,783.

To all whom it may concern:

Be it known that I, ANTONIO PAPINI, a subject of the King of Italy, having resided in the United States one year last past and having declared my intention of becoming a citizen thereof, and residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Automatic Electric Switch or Circuit-Controlling Mechanism for Electric Fluid-Heaters, of which the following is a specification.

My invention relates to a novel construction of an automatic electric switch or automatic electric circuit closing and opening mechanism which in its broad aspects is adapted to an electric heater for any fluid or liquid, as water or the like, such switch or circuit controlling device being automatic in its operation, and serving, through the medium of the pressure of the water or other fluid entering the lower portion of the apparatus, to close the electric circuit, thereby causing the electric energy to flow through the resistance or heating coil, whereby the water or other fluid is heated, the breaking or opening of the circuit being automatically effected by a tension device interposed between the fluid actuated piston carrying the electrical contacts and the insulating top of the device.

It further consists of a novel construction of an electric water heater, comprising a casing having inlet and outlet openings at the lower and upper portions thereof, a heater portion therein, a piston in the casing adapted to travel upwardly under the pressure of the incoming water or other fluid to be heated which automatically effects the closing of the electric circuit, the heating of the water or other fluid and the opening of the outlet opening therefor, means being provided for automatically actuating said piston in reverse direction by a suitable tension device when the pressure of the water at the inlet ceases or is released, whereupon the electric circuit is opened and the outlet from the casing is closed, whereby the fluid or liquid heating means is operative only when the heating thereof is desired.

My invention further consists of a novel construction of a casing having a plurality of pistons therein, connected by a common

piston rod, the upper of said pistons carrying the contacts and resistance coil, while the lower of said pistons serves to control the auxiliary outlet or by-pass to the main outlet from said casing, the upper portion of the latter being provided with an insulating cover carrying telescoping electrodes in combination with a spring interposed between the top of said casing and the upper of said pistons.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same will give in practice satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a vertical sectional view of an automatic electric switch or circuit controlling device embodying my invention, showing also a fluid heater to which my invention is applicable, certain of the parts being shown in elevation.

Fig. 2 represents a transverse section on line 2—2 Fig. 1, viewed in the direction of the arrows.

Similar numerals of reference indicate corresponding parts in the drawings.

Referring to the drawings:—

1 designates the casing which contains or supports the principal elements of my electric heating and circuit controlling device, said casing having in the lower portion thereof, the resistance wire heating element 2, and the lower inner surface of said casing being provided with the insulation 3. 4 designates coil springs, connecting the upper ends of the resistance 2 to the contacts 14 hereafter referred to. 5 designates the insulating top cover, which is secured to the insulating top 7 by the screws or other fastening devices 6, said top 7 being secured in the top of the casing 1 by the tap screws or similar fastening devices 8. 9 designates electrodes suitably secured in the insulating top 7, which are surrounded by the expansion or movable electrodes 10, the springs 11 being common to said electrodes, and tending to hold them

in the position seen in Fig. 1, whereby said expansion or outer electrodes 10 are capable of a sliding or telescoping movement with respect to said electrodes 9. 12 designates insulating bushings secured in the piston 13, said bushings each containing a contact or conductor pin 14, each of whose upper ends 15 is composed of spark steel on platinum, while the lower ends of said bushings 12, carry the insulated bushing nut 16.

17 designates a coil spring or similar tension device interposed between the bottom of the insulating top 7 and the top of the piston 13, it being understood that the latter may be provided with suitable packing or rings of any conventional type, which I deem it unnecessary to describe in detail.

18 designates a piston rod depending from the piston 13 and having its lower end 19 secured to or within the apertured guide piston 20, by any suitable means, said latter piston being also provided with packing 21 of any suitable construction. 22 designates an angular outlet passage or by-pass whose lower end 23 communicates with the water or fluid chamber at a point between the pistons 13 and 20 when the parts are in the position seen in Fig. 1, while its upper end 24 communicates with the outlet pipe 25, the inlet to the casing 1 being indicated at 26.

27 designates electrical conductors which pass through the cover 5 and are electrically connected to the electrodes 9 in any suitable manner. The guide piston 20 is preferably formed with the openings 28 therein, in which the coil springs 4 are located and it will be evident that the pistons 13 and 20 move as a unit, and if desired could be built integral, but I preferably employ the construction seen in Fig. 1 for convenience in assembling.

It will be understood that suitable controlling mechanism will be employed at the inlet 26, for permitting or checking the inlet of the liquid or fluid to be heated and that the pistons 13 and 20 and their adjuncts serve the dual function of both carrying and supporting the resistance coil 2 and the contact pins 14, and also controlling the openings to the outlets 22 and 25, the outlet 25 being controlled by the main or upper piston 13, and the inlet port 23 to the passage 22 being controlled by the lower piston 20 having the packing 21 on its side which is juxtaposed to the port 23.

The electrodes 9 and 10 are normally held in the position seen in Fig. 1 by reason of the springs 11, and in case the lower or movable electrodes 10 are pushed upwardly, as will be hereinafter explained, the tension of the springs 11 will tend to restore the bottom or movable electrodes 10 to their normal position seen in Fig. 1.

The operation is as follows:—

The parts normally appear as seen in Fig. 1.

As the water or other liquid to be heated is admitted through the inlet 26, it will fill the bottom of the casing 1 around the heating element 2, and a small portion of the incoming fluid will overflow through the passage 22 to the outlet pipe 25. The pressure of the incoming fluid will elevate the piston 13 and the guide piston 20, and the top of the contacts 14, carried by the piston 13 in its upward stroke will meet first the bottom of the expansion electrodes 10 making electric contact, thereby closing the circuit and allowing the current to flow through the heating element or resistance coil 2.

As the piston 13 moves upwardly, it will uncover the inlet to the outlet pipe 25, and the heated water or other fluid can flow therefrom. The packing 21 will now close the port 23 of the overflow outlet 22, and heated water or other liquid will be delivered at 25. The movable electrodes 10 will accommodate themselves to the variations in the height or upward travel of the pistons due to the varying quantity of water discharged to suit requirement without breaking the contacts, as is evident.

When the inlet 26 is closed, the pressure below the piston 13 will cease or drop, and the tension of the spring 17 will overbalance it, pushing the pistons 13 and 20 down, breaking the contacts, and the pistons will resume the position seen in Fig. 1, the piston 13 closing the outlet passage 25, and the piston 20 being below the port 23.

It will be apparent from the foregoing, that my invention is very economical in the use of electricity, since the electric circuit is closed only when it is desired to heat the liquid or fluid contained in the lower portion of the casing 1, and when the inlet 26 is closed, the electric circuit is instantly and automatically broken, so that there is no undue waste or expenditure of electricity involved.

It will be further apparent that my device is entirely automatic in its operation, the elevating or upward travel of the piston 13 and its adjuncts being effected by the opening of the inlet passage 26, while the downward travel of the piston is automatically effected by the closing of the inlet 26 and the tension of the spring 17 or its equivalent.

While I have described by invention as being applicable to heating water, it will be apparent that any fluid or liquid desired may be heated with equal economy and facility, and while I have described my novel circuit controlling mechanism as being especially adapted to an electric heater of the general character disclosed, it will be

apparent that it can be effectively used with equal efficiency in other types of electrical and other apparatus without departing from the spirit of my invention.

5 Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a device of the character stated, a casing, means within said casing for effect-
10 ing the closing of an electric circuit by the pressure of the incoming liquid to be heated; the contacts for closing the electric circuit being so positioned as to be always out of contact with the incoming liquid, and spring
15 actuated means for effecting the opening of said circuit when the flow of the incoming liquid is checked.

2. In a device of the character stated, a casing, means within said casing for effect-
20 ing the closing of an electric circuit by the pressure of the incoming liquid to be heated; the contacts for closing said circuit being so positioned that they are not immersed in the incoming liquid to be heated, and means
25 for effecting the automatic opening of said circuit when the flow of the incoming liquid is checked.

3. In a device of the character stated, a casing having an inlet and an outlet, means
30 contained within said casing for effecting the closing of an electric circuit by the pressure of the incoming liquid to be heated, said means controlling said outlet, and spring
35 actuated means within said casing for effecting the opening of said circuit when the flow of said liquid is checked.

4. In a device of the character stated, a casing having an inlet and outlet, means
40 within said casing for effecting the closing of an electric circuit by the pressure of an incoming liquid to be heated, said means controlling said outlet, and means within said casing for effecting the automatic opening
45 of said circuit when the flow of said liquid is checked.

5. In a device of the character stated, a casing, an insulating top therefor, telescopic
50 electrodes mounted in said top, a piston in said casing, insulating sleeves in said piston, contacts located in said sleeves and in alignment with said electrodes, a resistance coil depending from said contacts, and means interposed between said insulating top and
55 piston for causing the latter to travel downward and open a circuit when the flow of the incoming liquid to be heated is checked.

6. In a device of the character stated, a casing, an insulating top therefor, tele-
60 scopic electrodes mounted in said top, a piston in said casing, insulating sleeves in said piston, contacts located in said sleeves and in alignment with said electrodes, a resistance coil depending from said contacts, and an outlet from said casing controlled
65 by said piston, the latter being moved up-

wardly to effect the closing of the circuit by the pressure of the incoming liquid to be heated.

7. In a device of the character stated, a casing, an insulating top therefor, tele- 70
scopic electrodes mounted in said top, a piston in said casing, insulating sleeves in said piston, contacts located in said sleeves and in alignment with said electrodes, a resistance coil depending from said contacts, 75
and an outlet from said casing controlled by said piston, the latter being moved upwardly to effect the closing of the circuit by the pressure of the incoming liquid to be heated, in combination with means for effecting the 80
opening of said circuit when the pressure of the incoming liquid to be heated is checked.

8. In a device of the character stated, a casing, an insulating top therefor, tele-
85 scopic electrodes mounted in said top, a main piston in said casing, insulating sleeves in said piston, contacts in said sleeves and in alignment with said electrodes, a resistance coil depending from said contacts, an outlet from said casing controlled by said 90
main piston, a second piston located below said main piston and movable in unison therewith, and a restricted passage leading from said casing to said outlet passage and controlled by said lower piston. 95

9. In a device of the character stated, a casing, an insulating top therefor, tele-
95 scopic electrodes mounted in said top, a main piston in said casing, insulating sleeves in said piston, contacts in said sleeves and 100
in alignment with said electrodes, a resistance coil depending from said contacts, an outlet from said casing controlled by said main piston, a second piston located below 105
said main piston and movable in unison therewith, and a restricted passage leading from said casing to said outlet passage and controlled by said lower piston, in combination with means for causing said 110
pistons to move downwardly when the flow of the incoming liquid to be heated is checked.

10. In a device of the character stated, a casing, an insulating top therefor, tele-
105 scopic electrodes mounted in said top, a main piston in said casing, insulating sleeves in said piston, contacts in said sleeves and in alignment with said electrodes, a resistance coil depending from said contacts, an outlet from said casing controlled by said 120
main piston, a second piston located below said main piston and movable in unison therewith, and a restricted passage leading from said casing to said outlet passage and controlled by said lower piston, in combina- 125
tion with means for causing said pistons to automatically move downwardly and open said circuit when the flow of the incoming liquid is checked.

11. In a device of the character stated, a 130

casing, an insulating top therefor, telescopic electrodes mounted in said top, a piston in said casing, insulating sleeves in said piston, contacts in said sleeves and in alignment with said electrodes, a second piston located below said main piston and movable in unison therewith, said second piston having openings therethrough, coiled springs depending from said contacts and connected to the upper extremities of said resistance coil, a main outlet passage from said casing, controlled by said upper piston, a restricted outlet passage leading from said casing to said main outlet passage and controlled by said lower piston, and a spring interposed between said insulating top and said main piston.

12. In a device of the character stated, a casing, an insulating top therefor, electrodes in said top, a piston in said casing, contacts carried by said piston and alining with said electrodes, a resistance coil connected to said contacts, and means for actuating said piston to open a circuit when the flow of the incoming liquid to said casing is checked.

13. In a device of the character stated, a casing, an insulating top therefor, electrodes in said top, a piston in said casing, contacts carried by said piston and alining with said electrodes, a resistance coil connected with said contacts, an outlet from said casing controlled by said piston, and means intermediate said top and piston for actuating said piston to open the circuit when the flow of the incoming liquid is checked.

14. In a device of the character stated, a casing, an insulating top therefor, electrodes in said top, a piston in said casing, contacts carried by said piston, a resistance coil connected to said contacts, and a spring located between said top and piston.

15. In a device of the character stated, a casing, means therein for effecting the closing of an electric circuit by the pressure of the incoming fluid to be heated, a resistance coil carried by said means and movable therewith, and means within said casing for effecting the opening of said circuit when the flow of the incoming liquid is checked.

16. In a device of the character stated, a casing, having an inlet and outlet, an insulating top therefor, electrodes in said top, a main piston in said casing, contacts carried by said piston and alining with said electrodes, a resistance coil connected to said contacts, said piston controlling said outlet, and means for actuating said piston to open the circuit, when the flow of the liquid to be heated is checked.

17. In a device of the character stated, a casing, having an inlet and outlet, an insulating top therefor, electrodes in said top, a main piston in said casing and controlling said outlet, contacts carried by said piston

and in alinement with said electrodes, a resistance coil connected to said contacts, a second piston below said main piston and movable in unison therewith, and a restricted passage leading from said casing to said outlet passage and controlled by said lower piston.

18. In a device of the character stated, a casing, having an inlet and outlet, a piston therein carrying means within said casing for effecting the closing of an electric circuit by the pressure of the incoming liquid to be heated, a restricted passage leading from said casing to said outlet, and means carried by said piston for controlling said restricted passage.

19. In a device of the character stated, a casing having an inlet and outlet, a piston therein carrying means within said casing for effecting the closing of an electric circuit, by the pressure of the incoming liquid to be heated, a restricted passage leading from said casing to said outlet, means carried by said piston for controlling said restricted passage, and a resistance coil also carried by said piston.

20. In a device of the character stated, a casing having an inlet and outlet, a piston therein carrying means within said casing for effecting the closing of an electric circuit, by the pressure of the incoming liquid to be heated, a restricted passage leading from said casing to said outlet, means carried by said piston for controlling said restricted passage, and a resistance coil also carried by said piston, in combination with means for actuating said piston to open the circuit when the flow of the incoming liquid to be heated is checked.

21. In a device of the character stated, a casing, means within said casing for closing an electric circuit by the pressure of the incoming liquid to be heated, said casing having an outlet passage controlled by said means, and a spring within said casing for actuating said circuit closing means to open the circuit, when the flow of said incoming liquid is checked.

22. In a device of the character stated, a casing, means within said casing for closing an electric circuit by the pressure of the incoming liquid to be heated, said casing having an outlet passage controlled by said means, and a spring within said casing for actuating said circuit closing means to open the circuit, when the flow of said incoming liquid is checked, in combination with a resistance coil carried by said circuit closing means.

ANTONIO PAPINI.

Witnesses:

A. OLLEY,
H. A. LEDIG.