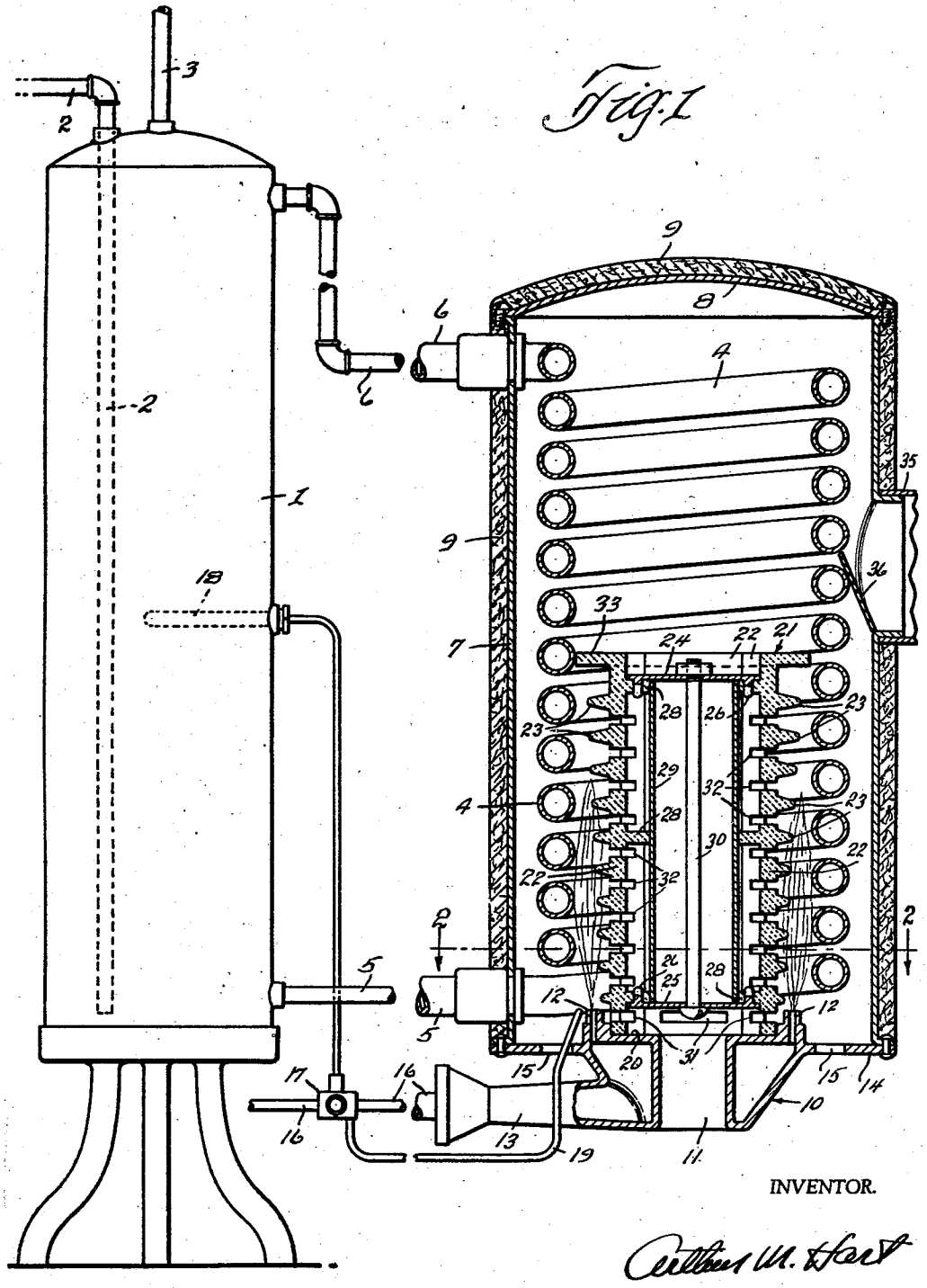
June 20, 1939. A. M. HART 2,163,199

WATER HEATER

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Fig. 1



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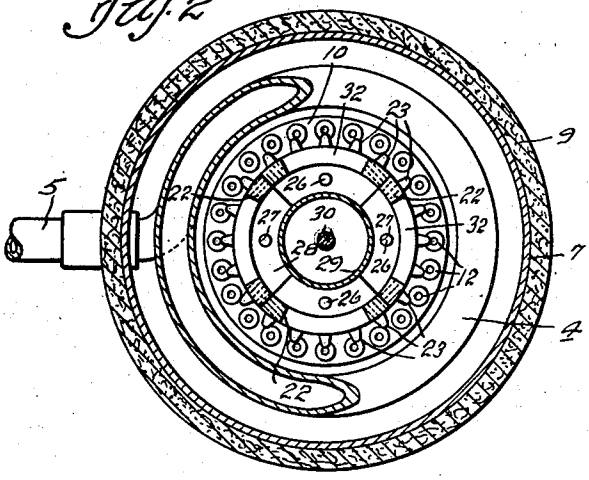
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WATER HEATER

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Fig. 2



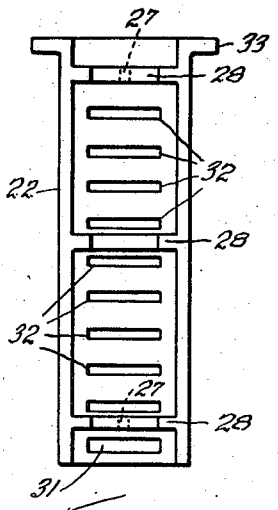


Fig. 3

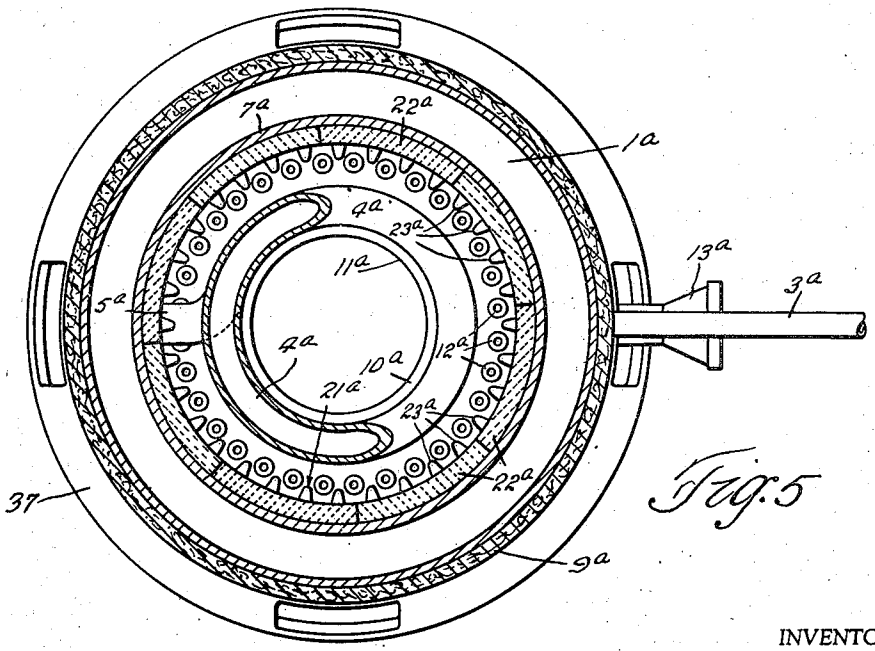


Fig. 5

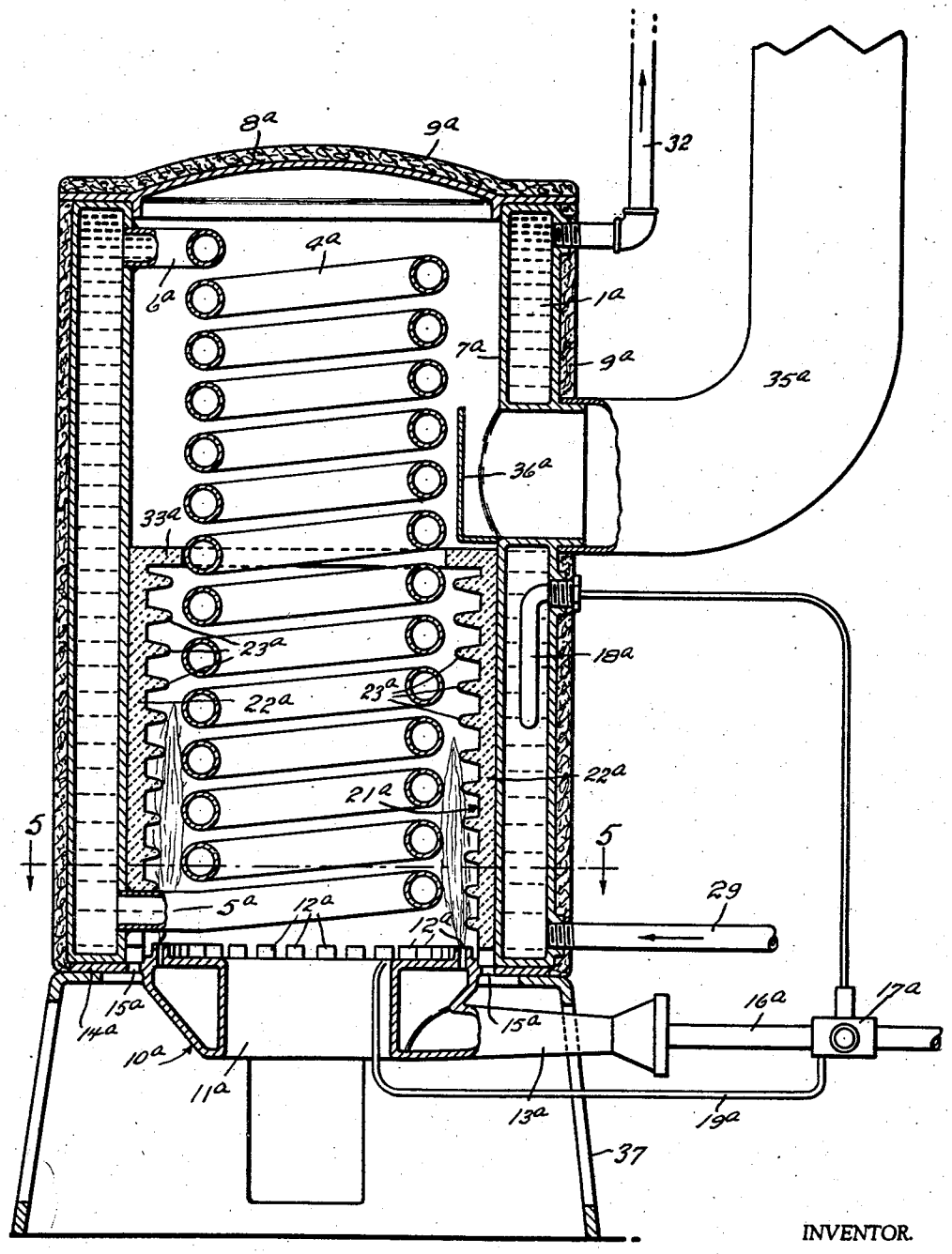
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Arthur M. Hart

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WATER HEATER

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INVENTOR.

Fig. 4 Arthur M. Hart

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UNITED STATES PATENT OFFICE

2,163,199

WATER HEATER

Arthur M. Hart, Lakewood, Ohio

Application February 25, 1937, Serial No. 127,793

5 Claims. (Cl. 122—250)

This invention relates to water heaters, which are especially adapted for domestic use.

The primary object of the invention is to provide a water heater which is more efficient and economical than devices of this character now in general use.

A more specific object of the invention is the provision of improved means for extracting a maximum of heat from the products of combustion and then applying it to the water to be heated.

These objects are accomplished by providing novel and efficient means for absorbing heat from the products of combustion while the burner is burning, and then applying this heat to the water to be heated after the burner has been extinguished.

They are also accomplished by providing a coil through which water is circulated, together with means for applying heat directly to the coil in combination with means for radiating heat against the coil and means for reflecting heat thereagainst.

Another object of the invention is to provide a self-contained water heater adapted for use with a small hot water heating system.

A further object of the invention is to provide an improved device of this character which is of simple construction and easily and cheaply manufactured.

Other and more specific objects of the invention will be apparent from the following specification and the accompanying drawings forming a part thereof wherein Fig. 1 is a vertical section through one embodiment of my invention showing it applied to a domestic hot water boiler; Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1; Fig. 3 is a rear elevation of one of the heat absorbing and radiating elements; Fig. 4 is a vertical sectional view through another form of my invention, and Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 4.

Referring now to the drawings, 1 indicates a domestic hot water storage boiler or reservoir of standard construction, having a cold water intake 2 and a hot water discharge 3. A heating coil 4 has its lower end 5 attached to the boiler 1 near the lower end thereof and its upper end 6 attached to the boiler near the upper end thereof. As the coil is heated, water is circulated from the lower part of the boiler, upwardly through the coil and into the upper part of the boiler.

A casing 7, having a removable cover 8 encloses the coil 4. A covering of asbestos or similar heat insulating material is indicated at 9. The numeral 10 indicates, generally, a gas burner which is secured to the lower end of the casing and forms a closure therefor. The burner 10 has a central opening 11, a circular row of jets 12 and the usual mixing chamber 13. An annular flange 14 formed integral with the burner body, provides convenient means for securing the burner to the bottom of the casing 7, in the proper position with respect thereto. A plurality of holes 15 in the flange 14 provide means additional to the opening 11 for the intake of air necessary to support combustion. Gas is supplied to the burner 10 by a supply pipe 16, and it is controlled by a thermostatically operated valve 17. The valve 17 which may be of any standard construction is controlled by a thermostat 18 in the boiler 1. A pilot light for the burner 10 is indicated at 19.

Supported by the burner 10, in a cylindrical recess 20 in the upper face thereof, and extending upwardly therefrom within the confines of the coil 4, is a heat absorbing and radiating member generally indicated by the numeral 21.

The member 21 is made up of a plurality of similar units 22. The units 22 are formed of material having high heat absorbing and radiating qualities. It has been found by experiment that various types of refractory material possess these characteristics and are suitable for use herein. Projections 23 formed integral with the units 22 and projected outwardly therefrom toward the coil 4 are provided to increase the radiating surfaces of the units 22, and since they become incandescent when heated promote complete combustion. The units 22 are arranged in the form of a cylinder and are held together by upper and lower plates 24 and 25 having projections 26 thereon which engage in openings 27 in inwardly extending annular webs 28 on the units 22. A cylinder 29 having a highly polished outer face extends between the plates 24 and 25 within the units 22. A bolt 30 holds the parts 22 to 29 together to form a removable cylinder, as shown. The cylinder 29 may be made of stainless steel which has a highly polished surface, or if desired, it may be made of other material and have its outer surface chromium plated to provide a highly polished surface.

A highly polished surface is provided in a like manner on the inner face of the casing 7.

Each of the units 22 has a slot 31 formed therein, below the lower web 28, to admit air to the jets 12. The slots 31 are of such size that in combination with the opening 15, they will admit sufficient air to support complete combustion of the gas discharged by the jets 12.

A plurality of slots 32 are formed in each unit 22 between the upper and lower webs 28 thereof. An annular flange 33 extends outwardly from the upper end of the member 21 into engagement with the coil 4.

The jets 12, as most clearly shown in Figs. 1 and 2, are positioned to discharge gas upwardly into the space between the member 21 and the

coil 4. As this discharged gas is burned, the flame will come in contact with the lower portion of the coil 4 and the member 21. This will heat the coil 4, and the water being circulated therethrough directly, and it will also heat the lower end of the member 21 directly. The products of combustion traveling upwardly will further heat the coil 4 and member 21 by direct contact. The member 21 will absorb most of the heat from the gases coming in contact with it, and the projections 23 will become incandescent. It will then radiate heat outwardly against the coil 4. It will also radiate heat inwardly against the highly polished outer face of the cylinder 29 which will reflect it outwardly through the slots 32 against the coil 4. Heat coming in contact with the highly polished inner face of the casing 7 will be reflected inwardly against the coil 4. The annular flange 33 on the upper end of the member 21 insures a better circulation of hot gases around the member 21 and the coil 4. The burned gases are discharged through a flue 35 above the flange 33. A baffle 36 is placed in front of the flue 35 to cause the gases to travel upwardly the entire height of the coil 4 and then downwardly before being discharged.

By this arrangement and construction of the various parts, novel means is provided for utilizing the maximum amount of heat generated by the burner 10. Consequently the gases discharged by the flue 35 are relatively cool, since the majority of the heat units have been extracted therefrom.

When the water in the boiler or reservoir 1 reaches a certain predetermined temperature, the thermostat 18 will operate the valve 17 to cut off the supply of gas to the burner 10; but the member 21 having been heated to a high temperature will continue to heat the coil 4, and the water therein, by radiation until it cools. When the water in the boiler drops below a certain predetermined temperature, the thermostat 18 will operate the valve 17 to again supply gas to the burner 10, which will be ignited from the pilot 19.

Figs. 4 and 5 illustrate a modification of my invention which is capable of performing all the functions of the form shown in Figs. 1, 2 and 3 and in addition thereto is particularly adapted for use in hot water heating systems employing only one or two radiators. It is also especially adapted for use as a semi-instantaneous water heater.

In this form, the boiler or reservoir 1ª surrounds the casing 7ª and forms a part thereof. The casing 7ª incloses a heating coil 4ª having its lower end 5ª in communication with the lower end of the boiler 1ª and its upper end 6ª in communication with the upper end of the boiler 1ª. A burner 10ª is mounted in the lower end of the casing and forms a closure therefor and the upper end of the casing is closed by a removable cover 8ª. 9ª indicates a covering of insulating material.

The burner 10ª is similar to the burner 10, having a central opening 11ª, jets 12ª, mixing chamber 13ª and an annular flange 14ª having a plurality of openings 15ª for the intake of air. The boiler 1ª, burner 10ª and connected parts are all supported on a base 37. Gas is supplied to the burner through a pipe 16ª and a thermostatically controlled valve 17ª which is operated at predetermined times by a thermostat 18ª in the boiler 1ª. A pilot burner is indicated at 19ª. The cold water intake to the boiler 1ª is indicated at 28 and the hot water outlet it indicated at 32. A discharge flue for burned gases is indicated at 35ª and a baffle, similar to the baffle 36, is indicated at 36ª.

In this form a heat absorbing and radiating member 21ª surrounds the lower end of the coil 4ª. An inwardly extending annular flange 33ª on the upper end of the member 21ª bridges the space between the casing 7ª and the coil 4ª.

The member 21ª is composed of a plurality of units 22ª, each having a plurality of projections 23ª formed integral therewith and extending toward the coil 4ª. These projections are similar to and serve the same purpose as the projections 23 on the member 21.

The operation of this form of my invention is the same as the operation of the form illustrated in Figs. 1, 2 and 3, and need not be described further.

From the foregoing, it will be seen that I have provided novel, efficient and economical means for accomplishing the objects of my invention enumerated herein.

Having thus described my invention, what I claim is:

1. In a device of the character described, the combination of a coil, a burner for heating said coil directly, means for heating said coil indirectly from said burner, said means comprising an element extending upwardly in spaced relation to said coil and having high heat absorbing and radiating qualities, a plurality of slots in said element, a reflector positioned to reflect heat, radiated thereagainst from said element, outwardly against said coil, a casing surrounding said means and said coil, a reservoir and connections between the ends of said coil and said reservoir.

2. In a device of the kind described, the combination of a casing, a vertical coil therein, a gas burner in the casing and under the lower end of said coil, and a cylindrical element extending vertically beside and concentric with the coil and spaced at all sides therefrom, said element comprising material of the radiant type having high heat absorbing and radiating qualities and provided with a plurality of projections extending toward the coil and into the path of the flames for absorbing and radiating the heat, the burner comprising a ring with gas jets directed upwardly into the space between the coil and the said element, to directly heat the coil and said element by contact therewith of the flames from the burner, and a flange at the top of said element extending across the top of the said space.

3. The combination stated in claim 2, the said element and the burner being supported upon the bottom of the casing.

4. The combination stated in claim 2, the said element extending vertically within the coil.

5. In a device of the character described, the combination of a coil, a burner for heating said coil directly, means surrounding said coil and associated with said burner for absorbing heat from said burner and radiating it against said coil, a reservoir surrounding said means and said coil, and connections between the ends of said coil and said reservoir.

ARTHUR M. HART.