No. 610,281. Patented Sept. 6, 1898.

E. RUUD.

AUTOMATIC WATER HEATER.

(Application filed Jan. 22, 1897.)

(No Model.)

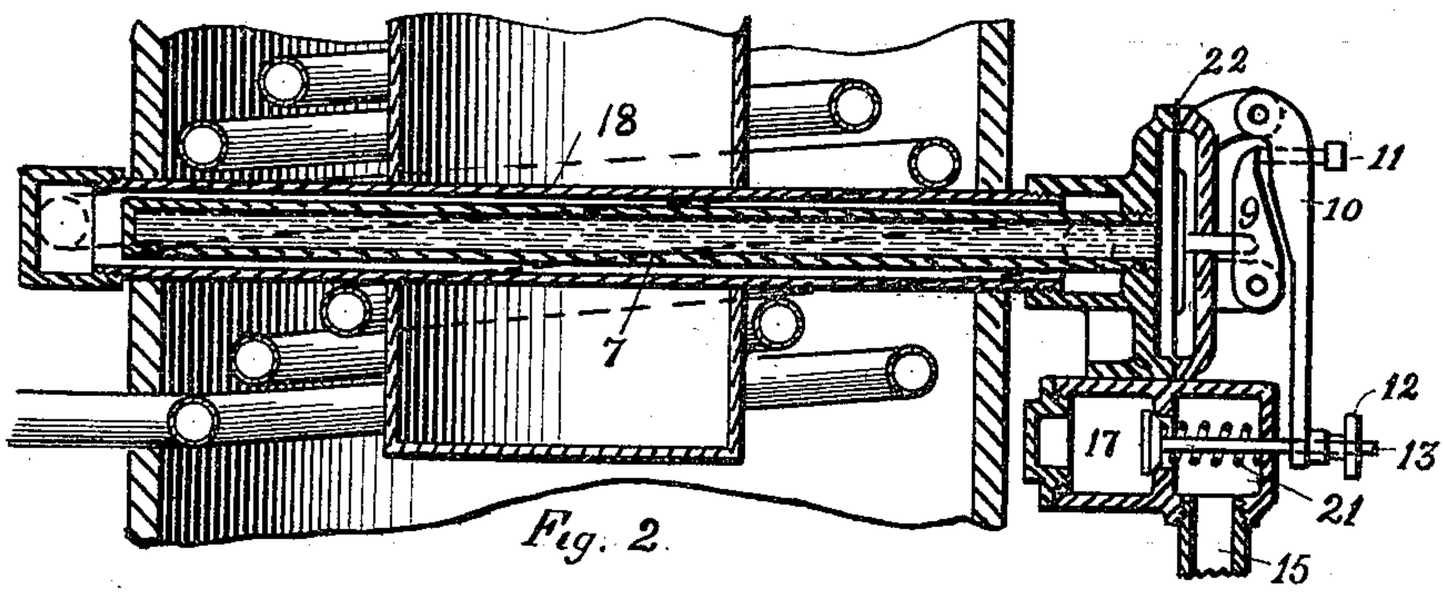

Fig. 2.

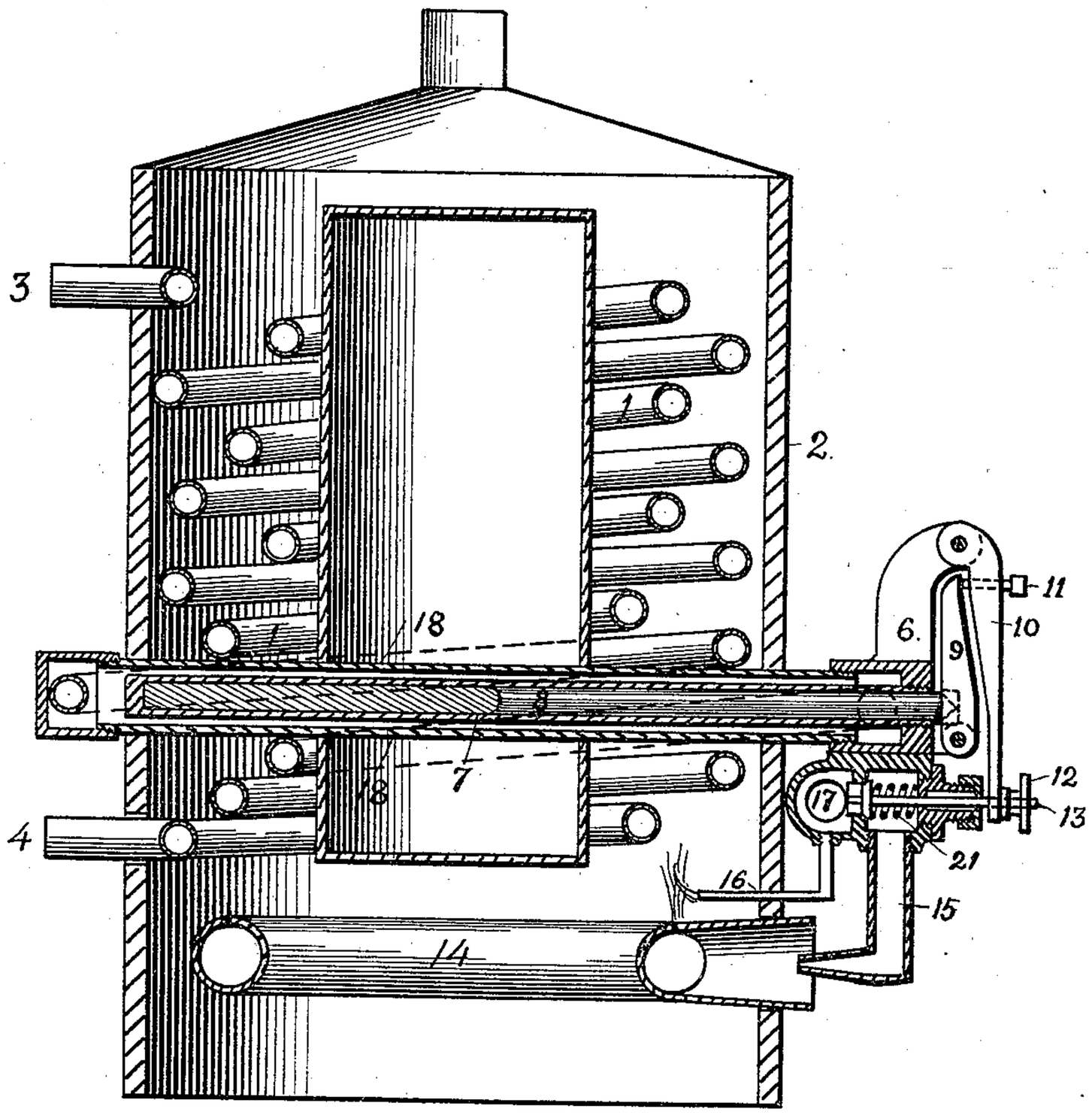

Fig. 1.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 610,281, dated September 6, 1898.

Application filed January 22, 1897. Serial No. 620,196. (No model.)

To all whom it may concern:

Be it known that I, EDWIN RUUD, a citizen of the United States, residing at East Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Automatic Water-Heaters, of which improvement the following is a specification.

The object of my invention is to provide an improvement in automatic water-heaters; and to this end my invention consists in an automatic water-tube or coil-heater in which the supply of heat is regulated by variations in the temperature of the water in the heating-coil.

In the accompanying drawings, which illustrate my improvement, Figure 1 is a central vertical section through my improved heater; Fig. 2, a sectional view of a portion of my heater with a thermal regulating device of a different form from that shown in Fig. 1.

In the construction shown in Fig. 1 a coil of heating-pipe 1 is entirely inclosed within the casing 2, and the terminals 3 and 4 of the coil connect, preferably, with a closed circuit of piping, to which cold water may be supplied and from which hot water may be drawn. If preferred, however, instead of being connected with a closed circuit one of the terminals of the heating-coil 1 may be connected with the cold-water supply only and the other with the hot-water pipe, chamber, or vessel, from which the hot water may be drawn. Either terminal of the coil may be connected with the cold-water pipe and the other with the hot-water-discharge pipe, chamber, or vessel. The number of discharge-pipes leading from the coil and through which hot water is drawn is immaterial, as is also the outer arrangement of pipes to which the terminals of the coil are connected.

Below the heating-coil, inside of the casing 2, is placed a burner 14 for supplying heat to the coil. The supply of gas to this burner is controlled or regulated by a thermal regulating device or thermostat, which is placed in circuit with the heating-coil. The form of this thermostat is not limited to any particular construction, and in the drawings I have shown two different devices for this purpose.

In Fig. 1 a tube 18 is connected at or near its opposite ends with portions of the coil 1 which extend above and below the tube 18, the space within the tube 18 forming a continuation or a portion of the coil 1, through which the water may circulate in passing from one terminal of the coil to the other. Within the tubular portion 18 is a tube 7, formed of metal, having preferably a comparatively great coefficient of expansion and being secured at one end to a stationary part 6. Within the tube 7 is a rod 8, preferably composed of less expansible material than the tube 7, and which bears at one end against the inner end of the tube 7 and at the outer end against a lever 9, which is outside of the tube 7 in position to engage with the adjusting-screw 11 of the lever 10, which is directly connected with a valve for controlling a supply of gas to a burner. The lever 10 is pivoted at one end to a fixed part or bracket and at its other end engages with an adjustable nut 12 on the stem of a valve 13, which controls the supply of gas to the burner 14.

As shown in Fig. 1, the burner 14 consists of a circular perforated ring, with an air-inlet into which the gas-pipe 15 extends; but my improvement is not limited to this or any other special form of burner.

An igniting-burner 16, which is supplied with gas from the supply-pipe 17, is in position to ignite the jets of gas from the burner 14 and is at all times lighted. This igniting-burner is specially adapted for use in connection with a valve which at times completely cuts off the supply of gas to the burner 14. The igniting-burner may be dispensed with, however, if the valve 13 is so arranged as to permit a small flow of gas at all times, so as to prevent the flame of the burner 14 from being entirely extinguished. For this purpose the valve 13 may be perforated, or a small hole may be formed in the valve-seat or in the casing, so as to connect the supply-pipe 17 with the pipe 15. If we suppose the thermostat to be adjusted, so as to maintain the supply of hot water at a certain temperature, and for any reason there should be an increase above the desired temperature, the tube 7 will expand, the rod 8 will be moved to the left by the levers 9 and 10, which are actuated by the spring 21, and the valve 13, which is acted on by the same spring, will be moved toward its seat and partially or wholly

closed, so as to decrease or entirely cut off the supply of gas to the burner 14. If any reduction in the temperature of the water in the coil below that for which the thermostat is adjusted should take place, the tube 7 will contract in length, the rod 8 will be moved outward to the right, and, acting through the levers 9 and 10, will unseat or more fully open the valve 13 and permit or increase the flow of gas from the supply-pipe 17 through the pipe 15 to the burner 14.

In ordinary operation the changes of temperature which act through the thermostat to effect variations in the supply of heat will be due to the withdrawal of hot water from the pipes and coil and the consequent flow of cooler water into the coil; but my improvement is adapted to maintain the supply of water at the desired temperature at all times, and variations of the heat-supply may be effected in accordance with variations in the temperature of the atmosphere without any withdrawal of water from the pipes or coil.

The important feature of my improvement is the combination, with a heating-coil, of a thermal regulating device in or in circuit with the heating-coil and forming a part of the heating-coil, through which the water passes in being heated, or which is connected to or forms a loop or by-pass connected with a part of the heating-coil which is exposed to the heat, the supply of which heat is controlled by the thermal regulating device. My improvement provides a practically instantaneous heater, the automatic control or regulation of which is or may be effected by comparatively great variations in the temperature of the water.

My improvement dispenses with the usual large boiler or other reservoir of heated water which has heretofore been employed and which is usually maintained at considerable expense.

My improvement provides, with the simplest possible construction, an automatic instantaneous heater, which practically consists only of a heating-coil and a thermostat or heat-regulating device, by means of which the water is heated as fast as it is drawn from the pipes. This rapid heating is due principally to the rapid and considerable variations which may be effected in the supply of heat during the correspondingly rapid and great variations of temperature to which the thermostat is subject on account of its location in the heating-coil.

The construction shown in Fig. 2 of the drawings differs from that shown in Fig. 1 only in the form of the thermostat. Instead of employing a rod to transmit motion from the inner end of the tube 7 to the lever 9 in Fig. 2 a column of liquid is interposed between the inner end of the tube 7 and a diaphragm 22, the stem of the diaphragm bearing at its outer end against the lever 9, which is moved outward by the expansion of the liquid under an increase of temperature, and motion is transmitted to the valve-stem as in Fig. 1; but the outward movement of the levers in Fig. 2 acts to close the valve by the expansion of the liquid in the tube 7, while in Fig. 1 the valve is closed by the expansion of the tube 7, which permits the spring 21 to seat the valve.

As shown in the drawings, the thermostat is located relatively close to the burner, and this is a feature of my improvement by which the efficiency of regulation is greatly improved. If preferred, however, the thermal regulating device may be located still nearer to the burner, or it may form the lower terminal of the coil—that is, the terminal exposed to the greatest heating effect.

I claim as my invention and desire to secure by Letters Patent—

1. In a water-heater, the combination, of a water-heating coil, a heater for heating the same, and a thermostatic controlling means in the circuit of the coil between the inlet and outlet of that portion of the coil which is subjected to the action of the heater, substantially as set forth.

2. The combination, in a coil water-heater, of a burner, and a thermal regulating device for controlling the burner, which is located in a section of the coil exposed to the direct action of the heat supplied by the burner, substantially as set forth.

3. The combination, in a water-heater, of a heating-coil inclosed in a casing, a burner for supplying heat to the coil, and a thermal regulating device for controlling the burner and which is located in a portion of the coil exposed to the direct action of the ignited gases, or flame, from the burner, substantially as set forth.

4. In a water-heater, the combination of a burner, a water-receptacle arranged in the combustion-chamber of said burner, a thermostat for operating the valve controlling the flow of gas to said burner and arranged in a chamber forming a part of the outlet from the water-receptacle and so located as to be directly subjected to the heat from the burner.

In testimony whereof I have hereunto set my hand.

EDWIN RUUD.

Witnesses:
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