

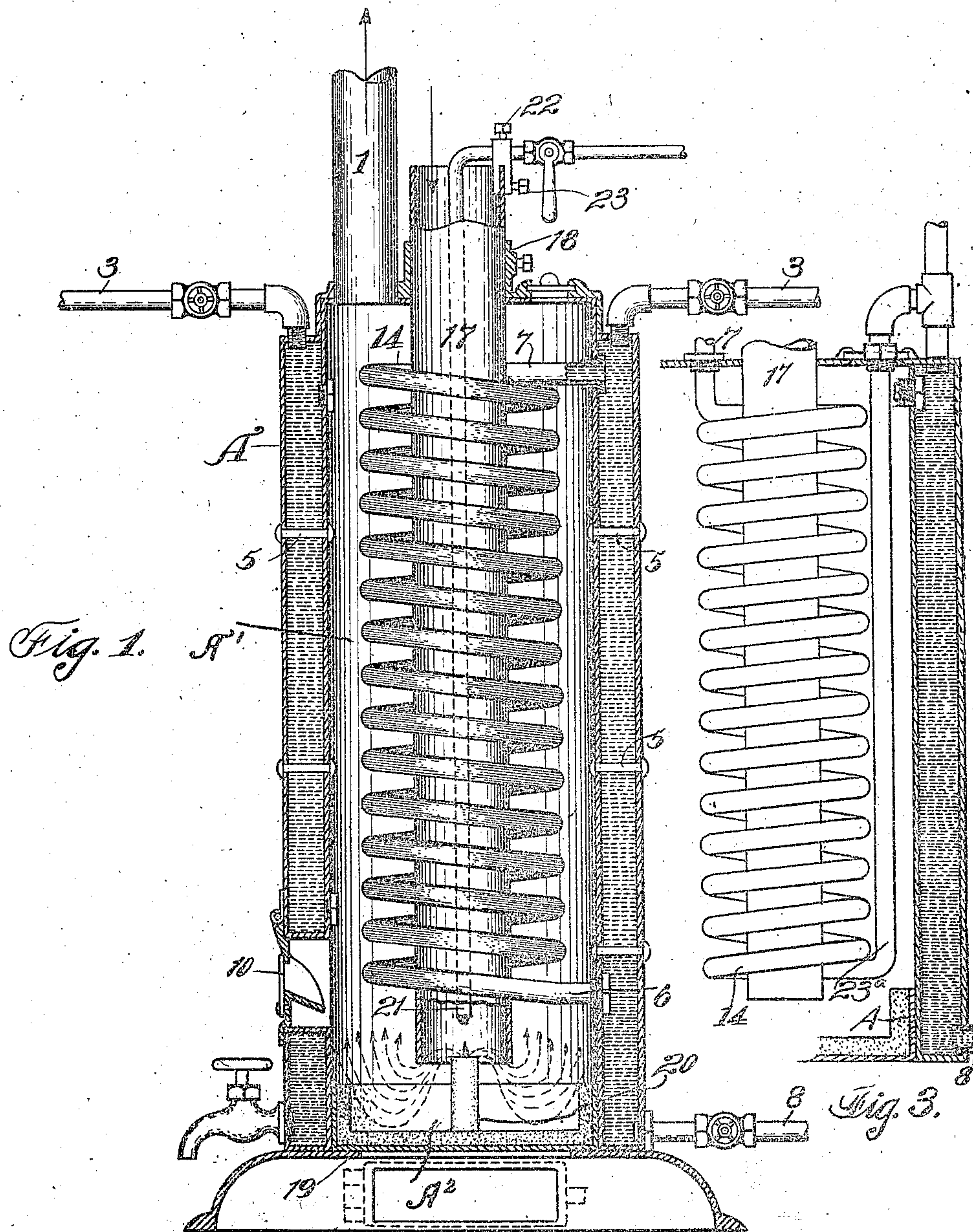
No. 876,868.

PATENTED JAN. 14, 1908.

E. W. DUNN.  
WATER HEATER.

APPLICATION FILED FEB. 14, 1907.

2 SHEETS—SHEET 1.



WITNESSES:

*F. E. Maynard.*  
*G. H. Searse*

INVENTOR;

*Emanuel W. Dunn.*

BY

*Geo. H. Strong.*  
ATTORNEY



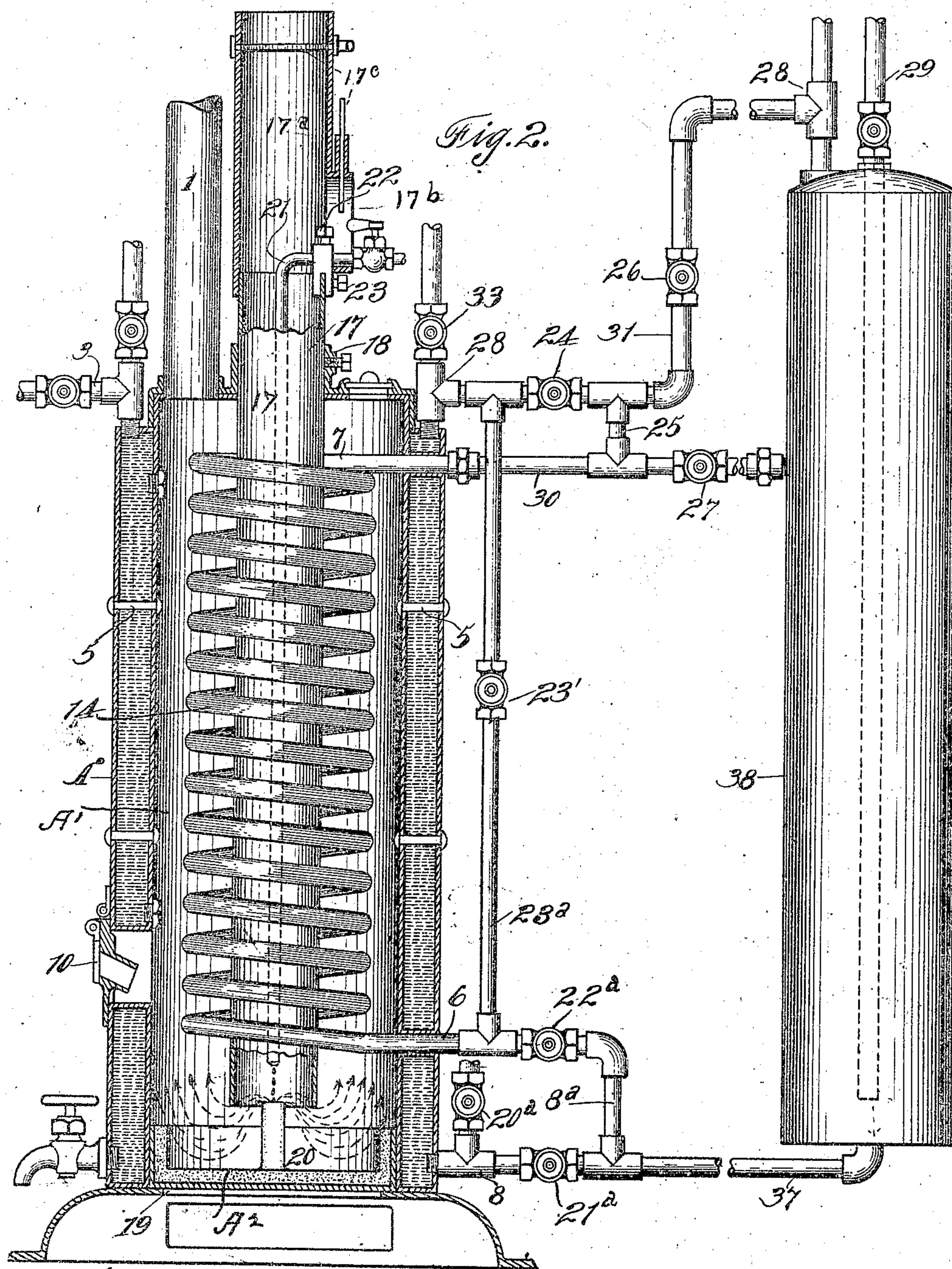
No. 876,868.

PATENTED JAN. 14, 1908.

E. W. DUNN.  
WATER HEATER.

APPLICATION FILED FEB. 14, 1907.

2 SHEETS—SHEET 2.



WITNESSES:

*J. H. Maynard.*  
*J. H. Maynard.*

INVENTOR;  
*Emanuel W. Dunn.*  
BY  
*Geo. H. Strong.*  
ATTORNEY



# UNITED STATES PATENT OFFICE.

EMANUEL W. DUNN, OF SAN JOSE, CALIFORNIA.

## WATER-HEATER.

No. 876,838.

Specification of Letters Patent.

Patented Jan. 14, 1908.

Application filed February 14, 1907. Serial No. 357,257.

*To all whom it may concern:*

Be it known that I, EMANUEL W. DUNN, citizen of the United States, residing at San Jose, in the county of Santa Clara and State of California, have invented new and useful Improvements in Water-Heaters, of which the following is a specification.

My invention relates to an apparatus which is especially designed for the heating and circulation of water.

It consists in a combination of parts, and in details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a vertical section of the main portion of the heater. Fig. 2 shows the connection of the heater with a storage tank. Fig. 3 is a partial elevation and section showing the parts connected to heat the water in two stages.

It is the object of my invention to provide a means for the rapid heating of water, and means for storing and circulating said water.

As shown in the drawings, A is a casing which in the present case is shown formed of vertical concentric shells having stay-bolts at suitable intervals, by which the walls of the casing are maintained in proper position, and any displacement by internal pressure is prevented.

Within the annular chamber A' of the casing is fitted a coil 14, the upper end 7 of which may connect with a discharge, or with the upper end of the casing A, and the lower end 6 may connect with the casing A, or with an inlet so that there may be a free circulation of water through the two parts as will be hereafter described. A burner plate or base A<sup>2</sup> made of appropriate refractory substance is placed within the lower part of the chamber A'. The side walls of this base or plate are sufficiently high to receive the impact of the burning gases or flame, and it also serves to retain the heat and transmit it to the inner walls of the chamber A'. From the central portion of the burner-plate rises a deflector 20.

17 is an air shaft located vertically within the coil 14; the lower end of this shaft extending downward to a point just below the top of the deflector 20. This air shaft is inclosed within a collar 18 which is fixed to the top of the casing A, or otherwise suitably supported, and by means of set screws the air-tube is held in place. By loosening the set screws the tube may be raised or depressed to adjust

it with relation to the burner-plate or fire line.

21 is an oil feed pipe receiving its supply from any suitable source, and this pipe extends down through the air-shaft with its lower end at a sufficient distance above the deflector 20. This oil pipe may be secured to the air-shaft, and movable therewith by means of a clamp fitting the upper end of the air-pipe, and having a locking screw 23. The pipe is locked into the clamp by a similar screw 22.

Oil is admitted through this central pipe, dropping upon the deflector 20 where it may be ignited by introducing a piece of burning paper, or other device through the door 10 in the side of the chamber A'; and when ignition takes place, the flame will be supplied with oxygen by a downward draft of air, which may be in the form of a force feed, if desired, until the air is heated, and a draft is established exterior to the air tube, and within the chamber A'. The oil falling upon the deflector and burner-plate is thus supplied with sufficient air for its perfect combustion, and the outward movement of the air from the bottom of the pipe, causes a radial divergence of the oil vapor and products of combustion, so that the whole interior of the heating chamber is filled with the burning gases. These gases rising upwardly rapidly heat the coil 14, and the interior of the chamber A', in a lesser degree; thus causing a circulation of the water which is drawn from the space between the double-walls or shells of the casing, and rising through the coil is delivered through the connection 7 into the upper part of the said space, as in Fig. 1, or to a discharge, as in Fig. 3. The products of combustion are conveyed away from the apparatus by a chimney or escape flue 1. Water may be drawn from the apparatus by one or more outlet pipes 3 connected with the upper part of the space between the double walls of the casing, and water may be supplied to the lower part of the space by a pipe or connection as at 8.

In order to provide for a large supply of water from the heater, I have shown a storage tank or chamber 38, the lower part of which is connected by a pipe 37 with the inlet passage 8 of the double-walled casing A, and by a branch pipe 8<sup>a</sup> with the lower part of the coil, see Fig. 2. The upper part of the coil may connect with the tank 38 by a pipe 30



which may lead through the walls of the casing A, or in other convenient direction, and opens into the tank 38 at a point below the top thereof. 31 is another pipe connecting the upper part of the space between the double walls of the casing with a fitting 28 through which the hot water from the whole system may be delivered into the upper part of the storage tank. The pipe 31 is connected with the pipe 30 by a short section of pipe, and suitable fittings as shown at 25; and by means of cocks located in said pipes, the circulation may be diverted so that the water from the heater may be delivered either into the upper part, or at a point between the top and bottom of the storage tank 38.

29 is a supply pipe through which cold water may be admitted, and said pipe leads down to a point near the bottom of the storage tank.

The operation will then be as follows: When the cock 21<sup>a</sup> in the pipe 8 is closed, and the cock 22<sup>a</sup> in the pipe 8<sup>a</sup> is open, and the cock 23' connecting the pipe 8<sup>a</sup> and 31 is closed, water from the bottom of the tank 38 will pass through the connecting pipe 37, thence through the pipe 8<sup>a</sup>, the valve 22<sup>a</sup>, and the pipe 6 into the lower part of the coil 14, thence passing upwardly it is delivered from the upper part of the coil through the pipe 7, and by opening the cock 27 in the pipe 30 it is delivered directly into the storage tank 38 at a point below the top of the tank; the valve 26 in the pipe 31 being closed. By closing the valve 22<sup>a</sup>, opening the valve 21<sup>a</sup>, and closing the valve 20<sup>a</sup>, water from the lower part of the storage tank will be delivered directly into the bottom of space between the double walls of the casing A. If the valve 21<sup>a</sup> be closed, and the valve 20<sup>a</sup> opened, a supply may be introduced into the space between the double walls of the casing from a source located at some point, not here shown, and from which the supply is received directly into the heating apparatus.

23<sup>a</sup> is a pipe shown outside of the casing A in Fig. 2 and inside of the chamber A' of said casing in Fig. 3 said pipe connecting the lower inlet 6 of the coil with the upper part of the casing A. By closing the valve 22<sup>a</sup>, opening the valve 23', closing the valve 24, and the discharge valve at 33, the hot water produced in the shell of the heater rising to the top will return through the pipe 23<sup>a</sup>, and through the connection 6 with the lower part of the coil, thus circulating the water within the heating apparatus so as to produce an instantaneous supply of hot water. By closing the valve 23<sup>a</sup>, opening the valve 24, and closing the valve 27 the hot water from the storage tank, will pass up through the pipe 31, the valve 26 being opened, and will be delivered through the fitting 28 and the upper part of the storage tank. By the

use of these various pipes and connections, it will be seen that the water may be either heated in the casing A and the coil 14, and discharged directly for use, or it may be circulated through the coil and casing to raise the temperature of the water rapidly to any desired degree; or it may be circulated through the separate storage tank to supply a large quantity of either moderately heated water taken from the casing A; or water of a higher temperature taken directly from the coil 14. The whole apparatus forms a very flexible and easily managed source of supply.

This apparatus enables me to concentrate the evolved heat simultaneously upon two portions of a heating structure, in such a manner as to heat a comparatively small body of water rapidly within one part of the heater, or by passing the water through a second portion, or a storage tank and returning it to the coil or first part of the heater, a large body of water may be heated.

It will be obvious that either a natural or a forced air-draft may be employed by extending the air-duct as at 17<sup>a</sup>, and providing a branch 17<sup>b</sup> with gates to each as at 17<sup>c</sup> so that one branch may be used for a natural, and the other for a forced draft.

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

1. In a water-heating apparatus, the combination of a vertically-disposed casing having an interior chamber with a surrounding water-space, a coil located within said chamber, connections between the coil and the said water-space, water supply and distributing means, closures for the top and bottom of said chamber, an escape-flue from the upper part of the chamber, a hydro-carbon fuel-pipe leading down within the coil and discharging at the lower end, a centrally-disposed air-pipe inclosing said fuel-pipe, and a burner-plate located in the lower part of said chamber, upon the surface of which plate the fuel is discharged and ignited, and from which it is delivered radially and below the bottom of the air-pipe to rise around the coil and within said chamber.

2. In a water-heating apparatus, the combination of a vertically-disposed casing having an interior chamber with a surrounding water-space, a coil located within said chamber having connection with said water-space, water supply and distributing means, a refractory base closing the lower end of the chamber, and forming a burner-plate, a fuel-supply pipe extending vertically down through the center of the coil and discharging fuel directly upon the burner-plate, an air-supply pipe open at both ends and inclosing the fuel-pipe, and extending downwardly to a point contiguous to the burner-plate, means for adjusting the air and oil pipes with relation to the burner-plate, a



closed top for the interior chamber, and a discharge flue from the upper portion of said chamber.

3. In a water-heating apparatus, the combination of a casing having an interior chamber with a surrounding water-space, a coil vertically-disposed in said chamber having circulating connection with said water-space, water supply and discharge means, a down-draft air-flue contiguous to said coil, a fuel-supply pipe extending downwardly through the air-flue to a point near the bottom thereof, a burner-plate located contiguous to the lower end of the air-flue and beneath the oil-pipe whereby a downward and outward projection of the products of combustion is effected, a closed top for the said chamber, and a discharge flue for the products of combustion.

4. In a water-heating apparatus, the combination of a casing having an interior chamber with the surrounding water-space, a coil vertically-disposed in said chamber having circulating connection with said water-space, a burner-plate located below the coil and forming a closure for the bottom of said chamber, a down-draft air-flue contiguous to the coil, the lower end of the flue being located near the surface of the burner-plate, a fuel discharge pipe extending downwardly through the flue and terminating contiguous to the burner-plate, and inlet and outlet pipes connecting with the bottom and top of the water-space of said casing.

5. In a water-heating apparatus, the combination of the casing having an interior chamber with a surrounding water-space, a coil vertically-disposed in said chamber and having circulating connection with said water-space, means within said chamber for heating said coil said means including a hydro-carbon supply pipe and an inclosing down-draft air-pipe, both entering the chamber to a point above the lower end thereof, a storage tank, connections between the upper and lower ends of said tank and the coil, means connecting said tank with the water-space of the casing, and a branch connection between the lower part of the storage tank and the bottom of the coil.

6. In a water-heating apparatus, the combination of a casing having an interior chamber with a surrounding water-space, a coil vertically-disposed in said chamber and hav-

ing circulating connection with said water-space, means for applying heat within the chamber and about said coil, the storage tank and a supply pipe therefor, connections between the bottom of the storage tank and the bottom of the water-space of the casing and the coil respectively, connections between the upper part of the storage tank and the upper part of the water-space and coil respectively, an intermediate coupling between the coil and water-space connections, and cocks whereby the flow of water may be diverted through either of the connections with the storage tank.

7. An apparatus for heating water in successive stages, said apparatus including a casing having an interior chamber with a surrounding water-space, a down-draft heating device centrally located in said chamber, a vertically-disposed coil surrounding the down-draft pipe and having circulating connection with said water-space, connections through which water may be circulated through said water-space and coil respectively, and means for changing the direction of the flow of the water.

8. In a water-heating apparatus, the combination of a casing having an interior chamber with a surrounding water-space, a coil vertically-disposed in said chamber having circulating connection with said water-space, a heater within the chamber and heating the same and the surrounding water, said heater including a down-draft air-flue located within the coil, and an interior fuel conductor discharging within the lower end of the air-flue and below said coil.

9. In a water-heating apparatus, the combination of a casing having an interior chamber with a surrounding water-space, a coil, within said chamber having connection with said water-space, a unitary heater for said chamber and the water in said space, said heater including a down-draft air-flue within the coil, a fuel conductor discharging substantially within the mouth of the flue, and a burner-plate and deflector.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EMANUEL W. DUNN.

Witnesses:

S. H. NOURSE,

FREDERICK E. MAYNARD.