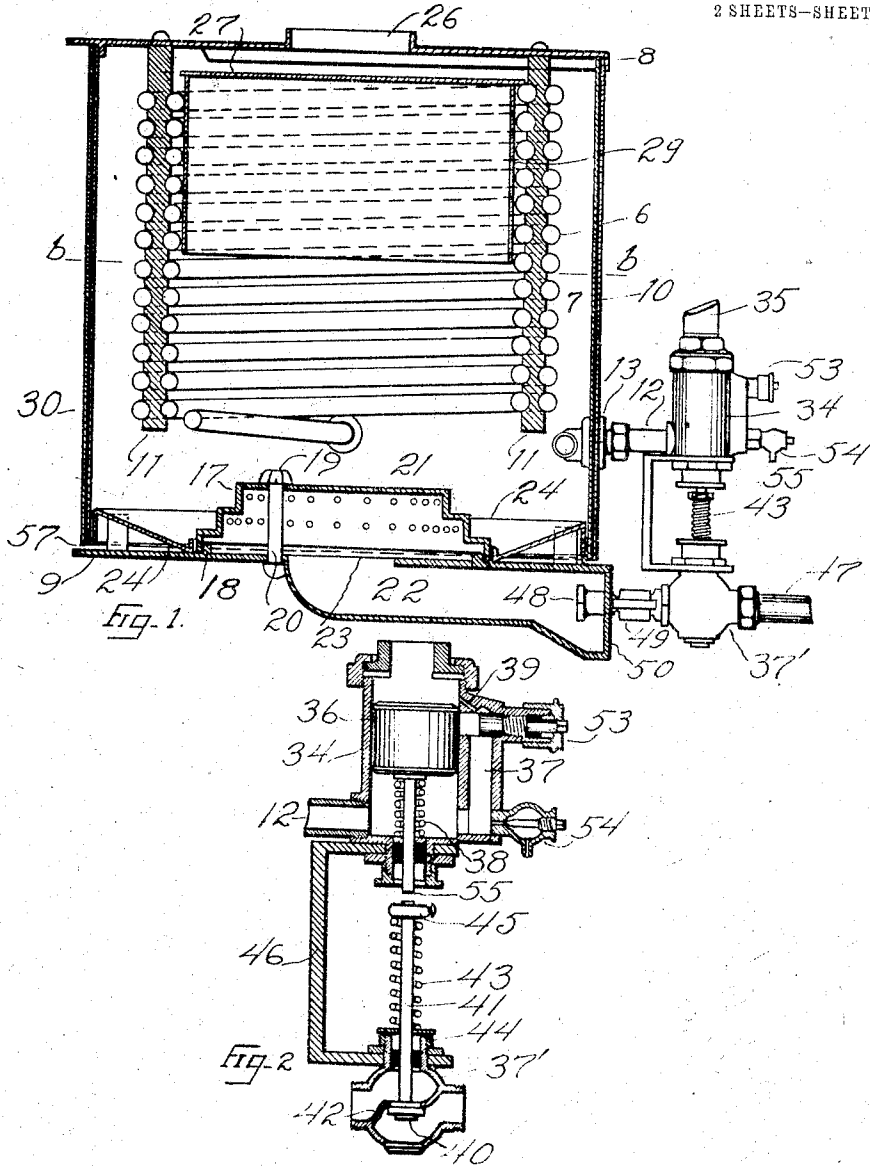


G. H. HARRINGTON.
INSTANTANEOUS WATER HEATER.
APPLICATION FILED APR. 5, 1909.

1,015,314.

Patented Jan. 23, 1912.

2 SHEETS—SHEET 1.



Witnesses

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By

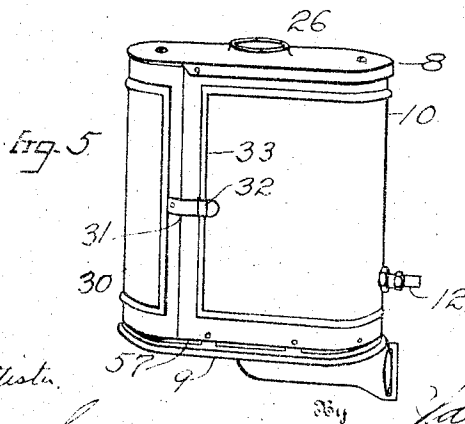
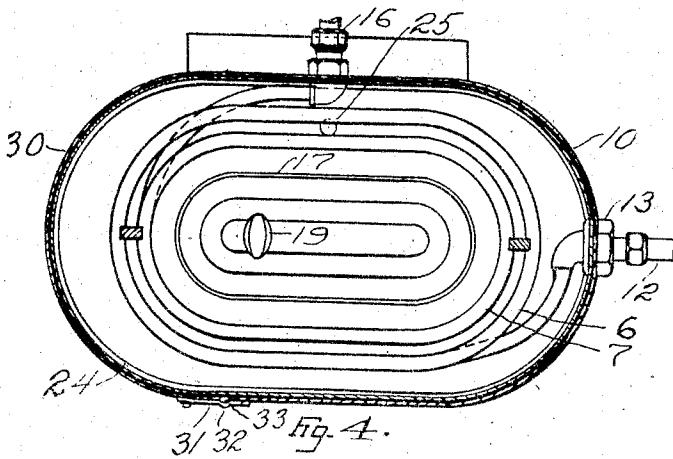
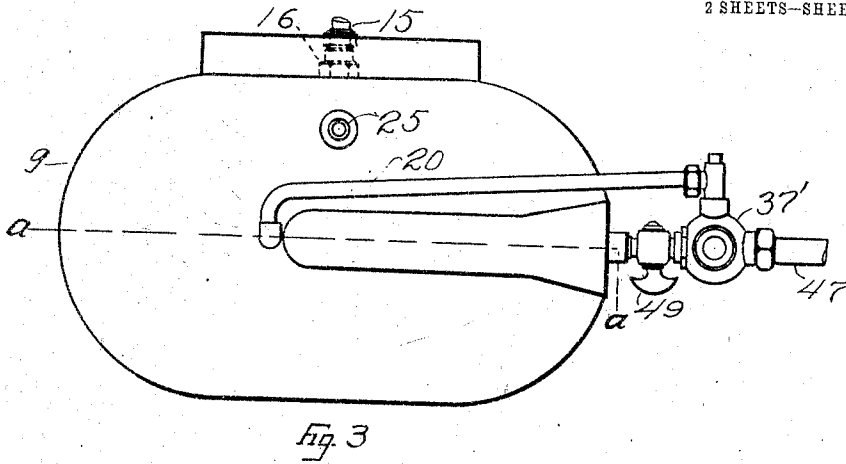
Walter Murray
his Attorney

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UNITED STATES PATENT OFFICE.

GEORGE H. HARRINGTON, OF CINCINNATI, OHIO.

INSTANTANEOUS WATER-HEATER.

1,015,314.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed April 5, 1909. Serial No. 487,901.

To all whom it may concern:

Be it known that I, GEORGE H. HARRINGTON, a citizen of the United States of America, and resident of Cincinnati, county of Hamilton, State of Ohio, have invented certain new and useful Improvements in Instantaneous Water-Heaters, of which the following is a specification.

This invention relates to instantaneous water heaters and has for an object the production of a heater in which simple and effective means are employed for heating the water as it traverses the coils of the heater.

A further object is the production of a heater in which a new and improved arrangement of heating coils is employed, and in which means are utilized for receiving the water of condensation and discharge it from the heater.

A further object is the production of improved automatic means for controlling the delivery of gas to the heater and the flow of water through the coils of the heater.

These and other objects I attain in an apparatus embodying the features herein described and illustrated in the drawings accompanying this application, and forming a part thereof.

In the drawings, Figure 1 is a sectional view along the line *a—b* of Fig. 3, and illustrates a heater embodying my invention. Fig. 2 is a transverse section of an automatic gas and water controlling device, which forms a part of my invention. Fig. 3 is a plan view from beneath, of the apparatus illustrated in Fig. 1. Fig. 4 is a sectional view along the line *b—b* of Fig. 1. Fig. 5 is a perspective view of the heater embodying my invention, the automatic controlling device being removed for convenience of illustration.

The apparatus embodying my invention includes two coils; an inner coil and an outer coil of copper pipe, which are mounted within a heat insulating casing, and which are connected to a water distributing system. The water is admitted to the coils through a controller, which actuates a gas valve in a gas delivery pipe, and which controls the flow of water through the coils. The gas valve controls the delivery of gas to a gas burner, which is located within the casing, inclosing the coils, and is adjacent to and below the coils.

Referring to the parts by means of the

reference numerals: An outer coil, 6, and an inner coil, 7, of copper pipe are located within a casing, which consists of a top, 8, a base, 9, and a shell portion, 10. The shell, 10 is rigidly secured to the base, 9, and supports the top, 8, from which the coils, 6 and 7, are supported, by means of hangers, 11. The hangers, 11, are located between the inner and outer coils and are provided on each side with recesses, which are adapted to receive and hold in place the separate turns of each coil. If deemed necessary, each turn, or several of the turns of each coil may be positively secured to the hangers by any suitable means, such, for instance, as wire loops. The lower end of the outer coil, 6, is connected to a water admission pipe, 12, by means of a coupling, 13, which performs the additional function of securing the lower end of the coil to the shell portion, 10. The coils are so arranged that the water entering through the pipe, 12, flows upwardly, in circulating through the outer coil, and then downwardly, in circulating through the inner coil, and is delivered from the inner coil through a pipe, 15, which is connected to the lower end of the inner coil by means of a coupling, 16. The pipe 15 communicates with the water distribution system, and the coupling 16 secures the lower end of the coil, 7, to the shell, 10. The base, 9, of the casing is especially constructed for mounting a gas burner 17, which is located within the casing, below the coils. The burner 17 is mounted on the base, by being fitted over a lug, or ridge, 18, formed on the upper face of the base and is secured in place by means of a pilot-light jet 19, and its connecting pipe, 20. The pipe 20, extends upwardly through an aperture in the top of the burner 17 and the jet 19, when in place on the pipe, 20, contacts with the top of the burner and rigidly secures the burner in place. The burner is so constructed that the gas apertures, 21, are arranged in several sets, one above the other. This is accomplished by constructing the burner with successive off-sets, one above the other, and by providing apertures 21 in the vertical faces of each off-set. These apertures 21 communicate with a gas and air mixing chamber 22, which is formed integrally with the base 9, and which communicates with the interior of the burner proper, through an opening 23 provided in the base.

One of the difficulties in instantaneous

heaters is due to the water of condensation which forms on the heater coils and by dripping off of the coils on to the burner, causes the burner to rust out, and to otherwise deteriorate. The water vapor which results from the thorough combustion of the gas supplied to the burner, is condensed upon coming into contact with the cold copper coils, and under some conditions, collects in such quantities that it must be taken into consideration in building a successful heater. The burners are usually placed directly beneath the coils, and, consequently the water of condensation drips on, or into them, and causes the difficulties above referred to. I avoid all these difficulties by placing the burner 17 directly beneath the intermediate space which is surrounded by the inner coil 7, and by providing a copper, or other rust proof drip pan, 24, located on the base portion, beneath the coils and around the burner 17. The pan drains through the outlet 25, which is provided in the base 9. The top 8 is provided with a vent 26 for the gases, resulting from the combustion within the casing. This vent may be connected by means of suitable piping to a flue for the purpose of carrying off the fumes. A deflector hood is located between the burner 17 and the vent 26, and is so arranged that it increases the travel of the heated gases within the casing, and brings them into more intimate contact with the water tubes of the heater. This hood consists of a flat disk 27 made of sheet metal and supported by the upper turn of the inner coil and located adjacent to the vent 26. A downwardly extending skirt 29 is secured to the disk 27 and is located in close proximity with the coil 7. This skirt, however, extends only part way down the coil. The heated gases arising from the burner are carried upwardly by convection. The hood deflects these convection currents so that they travel downwardly along the apron 29 and then upwardly through both coils on all sides of the apron 29. The lower portion of the inner coil is closer to the burner, and, consequently, receives the direct sensible heat of the burner, and since the hot water is delivered from the lower end of the inner coil, the hottest water is subjected to the hottest gases from the burner.

The shell 10 is formed in three pieces, an inner and an outer shell and an intermediate heat insulating portion. A portion 30 of the shell 10 is hinged to the other portion of the shell, and forms a door which extends the entire height of the coils and provides a means of admission to the coils, and the burner. This door is provided with what I term a non-positive catch 31, by which it is secured in the closed position. The catch 31 consists of a short piece of spring steel, which is secured to the edge of the door 30

and is provided with a slight depression 32, adapted to engage a ridge 33, of corresponding height, provided on the stationary portion of the shell. While this latch holds the door closed, it does not positively lock it in this position, and it therefore eliminates the danger which might arise from an explosion within the casing.

The automatic controlling device consists of a cylinder 34, which communicates directly with the pipe, 12, and with a water supply pipe 35. A plunger 36 is located within the cylinder 34 and is so arranged that it will move to actuate a gas valve 37 when a faucet is opened on the delivery side of the instantaneous heater. The plunger 36 is located in the cylinder between the pipe 35 and the pipe 12, and passages 37 are provided in the cylinder wall, around the plunger, for putting these pipes into communication. A spring 38 is located within the cylinder below the plunger and operates to force the plunger upwardly so as to close the upper end of the passage 37. A small by-pass 39 extends through the wall of the cylinder and connects the passages 37 with the portion of the cylinder above the plunger 36 when the plunger is in a position to close the upper end of the passage. With this arrangement, the plunger is exposed on each side to the water pressure, and when these opposing water pressures are equal, it is held by the pressure of the spring 38 in its upper position, that is, in the position in which it closes the upper end of the passage 37. When a faucet is opened in the distribution system on the supply side of the heater, the pressure is reduced in the system and, consequently, in the cylinder 34, below the plunger. The water pressure above the plunger then preponderates, and, by overcoming the pressure of the spring 38 forces the plunger downwardly and uncovers the upper end of the passage 37, and thereby causes a flow of water through the passage, and consequently through the coils of the heater.

The fall in pressure below the plunger in the cylinder 34, varies directly with the amount the faucet is open, and consequently, when the faucet is wide open, the plunger will be forced to its lowest position, so that the passage 37 will be wide open and a maximum amount of water will flow through the coils. The plunger 36, in responding to the variations in pressure below it, in the cylinder 34, as has been described, actuates the gas valve 37. This valve consists of a valve disk 40 which is inclosed within a globe valve casing, and which is connected to a valve stem 41. The disk 40 seats on a diaphragm 42, which extends across the casing between the admission and delivery ports of the valve. A spring 43 surrounds the outer portion of

the valve stem and is located between a pilot-nut 44 secured to the casing of the valve and a spring block 45 threaded on the end of the valve stem and secured in place by means of a set screw. The coiled spring operates to hold the valve disk 40 against the diaphragm 42 in the closed position, and the pilot-nut 44 is employed to vary the tension of the spring 43, and, consequently, to vary the operation of the valve. The valve casing is secured to the cylinder 34 by means of a bracket 46, which is suitably secured in place. A gas delivery pipe 47 communicates with the inlet port of the valve 37', and a gas delivery nozzle 48 communicates with the outlet port of the valve. A turn cock 49 is located between the nozzle 48 and the valve casing. The casing of the turn-cock projects through an aperture formed in a bracket 50, which is formed integral with the base portion 9 of the heater. The nozzle 48 is located within the mixing chamber 22, and when secured in place on the casing of the turn-cock 49, secures the turn-cock, and consequently, the gas valve 27 to the base 9.

The piping 20 of the pilot-light is connected to one side of the casing of the valve 37', so that it by-passes the gas around the disk 40 and continually supplies it to the pilot light.

An adjusting valve 53 is provided in the passage 37, so that the flow of water from the heating coils can be adjusted independently of the plunger 36. Any suitable valve may be employed for this purpose, which may be easily adjusted and which will stay in the adjusted position. A drain valve 54 is also secured to the cylinder 34 and communicates with the passage 37. The function of this valve is to drain the coils, and it accomplishes this by admitting air into the passage 37, when the water has been shut off from the pipe 35 and the faucets 45 have been opened on the distribution side of the heater.

A plunger, or piston rod 55 is connected to the plunger 36, and extending through suitable packing glands in the bottom of the cylinder 34, it is adapted to engage and to actuate the valve stem 41 of the gas valve. When a faucet is opened on the distribution side of the heater, the plunger 36, descends, as has been described, and opens the passage 37. At the same time, the piston rod 55, contacts with and moves the valve stem 41 to open the valve 37' and to cause a flow of gas to the burner 17. The gas thus admitted to the burner 17 is ignited by the pilot-light and the water flowing through the coils of the heater is instantaneously heated by the combustion. The plunger 36, in moving downwardly to operate the valve 37', must overcome the tension of the spring 43, and, consequently, the operation of the auto-

matic device may be adjusted by adjusting the tension of the spring.

The water delivered by the heater may be maintained at a predetermined temperature, by varying the adjustment of the valve 53, which controls the flow of water through the cylinder 34 and by varying the adjustment of the spring 43 by means of the nut 44.

The plunger 36 occupies different positions, dependent upon the rate of water flow through the coils 6 and 7, and, consequently, the valve 37' is open more or less, and supplies variable amounts of gas to the burner, in accordance with the variations of water-flow. This maintains the temperature of the water delivered by the heater substantially equal for all flows.

When it is desired to render the heater inoperative as a water heating agent, the turn-cock 49 is turned so as to shut off the gas to the burner. This in no way affects the operation of the controlling cylinder 34 and water is delivered without being heated, through the coils. When it is desired to shut off the water to the heater, the water is shut off from the pipe 35 and the drain-valve 54 is opened. The opening of the drain-valve admits air to the passages 37, and, consequently, when a faucet is open on the delivery side of the heater and below the heater, water is drained out of the coils through the faucet. If the coils are lower than any of the faucets in the distribution system, the valve 34 will act as the drain valve, when air is admitted through the distribution system by the opening of one of the faucets.

The heater is adapted to be secured to a wall and is provided for that purpose with brackets, which are located on the base and on the top portions of the casing. An air admission space 57 is maintained between the shell 10 and the base portion, for admitting air to the interior of the casing. This air space supplies additional air to the burner, and also is effective in maintaining air currents through the casing and out of the fume-vent.

In accordance with the patent statutes, I have illustrated and described what I now consider to be a preferred embodiment of my invention, but I desire to be understood that I do not limit myself to the apparatus shown, and that various changes and modifications may be made without departing from the spirit and scope of my invention.

What I claim is:

1. In combination with a water heater comprising a coil, a gas burner for heating said coil, a gas delivery valve for controlling the delivery of gas to said burner, a source of water supply for said coil, a water valve between said source and said coil and consisting of a cylindrical valve casing, a water passage upon the side of the casing and com-

5 communicating with the upper and lower ends
 of the casing, a reciprocating plunger with-
 in the casing, a coiled spring between the
 bottom of the plunger and the bottom of the
 10 casing and adapted to hold the plunger nor-
 mally over the upper end of the water pas-
 sage, and a small by-pass connecting the up-
 per end of the passage and the casing at a
 point above the normal position of the plun-
 15 ger, whereby the pressure of the water is
 normally communicated to both sides of the
 plunger.

2. In combination with a water heater
 comprising a coil, a gas burner for heating
 15 said coil, a gas delivery valve for controlling
 the delivery of gas to said burner, a source
 of water supply for the coil, a valve between
 said source and said coil and consisting of a

cylindrical valve casing, a water passage
 upon the side of the casing and communi- 20
 cating with the upper and lower ends of the
 casing, a reciprocating plunger within the
 casing, means for holding the plunger nor-
 mally over the upper end of the water pas-
 sage, a small by-pass connecting the upper 25
 end of the passage to the upper end of the
 casing at a point above the normal position
 of the plunger, and a manually operated
 valve located in the upper end of the water
 passage and adapted to regulate the size of 30
 the passage.

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Witnesses:

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 AGNES McCORMACK.