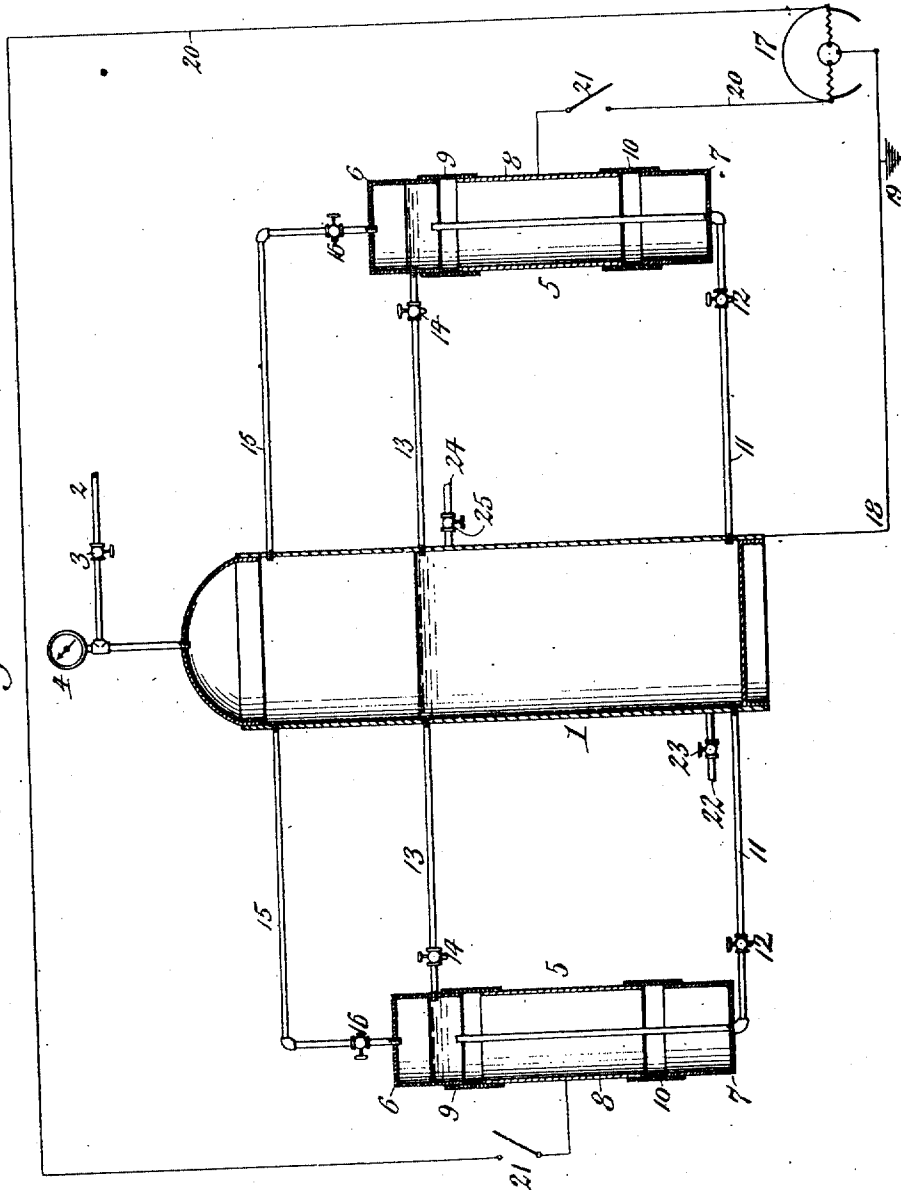


1,223,729.

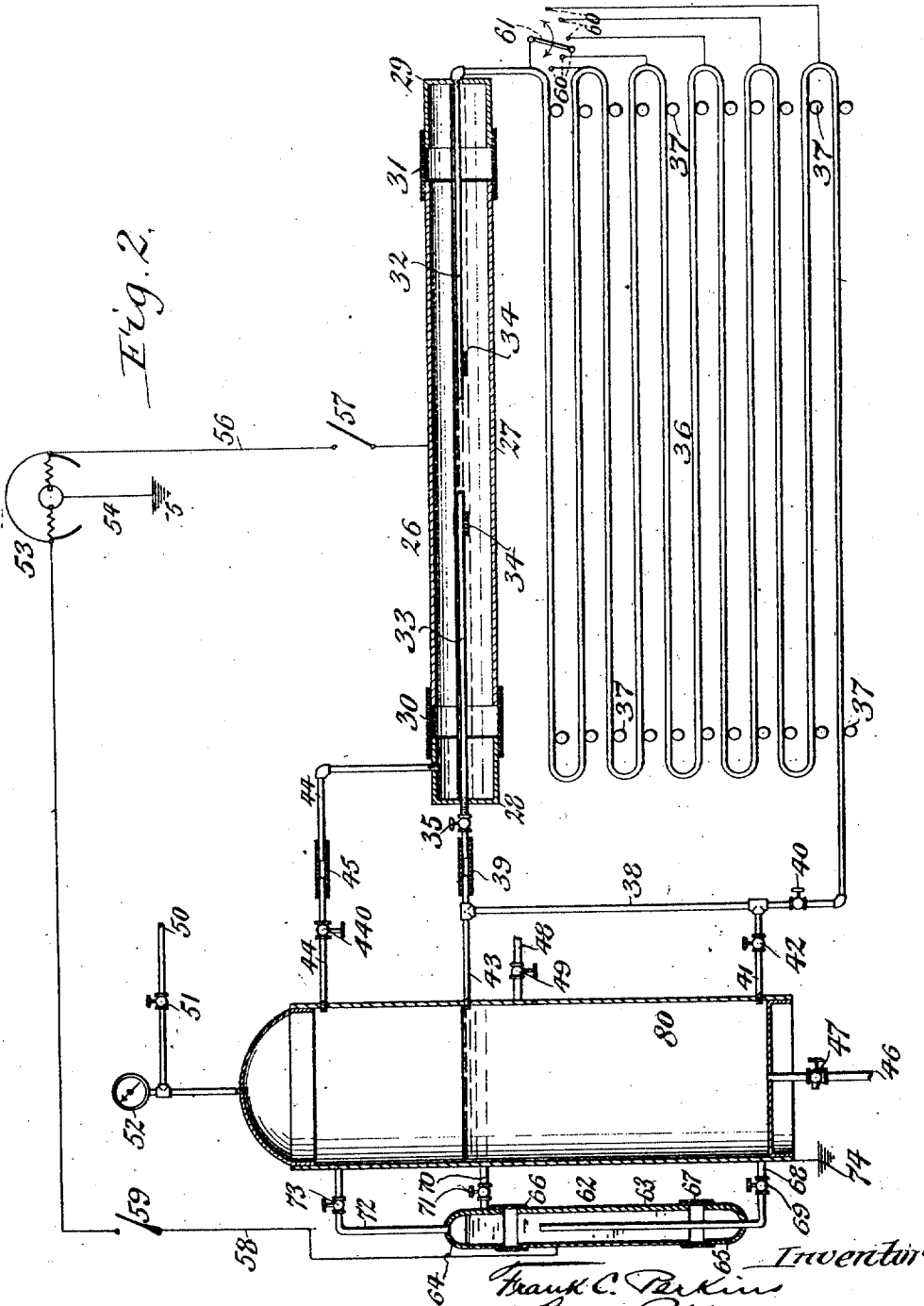
Fig. 1.



Inventor
Frank C. Perkins
by *Seay & Poff* Attorneys.

1,223,729.

Fig. 2.



Inventor
Frank C. Perkins
by *Sever & Pope* Attorneys

UNITED STATES PATENT OFFICE.

FRANK C. PERKINS, OF BUFFALO, NEW YORK, ASSIGNOR OF ONE-EIGHTH TO GEORGE J. MEYER, ONE-EIGHTH TO GEORGE H. MEYER, ONE-EIGHTH TO LEO P. MEYER, AND ONE-EIGHTH TO EUGENE MEYER, ALL OF BUFFALO, NEW YORK.

ELECTRIC WATER-HEATER.

1,223,729.

Specification of Letters Patent.

Patented Apr. 24, 1917.

Application filed December 1, 1916. Serial No. 134,291.

To all whom it may concern:

Be it known that I, FRANK C. PERKINS, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Electric Water-Heaters, of which the following is a specification.

This invention relates to an electric water heater and has the object to produce a heater of this character which is comparatively simple and inexpensive in construction, in which hot water and steam may be produced with a minimum of electrical apparatus and in which a water pipe rheostat is employed as part of the electric circuit in connection with the main water storage tank and the circulating pipes connecting the same with the water rheostat.

In the accompanying drawings:

Figure 1 is a diagrammatic representation of one form of electric water heating apparatus which embodies my invention and in which a three wire two phase alternating current is employed as the source of electric energy for heating the water and producing steam. Fig. 2 is a similar view showing another application of my invention in which the combined piping and resistance water form part of the electric circuit as a water rheostat and the water inlet pipe connecting the water rheostat with the storage tank is constructed in the form of a coil.

Referring to Fig. 1, 1 represents a storage tank which is constructed of suitable metal and which is adapted to store the water which is heated in the lower part thereof and the steam in its upper part. The steam may be withdrawn from this tank by means of a delivery pipe 2 containing a valve 3 and leading to any suitable place where the steam is to be consumed for any desired purpose, the pressure of the steam being indicated in any suitable manner, for instance by means of a pressure gage 4 connected with the steam delivery pipe.

In the application of my invention, as shown in Fig. 1, two separate electric heating units are employed but it is to be understood that only one of these units or a greater number than two may be employed, if desired. Each of these units comprises an upright water heating chamber 5 which, in the example shown in Fig. 1, consists of upper and lower metallic heads or caps 6, 7, an in-

intermediate tubular metal body 8 arranged between said heads, and coupling sleeves 9, 10 of rubber or other suitable material connecting the upper and lower ends of the tubular body with the upper and lower heads in such manner that water and steam tight joints are produced between the same but said body and heads are disconnected so far as metallic contact is concerned and electrically insulated from each other.

11 represents a lower metal inlet pipe which contains a hand valve 12 for controlling the same and which is connected at one end with the lower part of the storage tank while its opposite end is connected with the lower head of the heating chamber and passes upwardly into the heating chamber but terminates short of the upper end thereof so as not to come in metallic contact with the upper head or the tubular body of the heating chamber. At a point below the normal water line of the heating chamber and the storage tank these two members are placed in communication with each other preferably by means of the metallic water outlet pipe 13 which is connected at one end with the water tank and at its opposite end with the side of the upper head and is provided with a hand valve 14 for controlling the passage of the water through the same.

15 represents a steam pipe preferably constructed of metal and connected at one end with the top of the upper head of the heating chamber and at its opposite end with the storage tank above the water line therein and provided with a hand valve 16 for controlling the passage in this pipe.

17 represents an electric generator which in this instance is of the three wire two phase alternating current type, one wire 18 being connected with the metallic water storage tank and grounded at 19, while each of the other wires 20 is connected with the tubular metal body of one of the heating chambers and provided with a switch 21 whereby the circuit through the last mentioned wire may be turned on or off.

In the operation of this apparatus the current passes from the generator through each of the wires or lines 20 to the tubular body of a heating chamber, thence through the water within the latter, thence through the metal heads of the heating chamber and the metal pipes connecting the same with the

metal storage tank and thence back to the opposite pole or terminal of the generator. The water within the heating chamber thus forms a water rheostat which is heated as the current of electricity passes through the same, thereby causing the water to circulate between the heating chamber and the storage tank by reason of the lower inlet pipe and upper outlet pipe connecting this chamber and tank so that ultimately all the water in the several conduits is heated. Any steam which is generated in the upper part of the heating chamber is conducted by the steam pipe 15 into the upper part of the storage tank and mingles with any steam which may be in this tank. The water supply to the storage tank may be replenished in any suitable manner, for instance by means of a supply pipe 22 connecting with the lower part of the tank and provided with a valve 23 and hot water may be withdrawn from this tank for instance by means of a pipe 24 connecting with this tank below the water line and provided with a valve 25, as shown in Fig. 1.

By having several of these water heating units connected with the storage tank, each of a definite kilowatt capacity, the output of the heating plant as a whole may be adjusted to any desired capacity. In the installation of these water rheostats the amperes flowing in each water pipe will depend upon the relative length and diameter of the heating chamber and the length and diameter of the water conducting pipes communicating with the same which fact must be taken into consideration when designing a water heating and steam generating plant of a definite capacity. The valves 12, 14 and 16 are preferably of the by-pass type so that when the same are turned for shutting off communication between the heating and storage chambers the interior of the heating chamber will be placed in communication with the atmosphere, but when the heating and storage chambers are connected then the exit of the heating chamber to the atmosphere is cut off.

In the construction of the electric water heating apparatus embodying my invention and shown in Fig. 2, the water heating chamber 26 is arranged horizontally and comprises a tubular metal body or central section 27, two metallic heads or caps 28, 29 arranged at opposite ends of the body and insulating coupling sleeves 30, 31 which connect the opposite ends of the tubular body with said heads, but electrically insulate this body from said heads. 32 represents a metal water inlet pipe mounted on one of the heads of the heating chamber, for example the head 29, and extending axially inward to the central part of this chamber, and 33 represents a metal water outlet pipe mounted on the other head 28 of this cham-

ber and extending axially inward to a point adjacent to the central part of the chamber. No metallic connection exists between the inlet and outlet pipes 32, 33, within the heating chamber and the same are also prevented from forming metallic contact with adjacent metal tubular body 27 by means of insulating sleeves 34 of rubber or the like applied to the inner parts of the pipes 32, 33 so that if the same should be moved laterally by any cause no metallic contact would be produced between these pipes and the inner surface of the metal tubular body of the heating chamber. The outlet pipe is preferably provided with a hand valve 35 for controlling the passage of water through the same.

36 represents a metal water pipe coil arranged below the heating chamber and supported in any suitable manner so that the same is electrically insulated from adjacent parts, for instance by means of a plurality of insulating projections or knobs 37 mounted on a suitable support and engaging with the undersides of the several turns of this coil, as shown in Fig. 2. The upper end of this coil is connected with the inlet pipe 32 of the heating chamber and the lower end of this coil is connected with the lower end of a metal upright return pipe 38. The upper end of the latter is connected with the outer end of the outlet pipe 33 but insulated therefrom by means of a sleeve 39 of insulating material. This return pipe is provided with a hand valve 40 for controlling the admission of water to the lower end of the coil. Above the valve 40 the return pipe is connected with the lower part of the tank 80 by means of a metal pipe 41 containing a controlling valve 42 while the upper part of the return pipe is connected with the metal storage tank at a point below the normal water level by means of a pipe 43.

44 represents a steam pipe containing a valve 440 and connecting the upper part of the metal head 28 of the heating chamber with the steam space in the upper part of the storage tank 80, this last mentioned pipe being constructed of metal sections which are connected by means of a sleeve 45 of insulating material so that a conduit is formed between the heating chamber and the storage tank but no electric circuit is established between the heating chamber and the storage tank through this steam pipe.

Water may be supplied to the storage tank through a pipe 46 entering the lower part thereof and containing a valve 47 and hot water may be withdrawn from the same through a pipe 48 connecting with this tank below the water line and containing a valve 49. Steam may be withdrawn from the upper part of this storage tank and delivered to any suitable place by means of a pipe 50 containing a valve 51 and the pressure with-

in this tank may be observed by means of a pressure gage 52 connecting with the steam pipe.

53 represents an electric generator of any suitable construction, preferably of the three wire two phase type, which generates an alternating circuit and which has one of its wires 54 grounded, as shown at 55 while its second wire 56 is connected with the tubular body 27 and provided with a switch 57 and its third wire 58 is preferably connected in a manner as will later appear and provided with a switch 59.

In the operation of the apparatus illustrated in Fig. 2 the current passes from the generator through a wire 56 to the tubular body 27 of the heating chamber, thence through the water contained within the same, thence through the central inlet pipe 32, heating coil 36, return pipe 38 and branch pipes 41, 43 to the storage tank and thence by the wire 58 back to the opposite pole of the generator. The water within the heating chamber in this construction also operates as a rheostat and is heated by the passage of the current through the same so that a circulation of the water is by this means effected which causes the same to pass successively through the heating chamber, storage tank, the coil, and the piping connecting these members. The steam generated within the heating chamber is conducted from the upper part of the heating chamber to the upper part of the storage tank when the same joins any steam which may be generated in the latter.

By increasing or decreasing the length or diameter of the inlet pipe 32 which is arranged within the heating chamber the amount of current carried by the same may be varied and its heating effect in connection with the water surrounding the same as a rheostat may be varied accordingly.

As the current of electricity passes through the metal of the heating coil the same operates additionally as a means for heating the water passing through the same and thereby increases the heating capacity of this apparatus accordingly. In order to permit of varying the heating effect of this coil to suit different conditions, a switch mechanism is provided whereby more or less of this heating coil may be connected in series with the water rheostat while other parts of the same are shunted or cut out of this circuit. A suitable means for this purpose consists of a movable switch contact 61 connected with the upper end of the heating coil and adapted to engage with one or another of a plurality of fixed switch contacts 60 which latter are connected with different parts of the heating coil throughout the length thereof. By engaging the movable switch contact 61 with a fixed contact 60 connected with the upper part of the coil, a

greater part of the heating coil will be included in the electric circuit and a proportionately larger volume of water will be heated while upon engaging the movable contact 61 with a fixed contact 60 of a lower part of the heating coil then less of this coil will be included in series with a change in resistance of the electric circuit and a correspondingly changed heating effect upon the water will be produced by the passage of the electric current through this coil.

If desired an electric heater similar to that shown in Fig. 1 may be placed in the line 58, and as shown in Fig. 2, the same may comprise a heating chamber 62 having a central metal tubular section or body 63, upper and lower metal heads 64, 65, electric insulating sleeves 66, 67 connecting the heads and body, a water inlet pipe 68 connected with the lower head and placing the interiors of the heating chamber 62 and storage tank 80 in communication and provided with a valve 69, a water outlet pipe 70 connecting the upper head 64 with the tank 80 and containing a valve 71, and a steam outlet pipe 72 connecting the upper head 64 with the storage tank 80 and containing a valve 73. The operation of this last mentioned heater is the same as that shown in Fig. 1. The wire 58 is connected with the body 63 and both the tank 80 and the heads 64, 65 connected therewith are grounded at 74.

This electric water heating apparatus is very simple in construction and requires but few electrical elements in its organization, ordinary pipe fittings being readily used in its construction, thereby permitting of heating water and generating steam at comparatively low cost and without requiring an expensive installation.

I claim as my invention:

1. A water heating apparatus comprising a metal steam and water tank, a water pipe coil having its opposite ends connected respectively with the upper and lower parts of said tank and having a metal section which is insulated from those parts of the coil which are connected with said tank, and a source of electric energy having its terminals connected respectively with said insulated metal conduit section and said metal tank.

2. A water heating apparatus comprising a metal water tank, a water pipe coil having two metal end sections which are electrically connected with the upper and lower parts, respectively, of said water tank, and an intermediate metal section communicating with said metal end sections but electrically insulated therefrom, and a source of electric energy having its terminals connected, respectively, with said intermediate section and said tank.

3. A water heating apparatus comprising

a metal water tank, a heating chamber comprising two metal heads communicating, respectively, with the upper and lower parts of said tank and a tubular body connected at opposite ends with said heads but electrically insulated therefrom, and a source of electric energy having its poles connected, respectively, with said tubular body and said water tank.

- 10 4. A water heating apparatus comprising a metal water tank, a heating chamber comprising two metal heads and a tubular metal body connected at opposite ends with said heads but electrically insulated there-
15 from, a metal inlet pipe connecting the lower part of said tank with the lower head of said chamber, a metal outlet pipe connecting the upper part of said metal tank with the upper head of said chamber, and
20 a source of electric energy having its terminals connected, respectively, with said metal tank and said body.

5. A water heating apparatus comprising a metal water tank, a heating chamber com-
25 prising two metal heads and a tubular metal body connected at opposite ends with said heads but electrically insulated therefrom, a metal inlet pipe connecting the lower part of said tank with the lower head of said
30 chamber, a metal outlet pipe connecting the upper part of said metal tank with the upper head of said chamber, one of said pipes projecting into said heating chamber, and
a source of electric energy having its ter-

minals connected, respectively, with said 35 metal tank and said body.

6. A water heating apparatus comprising a metal water tank, a heating chamber comprising two metal heads and a tubular metal body connected at opposite ends with said 40 heads but electrically insulated therefrom, a metal inlet pipe connecting the lower part of said tank with the lower head of said chamber, a metal outlet pipe connecting the upper part of said metal tank with the up- 45 per head of said chamber, said inlet pipe being constructed in the form of a coil, and a source of electric energy having its terminals connected, respectively, with said metal tank and said body.

7. A water heating apparatus comprising a metal water tank, a heating chamber comprising two metal heads and a tubular metal body connected at opposite ends with said heads but electrically insulated therefrom, 55 a metal inlet pipe connecting one end of said tank with one head of said chamber, a metal outlet pipe connecting the other end of said metal tank with the other head of said chamber, said inlet pipe being constructed 60 in the form of a coil, means for electrically connecting said inlet pipe adjacent to said chamber with different parts of said coil more remote from said chamber, and a source of electric energy having its termi- 65 nals connected, respectively, with said metal tank and said body.

FRANK C. PERKINS.