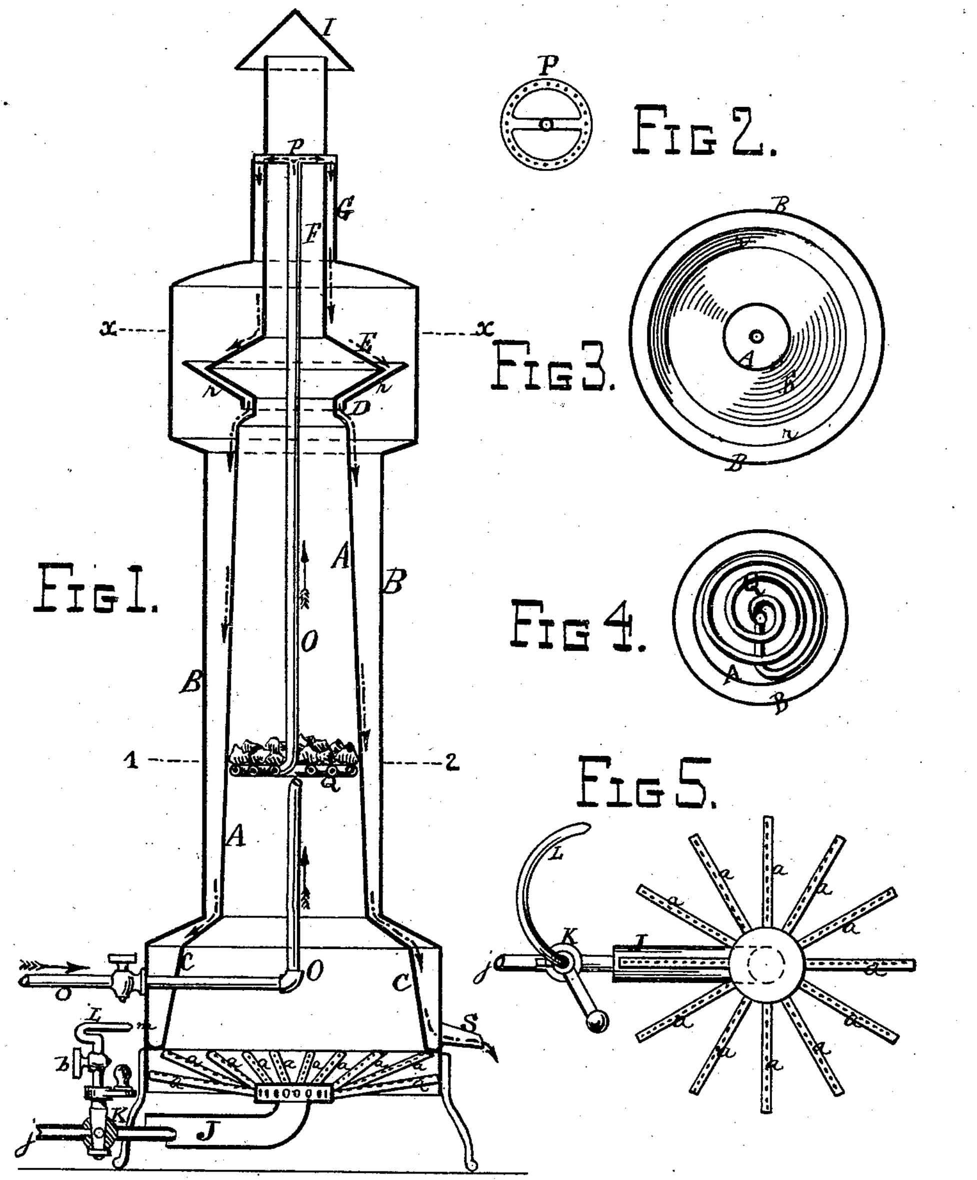
(No Model.)

2 Sheets—Sheet 1.

E. J. DOUGLAS.

APPARATUS FOR HEATING WATER.

No. 345,416. Patented July 13, 1886.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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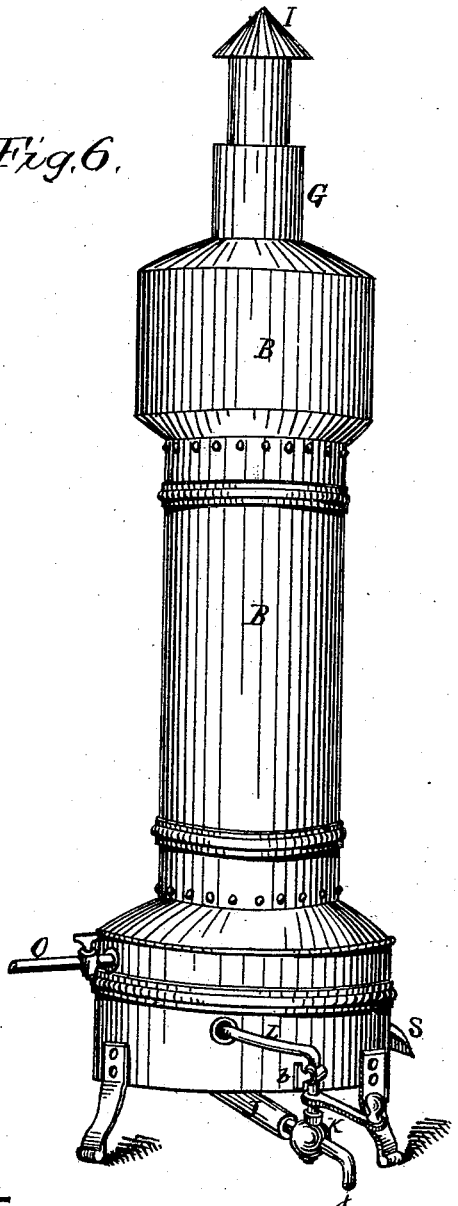
Fig. 6.



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UNITED STATES PATENT OFFICE.

EDWARD JOSEPH DOUGLAS, OF MELBOURNE, VICTORIA, AUSTRALIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO ANDREW RUDGEAR, OF SAME PLACE, AND SAMUEL BERNSTEIN AND EDWARD KUHNE, BOTH OF SAN FRANCISCO, CALIFORNIA.

APPARATUS FOR HEATING WATER.

SPECIFICATION forming part of Letters Patent No. 345,416, dated July 13, 1886.

Application filed September 24, 1885. Serial No. 178,077. (No model.) Patented in Victoria, February 8, 1883, No. 2,406; in South Australia August 18, 1884, No. 479; in New Zealand November 21, 1884, No. 1,203, and in New South Wales December 17, 1884, No. 1,544.

To all whom it may concern:

Be it known that I, EDWARD JOSEPH DOUGLAS, of the city of Melbourne, in the colony of Victoria, Australia, have invented an Improved Apparatus for Heating Water; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to an improved water-heater in which the heat for heating the water is produced by the combustion of gas in an inside compartment or chamber through which the water is caused to pass by pressure, being conducted upward through the center of the compartment or chamber until it reaches the top of the chamber, where it is sprayed into an outer annular compartment or chamber and compelled to flow down in a thin film over the heated surface of the inside vessel, all as more fully hereinafter described.

Referring to the accompanying drawings, Figure 1 is a vertical section of my water-heater. Fig. 2 is a plan of the sprinkler in the upper end of the heater. Fig. 3 is a transverse section taken through *x x*, Fig. 1. Fig. 4 is a transverse section taken through 1 2, Fig. 1. Fig. 5 is a plan of the radiating perforated pipes through which gas is introduced into the lower end of the heater. Fig. 6 is a vertical elevation of the heater.

Let A represent an inside vessel or heater, and B the outer shell or casing which surrounds and incloses it. The inner vessel, A, is made with an enlarged base-portion, C, in which the immediate ignition and combustion of the gas takes place. From this enlarged portion the vessel tapers upward to a greater or less distance, according to the height of the heater, where it is slightly contracted, so as to form a neck, D, above which it flares outward, and is again contracted, forming a V-shaped flange or shelf, E, and from thence it extends upward a short distance as an ordinary pipe or tube, F. The outer vessel or case is made of sheet-iron or other sheet metal, and it approximates in form to that of the inner vessel, being somewhat larger, so that an annular space is left between the two. The outer casing is enlarged near its top, so as to form an enlarged chamber around the V-shaped flange or projection E of the inner vessel. Above this enlarged chamber the outer casing is extended upward as an outside pipe or tube, G, surrounding the pipe or tube F of the inner vessel and extending a short distance above it. This pipe or tube is surmounted by a hood or cowl, I, as shown.

J is a gas-pipe, which is connected with a gas-main by a pipe, *j*, a rotary valve, K, serving to cut off and turn on the gas. The pipe J has a number of radiating pipes or tubes, *a a*, branching from its end inside the lower enlargement of the inner vessel. These radiating pipes are perforated, so that the gas which is admitted through the pipe J is distributed and discharged into the enlarged chamber through the perforations. A curved pipe, L, is connected with the valve-rod of the rotary valve K, so that when the pipe L stands vertical the rotary valve is closed and the gas cut off from the machine; but when the curved pipe is swung forward so as to carry the upper curved end of the pipe L through an opening, *m*, in the side of the enlarged chamber, the valve is opened and the gas is turned on through the pipe J. A cock, *b*, in the length of the curved pipe L, serves to turn on the gas through the curved pipe L, in order to light the jet at the end of the curved pipe before it is swung forward into the chamber.

O is the water-pipe which leads from a main pipe or from some elevated source. This pipe passes into the lower enlarged chamber, and is then bent upward, as shown, so as to pass up through the center of the inner or heating-chamber, and terminate at the top of the pipe F, where an ordinary spraying-rose, P, is secured to it. In the length of this pipe where it passes up through the body of the heater (preferably near the enlarged chamber) it is bent into a coil, Q, so that the water will circulate through this coil in passing upward through the heater. On this coil I place lump

asbestus or other non-combustible substance, which will obstruct too free a draft through the heater and retain the heat a greater length of time in direct contact with the pipe. The operation will then be as follows, all proper connections with water and gas having been made: I first turn the cock *b*, which turns the gas on at the end of the curved pipe L. I then light the jet at the end of the curved pipe and swing it forward, so as to insert the lighted end through the opening *m* in the enlarged chamber. This movement of the pipe L turns the rotary valve K, so as to admit gas from the gas-main through the pipe J and perforated branch pipes *a a* into the enlarged chamber, where the gas is ignited by the burning jet of pipe L, and the whole interior of the heater is heated by the burning gas. The water is then turned on through the pipe O, and the pressure causes it to pass up through the pipe and coil, where it is given a preliminary heating, and is finally sprayed from the rose P into the annular space surrounding pipe F; thence it flows down the outside of pipe F and over the inclined flange or shelf E, and is thence directed by a dish, *r*, which is supported under the shelf, to the neck D, and thence down the outside of the heater until it is discharged through the spout S, being heated in its passage through the pipe O and down the heated outer surface of the inside vessel. By this means water can be quickly heated at a small expense by the combustion of gas alone.

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

1. In a water-heater, the combination of an outer shell, an inner shell with its chamber in communication with the heating-furnace and separated from the outer shell by an annular space, and a water-conveying pipe passing upward through the inner chamber and terminating at its upper end in an atomizer, as and for the purpose set forth.

2. In a water-heater, the combination of an outer shell, a tapering inner shell, the interior of which communicates with the furnace, and a water-conveying pipe passing upward through the inner chamber and terminating in an atomizer communicating with the annular chamber surrounding the shell, as and for the purpose set forth.

3. In a water-heater, the combination of the outer shell, B, inner shell, A, pipe O, extending upward within the shell A and having the atomizer P at its upper end, and the furnace, as set forth.

4. In a water-heater, the combination of the outer shell, B, inner tapering shell, A, water-conveying pipe O, extending upward within the shell A and having the atomizer P at its upper end, and the furnace, as set forth.

5. In a water-heater, the combination of the outer shell, B, inner tapering shell, A, having the enlarged part E, and neck D, dish *r*, water-conveying pipe O, atomizer P, and the furnace, substantially as described.

6. In a water-heater, the combinaton, with a heating-chamber having the slit or opening *m*, of the main gas-pipe J, with its radiating perforated discharge-tubes *a a* in the bottom of the chamber, and the supplemental gas tube or burner L, substantially as and for the purpose described.

7. In a water-heater, the combination of an outer shell, an inner tapering shell, a water-conducting pipe within the inner shell coiled upon itself in part of its length and extending upward within the inner shell, and provided with an atomizer at its upper end, and a gas-furnace and gas-supply pipe at the base of the shell, all as set forth.

8. In combination with a water-heater, the gas-furnace *a*, and gas-supply pipe J, provided with the hollow perforated valve K, and curved tubular extension L, whereby a flame for igniting the furnace *a* may be provided at the end of the pipe L, as and for the purpose described.

9. In a water-heater, the inner vessel constructed with an enlarged combustion-chamber, C, at its base, a body tapering to a neck, D, a V-shaped flange or shell, E, and short pipe F, in combination with a large outside shell or case, B, provided with an enlarged chamber near its top and terminating a short distance below the pipe F of the inner vessel, said outer vessel having a discharge-spout near its bottom, and the water-conveying pipe O, substantially as described.

10. In a water-heater, the combination, with the combustion-chamber C, tapering shell A, having the neck D and V-shaped shelf E near its upper end, and a water-conveying pipe communicating at one end with a water-supply and at the other with the upper end of the shell A, the dish *r*, arranged around the shell under the V-shaped flange, whereby the water which flows down the outside of the shell upon the flange E shall be directed upon the tapering sides of the shell below the neck D, as set forth.

EDWARD JOSEPH DOUGLAS.

In presence of—
THOS. T. KINNAIRD,
HY. HUTCHINSON.