No. 884,223. PATENTED APR. 7, 1908.

A. E. SHIPLEY.

INSTANTANEOUS WATER HEATER.

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Fig. 1.

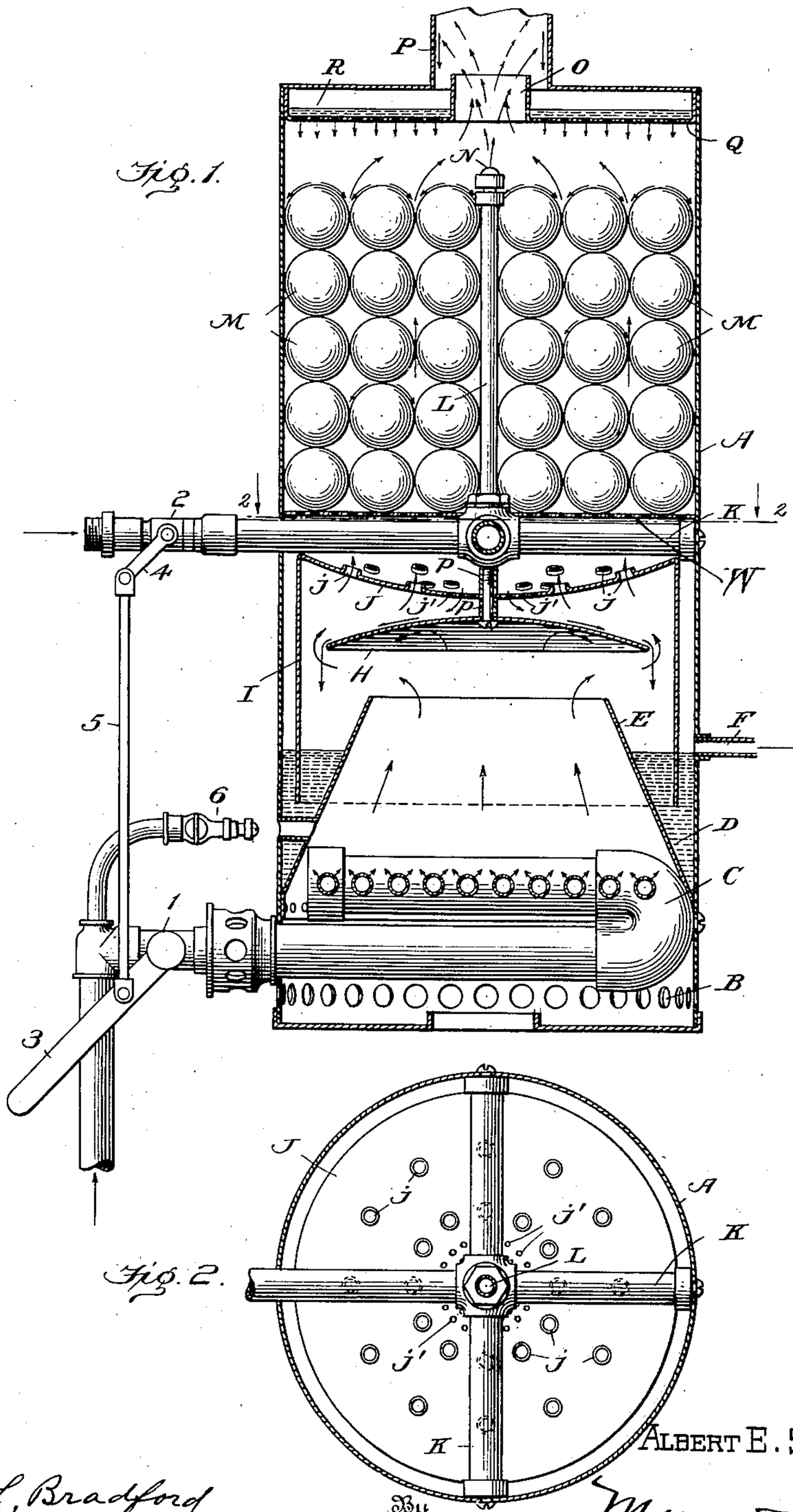


Fig. 2.




Witnesses

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## INSTANTANEOUS WATER-HEATER.

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Application filed May 31, 1907. Serial No. 376,632.

*To all whom it may concern:*

Be it known that I, ALBERT E. SHIPLEY, a subject of the King of England, and resident of Nelson, British Columbia, Canada, have invented a new and useful Improvement in Instantaneous Water-Heaters, of which the following is a specification.

This invention relates to water heaters employing gaseous fuel, and comprises an improved device in which the water is heated by direct contact with the products of combustion, being exposed thereto in films on the surface of non-absorbent balls or the like and in the form of fine spray falling from perforations in plates, as well as in thin films of water flowing over the surface of heated plates or drums.

The invention further embodies the application of a water spray blast to intensify the draft in a water heater using gaseous fuel for the purpose of causing the products of combustion to flow through the interstices between the balls or the like and to render the combustion more perfect.

The heater is illustrated in the accompanying drawings, in which

Figure 1 is a central vertical section thereof. Fig. 2 is a horizontal section on the line 2—2 of Fig. 1.

Referring specifically to the drawings, the casing of the heater consists of a cylindrical sheet metal shell A, having at the lower end perforations B for the entry of air for combustion and this contains near the bottom a powerful burner C of the Bunsen type. A catch cistern, or well D, formed by the junction of the frusto-conical shell E with the cylindrical shell A is placed immediately over the burner.

An overflow pipe F enters the shell A at a point near the top of the well to conduct the hot water to the bath, or other vessel. A hood H of sheet copper or other metal is placed over the well as shown, and immediately above it is a perforated metallic disk J surrounded in its circumference by a second cylindrical shell I dipping below the water level in the well. The disk J is cupped or curved downward towards the center, and has a series of large perforations *j* made in such a way that the metal is turned slightly upward at the edges thereof forming a low vertical wall around the perforations. In the center of the disk J is a number of fine holes *j'* to allow the water to trickle onto the center of the shield H. The object of the shell I is to prevent the hot products of combustion coming into contact with the walls of the heater and the consequent loss of heat by radiation. The disk J and hood H are spaced by short pipe separators *p*.

K is a hollow four arms cross shaped grid, which may be either built up of pipe and fittings as shown, or made of cast iron or other metal and is arranged directly below a perforated partition W. Its object is to support the contents of the upper portion of the heater, and at the same time conduct the water to the spray nozzle N by means of the vertical pipe L at the center.

The upper half or part of the heater is filled to the level of the nozzle N with round porcelain balls M, smooth round stones or other similar non-absorbent material, the object of which is to form a large area of wetted surface in direct contact with the heated products of combustion, which pass upward through the interstices between the balls.

The nozzle N is so constructed as to project the water upward in a cone of fine spray, so regulated as to just cover the area of the opening O. This spray, passing through the opening O, at high velocity, carries with it a large body of the products of combustion from the upper portion of the heater, thus producing a strong artificial draft for the products of combustion.

Q is a dished cover for the heater and supports the stack or waste flue or pipe P. It contains a compartment or space R into which the water trickles on its return from the stack. The bottom of this compartment is perforated with many fine holes of such size as to provide a small depth of water in the compartment, in order to produce an even distribution.

The action of the heater is as follows: On lighting the burner the water being turned on at the same time by the mechanism shown the heated products of combustion pass upward, coming in contact with the inner walls of the well D. On reaching the shield H, they are deflected, passing out towards its circumference, thence upward through the openings in disk J into the upper half of the heater. The openings in J are so arranged as to give an even distribution to the waste products throughout the diameter of heater. They then find their way through the openings between the balls or stones, until they reach the space above, from which they are drawn by the action of the water blast

through the opening O and forced out the waste flue P.

The water passes up through the pipe L into the nozzle N where it is discharged in a fine spray and projected at high speed through the opening O, carrying with it the waste products. This spray eventually becomes arrested by contact with the walls of the stack P and by the force of gravity is carried downward in a film along the walls of the stack until it reaches the compartment R. Here it spreads over the bottom of the compartment to a depth of from ¼ to ¾ inch and drops in a fine rain from the numerous perforations in the bottom. This rain falling on the filling of balls M forms a thin skin or wetted surface over the surface of each ball. This skin has a downward motion due to gravity and drops from one ball to the other, re-forming on the successive balls until finally it drops to the concave surface of the plate J. The upward turned edges of the gas openings in J prevent the water passing through them, and the latter is in consequence led towards the center from where it drops through the small holes *j'* to the upper surface of the shield H. Passing down the curved surface of H, it drops from the circumference into the well D. From the well it overflows into the bath or other vessel through the pipe F, whose height governs the water level as shown in the drawing.

The transfer of heat from the waste gases to the water is accomplished as they travel in opposite directions, the hot water being in contact with hot gases at the bottom and the cool gases in contact with the cold water at the top, thus effecting a most complete interchange of heat through the medium of the heating surfaces provided in the invention. The hot gases impinging on the surfaces of the parts E, H, and J, heat the water on the upper surfaces by conduction through the plates. The water as it drops from one plate to the other and to the well is also heated by direct contact of the waste gases with the drops. The complete transfer of heat is accomplished in the upper half by the intimate contact of the combustion gases with the films of waters in the passage through the bed of balls or stones. Further the fine spray of water in the smoke stack, serves to insure a complete transfer of heat and the issue of the waste gases at a temperature much below that of the surrounding atmosphere. This transfer is so complete that an efficiency of between 90 and 100 per cent. is obtained, while the induced draft intensifies the action of the burner, insuring perfect combustion and preventing the formation of sooty deposits in the water.

The flow of gas to the heater is controlled by the cock or valve 1 operated by lever 3. 6 is a pilot light for the purpose of lighting the burner. The cold water is controlled by a cock or valve 2 connected by the lever 4 and link 5 with the lever 3. The cold water and gas are thus controlled in unison through the lever 3. To operate the heater, the pilot cock 6 is turned on and lighted. The lever 3 is then turned upward opening together the gas and water inlets, after which the pilot is turned off. To extinguish, the lever is merely turned down.

I claim

1. In a water heater, a vertical casing provided at its top with an outlet for the products of combustion, and at its bottom with a burner, a transverse grid at the center of the casing, a spray pipe extending upward from the grid at the center of the casing and arranged to deliver a spray into the outlet, a dished perforated cover for the casing, provided with an opening to permit the passage of the spray and with an annular flange around the opening, a plurality of non-absorbent balls supported by the grid, a convex transverse shield below the grid arranged with its concave face downward, a cone shaped hood above the burner, the edges of the shield projecting beyond the adjacent edge of the hood, the space between the outer face of the hood and the inner face of the casing being adapted to receive the water passing downward through the casing, said casing being provided with an overflow pipe to permit the passage of the water therefrom, and a downwardly cupped disk provided with perforations adjacent its center for permitting the passage of the water and with upwardly flanged perforations near its edges for permitting the passage of the products of combustion arranged above the hood.

2. In a water heater, a vertical casing provided at its top with an outlet for the products of combustion, and at its bottom with a burner, a transverse grid at the center of the casing, a spray pipe extending up from the grid and arranged to deliver a spray into the outlet, a dished perforated cover for the casing provided with an opening to permit the passage of the spray, and with an annular flange around the opening, a plurality of non-absorbent balls supported by the grid, a convex transverse shield below the grid arranged with its concave face downward, a cone shaped hood above the burner, the edge of the shield projecting beyond the adjacent edge of the hood, the space between the outer face of the hood and the inner face of the casing being adapted to receive the water passing downward through the casing, said casing being provided with an overflow pipe to permit the passage of the water therefrom.

3. In a water heater, a vertical casing provided at its top with an outlet for the products of combustion, and at its bottom with a burner, a transverse grid at the center of the casing, a spray pipe extending upwardly therefrom and arranged to deliver a spray in

the outlet, a dished perforated cover for the casing provided with an opening to permit the passage of the spray, and with an annular flange around the opening, a plurality of non-absorbent balls supported by the grid, a cone shaped hood above the burner, the space between the outer face of the hood and the inner face of the casing being adapted to receive the water passing downward through the casing, said casing being provided with an overflow pipe to permit the passage of water therefrom, a downwardly cupped disk provided with perforations adjacent to its center for permitting the passage of the water, and with upwardly flanged perforations near its edges for permitting the passage of the products of combustion arranged above the hood, and means for deflecting the falling water to the space between the hood and the casing.

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