

Nov. 14, 1939.

F. H. CZESCHIN

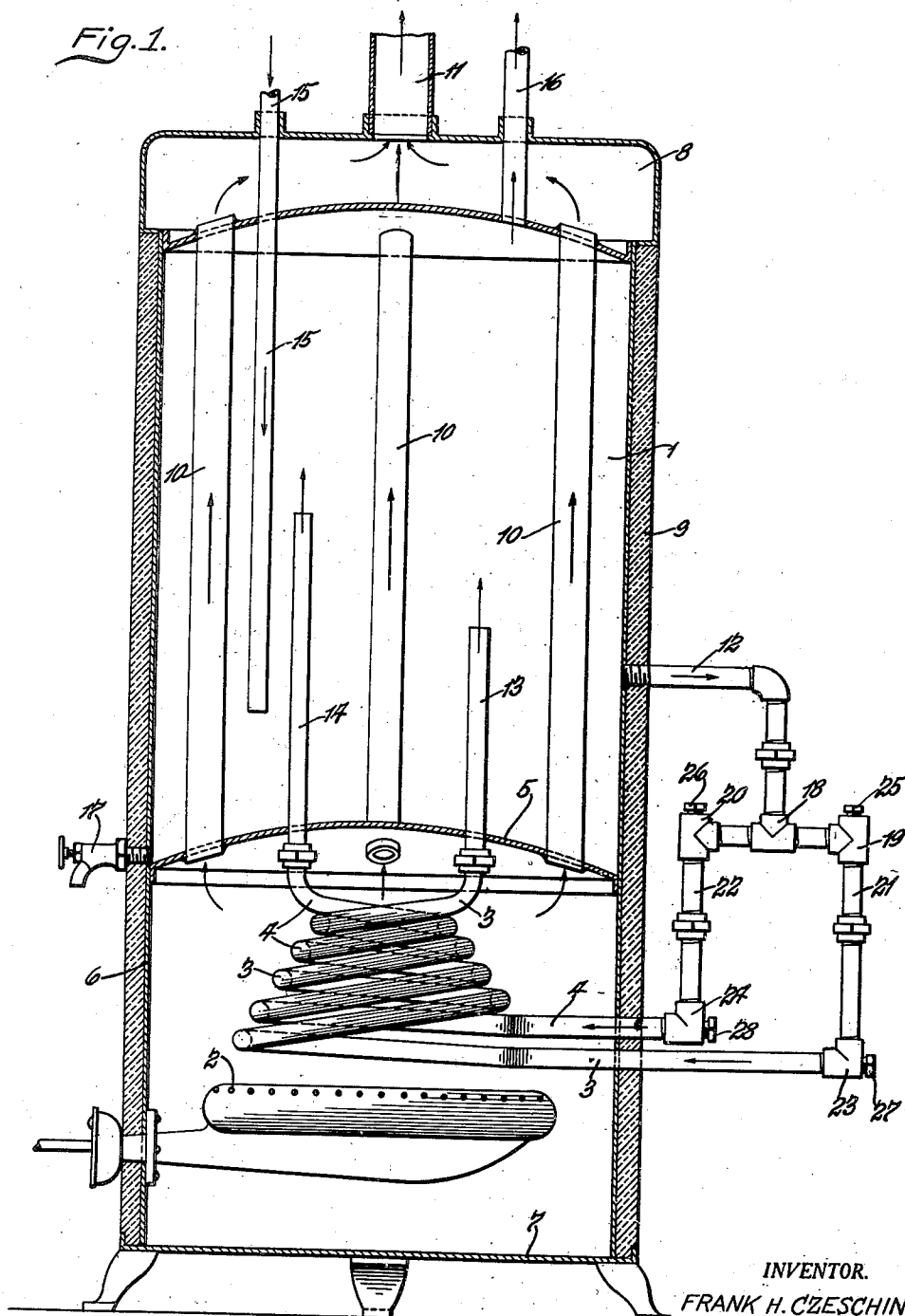
2,179,496

WATER HEATER

Filed Oct. 8, 1937

2 Sheets-Sheet 1

Fig. 1.



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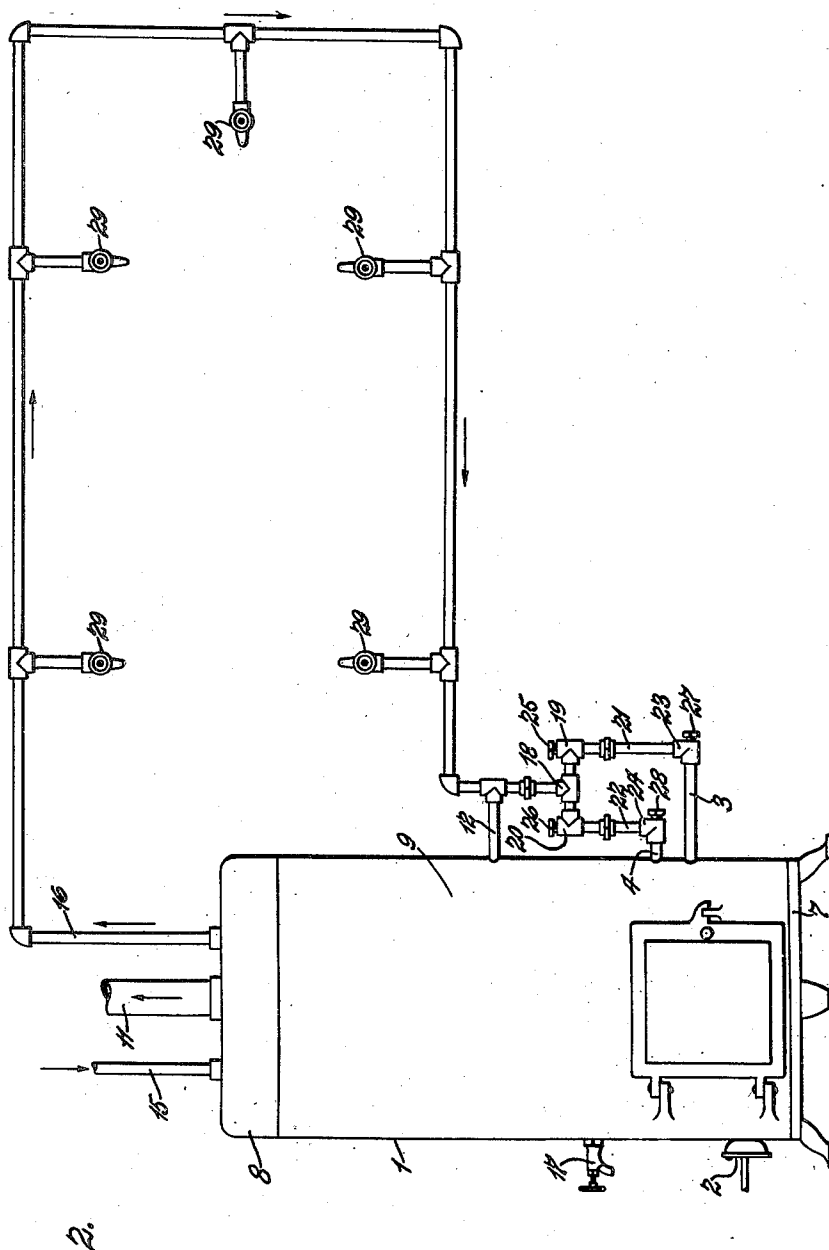


Fig. 2.

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## UNITED STATES PATENT OFFICE

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## WATER HEATER

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3 Claims. (Cl. 122-18)

This invention relates to water heaters.

One of the objects of this invention is to provide a water heater which will heat water quickly as well as efficiently.

Another object of this invention is to provide a heater which will heat water in a supply tank uniformly.

And a third object is to provide a water heater with heating coils, so arranged that hardness and other solids will tend to precipitate in a supply tank, avoiding the settling of such solids in the coils and preventing scale. All of these objects are accomplished by the novel elements and arrangement hereinafter described and claimed.

A further object of the invention is to provide means whereby the heating coils of a water heater may be quickly and efficiently cleaned.

The invention comprises the elements and their arrangement and environment hereinafter described as embodied in a specific device and pointed out in the claims.

Fig. 1 is a sectional view illustrating a water heater embodying the invention, and Fig. 2 is an elevation showing the water heater connected as it may be with a return service line, the line being illustrated diagrammatically.

As specifically illustrated in the drawings, the invention is embodied in a unitary structure which includes a supply tank 1 arranged above a burner 2, and a plurality of heating coils 3 and 4 (two as shown in the drawings) are arranged above the burner 2 and below the bottom 5 of the supply tank. A burner box 6 has a casing 7 which surrounds the burner and the coils 3 and 4, and preferably also has a bottom plate 7. A combustion dome or manifold 8 is positioned above the tank 1. Suitable insulating material, indicated by the numeral 9, is placed about the casing 6 and the supply tank 1 to conserve the heat from the burner and in the tank.

The burner 2 may be of any desired structure and may be arranged to burn gas or oil. This invention is not concerned with the type of burner. In the drawings it is illustrated in a conventional manner.

Flues 10 pass vertically through the water tank from the burner box to the combustion dome 8 and may be of any suitable selected number, size and arrangement. An outlet flue 11 is provided for the combustion dome or manifold 8.

It will now be understood that the burner 2 is positioned to heat the coils 3 and 4, as well as to direct heat against the bottom of the supply tank 1, while heat from the gases of combustion is also absorbed at the flues 10.

The coils 3 and 4 are connected to receive water at a low level in the tank 1 and deliver it at separate levels respectively to the tank. The coils 3 and 4, for their inlet, are connected through pipes, which later will be described in detail, to a pipe connection 12 near but substantially above the bottom 5 of the tank 1. Thus, as clearly indicated in the drawings, the coils 3 and 4 are connected to a single pipe for their inlet. But it will be understood that the coils 3 and 4 may be separately connected at their inlet ends with the tank 1 and this may be desirable, depending upon the efficiency required, but for ordinary purposes and for the sake of economy a single connection is generally satisfactory. It is essential, however, that the return for the coils to the tank be separate. The coil 3 is provided with a return line 13 and coil 4 is provided with a return line 14, each passing through the bottom 5 of the tank, while the line or pipe 13 extends less than half way through the tank and the return line 14 more than half way through the tank.

The tank 1 is provided with a supply line which, as shown in the drawings, comprises the pipe 15 which passes through the top of the tank and extends downwardly toward the bottom 5 of the tank but terminates well above it. A service line 16, through which hot water may be removed, is connected into the top of the tank. A drain outlet or valve 17 is connected into the lower most part of the tank.

From the foregoing description certain important functions of the novel arrangement therein described may be pointed out and explained. Because the return lines 13 and 14, from the coils 3 and 4, empty into the tank at substantially different levels, substantial circulation of water is provided in the tank when the burner 2 is operated. The arrangement results in quickly and uniformly heating the entire contents of a tank 1. In water heating for domestic or personal use it is desirable that the water be moderately hot rather than boiling, and the device illustrated and described accomplishes this purpose and quickly.

With many types of water heaters and supply tanks the upper layer of water in the tank is heated very hot while the body of water below that layer is cold. With the present device, however, the entire contents of the tank are uniformly but quickly heated, although it may not be heated to the extreme temperature that a portion of the water will be heated in the same length of time in other structures. In an actual construction and operation a tank containing

thirty gallons of water is heated to a temperature of 140° in seventeen minutes. Thus it will be seen and understood that the device heats water quickly in an efficient and satisfactory manner. The construction and arrangement has an additional function which associates in securing the results just outlined.

The construction and arrangement is such that the temperature of the tank will be equalized quickly as soon as the burners are shut off. That is to say, when the burners are operating there may be a difference of 10° in temperature between the water at the extreme top of the tank and a low point in the tank. But when the burners are shut off there still remains enough heat in the coils of the burner box and in the burner to cause a continued mild circulation of water, sufficient to equalize the temperature, so that shortly after the burners are put out of operation there will be no more than one degree difference in temperature at extreme points in the tank.

The construction and arrangement of the heater is responsible for an entirely different and additional function and result, that is the prevention of scale and other settling in the heating coils. It is well known and understood that when heating water certain solids in colloidal suspension tend to settle and also that certain minerals in water, especially those which cause so-called "temporary hardness" are caused to precipitate. These will form on a boiler surface or a heating coil causing scale, reducing the efficiency of the device and finally stopping up coils, rendering them entirely useless. This invention does not eliminate this settling and scale entirely, but it does reduce it to a minor fractional part of that encountered in conventional structures.

An attempt at the explanation of the reasons for this function and result in the structure of this invention will be made. It has already been explained that the body of water in the tank 1 is kept at an almost uniform temperature; the reason for this has been pointed out. In addition, because the burner 2 is directed toward the bottom 5 of the tank 1, that portion of the water in the tank below the connection 12 will be maintained in a heated condition uniformly with that of the body of water affected by the circulation which has been already described. While this lower strata of water is kept heated at substantially the same temperature as the upper portion of the water it is maintained in a quiescent condition. To accomplish this the connection 12 is made substantially above the bottom of the tank. Also, the supply line 15 empties into a tank substantially above the bottom of the tank so that when the tank is being filled, incident to the withdrawal of water through the service line 16, it will not set up a current or destroy the quiescence at the bottom of the tank. A body of water in motion tends to keep solids in suspension while they tend to settle when the liquid is still. Thus it is, in the present structure, that the major portion of the water in the tank is kept in constant motion and circulation while the lower portion is kept in a quiescent condition. Therefore, the settling of solids in suspension will be much greater in the lower portion of the tank than in the upper portion or in the coils. Hence most of the precipitation and settling will occur in the bottom of the tank and not in the coils. By actual experience coils of the same size and under the same condition

are found to remain in serviceable condition many times as long as in conventional structures.

The drain valve 17 provides means readily available for draining the sediment from the bottom of the tank.

Nevertheless, with average tap water there is a tendency for some scale to form and some deposit to be made in the coils. For readily cleaning out the coils novel means have been provided and will be presently described. As specifically illustrated in the drawings, the pipe 12 is connected to a T 18, in order to provide a branch circuit to connect with both coils 3 and 4. The branches of the T are in horizontal position and connect respectively with T's or elbows 19 and 20 and then with vertical pipes 21 and 22. The vertical pipes 21 and 22 connect through elbows or T's 23 and 24 with the coils 3 and 4 at their lowermost position. Plugs 25 and 26 are inserted in the upper branch of the T's 19 and 20 in vertical alignment with the pipes 21 and 22, and plugs 27 and 28 are positioned in the lower elbows or T's 23 and 24 in horizontal alignment with the connected portion of the coils 3 and 4 and at their lowermost position.

The arrangement of the pipes and plugs described in the foregoing paragraph is such that the plugs 25 and 26 may be removed when it is necessary or desirable to clean the coils. A cleaning fluid, such as muriatic acid, may then be poured into the coils through the plug openings completely filling the coils up to the level of those openings. Then by removing the lower plugs 27 and 28 the coils may be drained and cleaned out at their lowermost position.

Fig. 2 illustrates a circuit arrangement when it is desired to use a return service pipe. In apartments or hotels, or in other places where the service pipe is long and the taps are many, it is desirable to have the service line arranged in a complete circuit so that the water may be kept hot in the service line as well as in the supply tank. As illustrated in the drawings, the service line 16 is connected into the top of the tank 1 and may have a plurality of faucets, indicated by the numerals 29. Its return end is connected into the inlet pipe 12, as clearly shown in the drawings, Fig. 2. This circulation of hot water will be maintained in the service line 16 and hot water may be obtained immediately at any of the faucets 29 without waiting for a considerable section of pipe line to clear or drain before the hot water is reached. In residences, however, the employment of a closed circuit in the service line is unnecessary, and the service line 16 will then be a dead end pipe.

It will be apparent from the foregoing description and explanation that the invention accomplishes its objects. Various changes may be made in the details of construction within the scope of the appended claims, without departing from this invention, and parts of the invention may be used without the whole.

#### I claim:

1. In a water heater, a supply tank adapted to be completely filled, a plurality of independent heating coils, an inlet for the coils connected near the bottom of the tank, and outlet connections respectively for the coils at substantially different elevations in the tank, one coil terminating at an intermediate portion and one at a lower portion.

2. In a water heater, a supply tank adapted to be completely filled, a burner below the tank

and adapted to heat the bottom of the same, a plurality of independent pipe coils adjacent the burner, a pipe connection in the side of the tank near its bottom as an inlet for the coils, and outlet pipes for the coils respectively passing through the bottom of the tank and terminating inside the tank at substantially different elevations therein, one coil terminating at an intermediate portion and one at a lower portion.

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3. In a water heater, a supply tank adapted to

be completely filled, a burner below the tank and adapted to heat the bottom of the tank, a plurality of independent pipe coils connected for inlet near but substantially above the bottom of the tank and situated adjacent the burner, and outlet connections respectively for the coils discharging at different elevations in the tank above said inlet, one coil terminating at an intermediate portion and one at a lower portion.

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