April 7, 1936. J. ORBAN 2,036,602

CONVERTIBLE GAS AND HOT FLUE WATER HEATER

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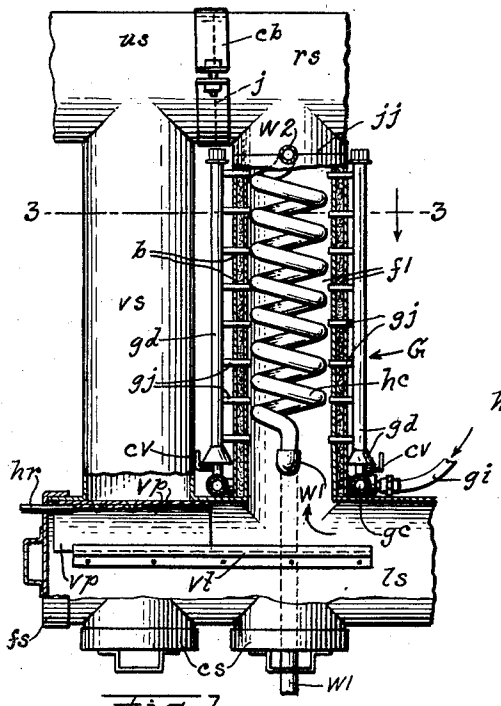


Fig. 1.

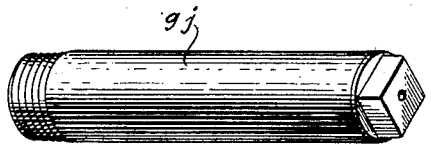


Fig. 2.

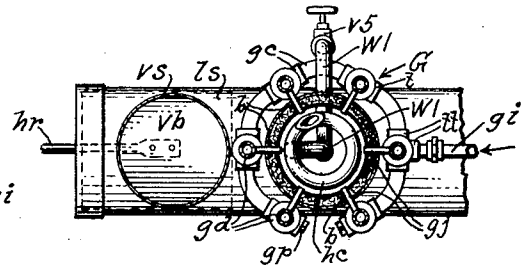


Fig. 3.

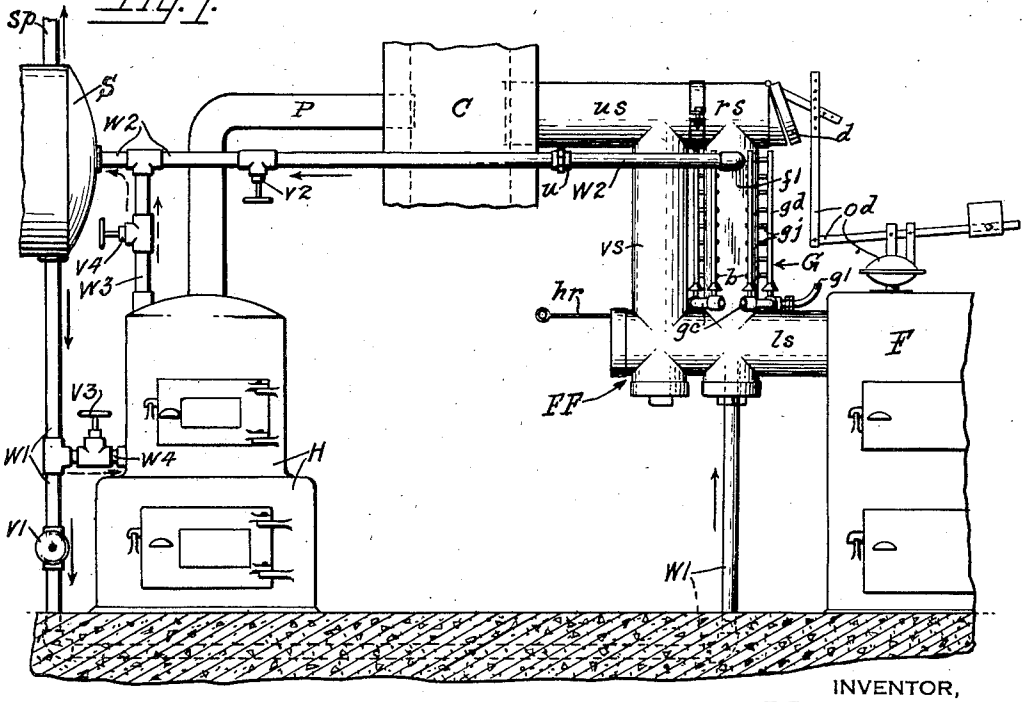


Fig. 4.

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CONVERTIBLE GAS AND HOT FLUE WATER HEATER

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2 Claims. (Cl. 122—20)

This invention relates to coal-saving and heat-controlling devices, and especially to a convertible gas and hot flue water heater.

One object of the invention is to provide an extremely efficient water heater, and to provide the same with practical and efficient means to control the heat applied thereto, to compensate for surrounding variations of temperature.

Another object is to provide, in combination with a helical pipe-coil through which flows a current of water, an effective and thoroughly practical arrangement and distribution of gas-jets which when lighted will distribute the heat evenly around the coil from end to end, so as to heat the water in the coil most thoroughly and quickly without unduly heating or overheating any part of the coil, and without causing uneven expansion of the coil or its connections.

Another object is to provide, in combination with the helical coil, and a heat-insulating flue therearound, and an arrangement of gas-jets extending through the heat-insulating means in such fixed and cooperative relation that the whole constitutes a unit that can be disposed vertically, horizontally or obliquely and will operate efficiently in any position or at any angle, in contradistinction to coils having a heating device at one end or side only.

Another object is to so combine a water heating coil and its gas-heater (as above mentioned) with a set of furnace-flues, that the coil may be heated by the exhaust gases and smoke, so as to either supplement the heat of the gas-heater, or to substitute the exhaust furnace heat for the heat of the gas heater or burner.

Another object is to provide the above-mentioned coil and gas-heater and furnace-heating arrangement in combination with a coal-burning or oil-burning water-heater, so that the water in the same coil can be heated by all three heat-sources either simultaneously, or selectively by means of an effective arrangement of valves and dampers.

Another object is to provide an apparatus or device of this kind in easily separable parts which are also easily attachable so as to provide for efficient assembling and installing and for cleaning out any accumulation of ash or carbon deposits when occasion requires, or when cleaning is desirable.

Other objects or important features are pointed out or implied in the following details of description, in connection with the accompanying drawing in which:

Fig. 1 is a side elevation, partly in vertical section, showing my improved gas-burning water heater by the side of an emergency flue, and the very simple and effective sliding valve or gate that controls the emergency flue and water-heating flue alternately.

Fig. 2 is an enlarged perspective view of a very simple and practical form of gas-jet such as may be used to advantage as an element of the gas-burner or heater.

Fig. 3 is a sectional view along the line **3—3** of Fig. 1.

Fig. 4 is a side elevation of the general combination of parts including or comprising my invention.

Referring to the drawing in detail, in which, similar letters and numerals refer to similar parts in the several views: The invention is described in detail as follows:

In Fig. 4, a part of a coal-burning furnace is shown at F, while at H is indicated a coal-burning water heater of a typical and well-known kind, and at S is shown part of the storage tank for hot water. A section of the chimney is shown at C, and a smoke-pipe P connects the coal-burning water heater H to the chimney C. Water-pipes *w1* and *w2* connect to the storage tank S, and the first of these pipes extends through the concrete floor to a point under the gas-heater (which is generally indicated at G), thence upward to a point above the lower end of the gas-heater, and thence horizontally through the water-heater-flue *f1*, or through the wall thereof to the interior where it connects with the heating coil *hc* in open communication (Figs. 1 and 3); while the pipe *w2* similarly connects to the upper end of the heating coil, this water-pipe extending through the upper part of the wall of the water-heating flue as seen in Fig. 1. A valved water-pipe *w3* connects the heater H to the water-pipe *w2* and thereby connects it to the storage tank S. A second valved pipe *w4* that connects with the heater H also connects to the water-pipe *w1* and thereby connects the heater H to the storage tank. It should be understood that the storage tank has a water-supply pipe (not shown) for supplying the water to be heated, and also has an outlet or service pipe indicated at *sp* to supply hot water for a bath-tub, kitchen or general purposes.

The water-pipes are provided with valves *v1*, *v2*, *v3*, *v4* and *v5*, the latter shown only in Fig. 3. The purpose of the respective valves will be explained hereinafter.

The gas-heater will now be explained in detail as follows:

At *gc* is shown a gas-conduit which is substantially circular or annular, and may be considered as a single length of pipe, though here shown as made up from a series of short bent pipe sections connected by reducing T-couplings, the ends of the conduit being plugged at *gp*; or in lieu of one of these plugs, a gas-inlet pipe *gi* may communicate with the interior of the conduit, instead of communicating therewith through the dual T-coupling *tt* (Fig. 3). A series of gas-distributing and aerating tubes *gd* are secured to the respective reducing branches of the couplings *t* and *tt* and extend therefrom in parallel relation to one another and to the wall of the heating flue *fl*, hence, parallel to the axis of the helical heating coil *hc*. The hollow-filled heat-insulated wall of the flue *fl* is radially bored or apertured at numerous points, as at *b*, and through these bores extend (respectively) gas-jets *gj* which protrude from the gas-distributing tubes *gd* and communicate with the interior of the latter; so gas from the gas-inlet *gi* passes around the conduit *gc* and thence into the distributing pipes *gd*, and finally through the numerous gas jets *gj* where the gas may be ignited by any appropriate means, and so the flames are distributed all around the heating coil *hc*, from end to end thereof, and heats it uniformly. By employing all the gas-jets here shown, the water can be heated very quickly, and in case it is desired to heat it less quickly or to a less degree, one or more of the distributing tubes may be cut out of service by means of their respective cut-out valves *cv*. Moreover, for a less expensive gas-heater, the number of distributing pipes *gd* and their adjuncts may be less than here shown.

For comparative ease in assembling the gas heater, and for other reasons, it is desirable to form the furnace-flue (generally indicated at FF') with a removable section *rs* of the upper flue section *us*, and a clamp-band *cb* may be employed for normally holding the removable section in place; but when the clamp-band is removed or sufficiently loosened, the part *rs* can be separated, at the joints *j* and *jj* from the parts *us* and *fl*, thus freeing the upper end of the heating coil, so the latter can be disconnected at *wl* and taken out of the flue *fl*, and so access can be gained to any gas-jet *gj* for cleaning or for any other purpose; or, from a standpoint of the manufacturer,—the flue *fl* being primarily empty, access can be gained to its interior for inserting and screwing-in the gas-jets *gj*, and thereafter, the heating coil can be connected at *wl* either by screwing it in the L-coupling, or by a smooth-taper joint instead of screw-threads.

The lower end of the heater-flue *fl* is united with and supported by the horizontal lower flue-section *ls* which is in open communication therewith when not closed by a sliding gate or valve-plate *vp* which is supported on tracks *vt* of which there is one shown and one removed from Fig. 1. In the present showing, the valve-plate *vp* is in the position to close the opening between the lower section *ls* and the vertical section *vs* of the furnace flue, while the latter is in open communication with the heater-flue *fl*, and the hot products of combustion of the furnace F may either supplement the gas-heater, or may constitute the entire source of heat if the gas is cut off at *cv* or at some point in the gas-inlet pipe *g1*; but, on the other hand, when the furnace-fire is out, low or banked, the gas-heater may be the entire and exclusive source of heat for the coil *hc*.

When it is desired to utilize both the coal-burning water-heater H and the gas-burning heater G for heating the water, the valves *v1*, *v2*, *v3*, *v4* and *v5* are open; but when the gas-heater is used alone, valves *v3* and *v4* are closed. The valve *v5* is an emergency cut-off to prevent the heating coil from running dry while subjected to heat in the event of a leak at a lower level in the water-pipe *w1*.

The damper *d* and its operating device *od* are of such simple construction as to need no explanation.

The valve-plate *vp* is provided with a handle-rod *hr* that can be slid inward and outward through a hole in the removable flue-stopper *fs* so as to alternately push and pull the valve-plate and thereby alternately close the flue *fl* and the vertical emergency flue *vs*. It should be understood that the term "vertical" as applied to the flue *vs* is used only to distinguish it from the upper and lower flue sections, for as previously mentioned, it may be disposed at any angle to the vertical. In broader terms, the two flue sections *fl* and *vs* may be termed alternate flue-passages, since they are never used simultaneously, but always used alternately, in view of the valve-plate *vp*.

The clean-out stoppers *cs* are provided with handles to remove them, and may be so snugly fitted that they will stay in place, or may be provided with any appropriate means to fasten them in place.

In the upper smoke-flue, a damper or slide-plate similar to the plate *vp* may be inverted and provided with a handle similar to handle *hr*, so this plate can be caused to provide a greater or less opening for air and products of combustion, whereby the draft may be perfectly controlled. Moreover, the inside or outside cylinder, on which the outer damper *d* is hinged, may be rotatable with respect to the part *rs*, so these parts may be caused to stay in the position shown, even when the flue-sections *vs* and *fl* are not vertical.

Though I have described this embodiment of my invention quite specifically, I do not intend to limit my patent protection to these exact and precise details, for the invention is susceptible of numerous changes which are within the scope of the inventive ideas as herein implied and claimed.

What I claim as my invention is:

1. A gas-burning water-heater comprising a flue-section having rows of radially disposed openings through its wall, a water-conducting pipe including a part extending longitudinally through said flue-section, a gas-conduit substantially curved around said flue-section and having an inlet for combustible gas, a set of gas-distributing pipes distributed around and secured to said gas-conduit and in open communication with the latter, and a plurality of sets of tubular gas-jets, each set of gas-jets being distributed along a respective gas-distributing pipe and in open communication with the latter and extending through a respective row of said radially disposed openings of the flue-section to points near said water-conducting pipe.

2. In a convertible gas and furnace-flue water heater, the combination of; a furnace flue; a water-conducting pipe; a gas-burning heater; and a valve-plate slidably mounted in said furnace-flue; said furnace-flue comprising a lower section for connection to a furnace, an upper section for connection to a chimney, a water-heating section having its ends connected to and intercommunicating with the lower and upper

sections and having rows of radially disposed openings through its wall, and an emergency section having its ends connected to and intercommunicating with the upper and lower sections and being adjacent to the water-heating section; said water-conducting pipe having a part within said water-heating section and extending therealong; said valve-plate being provided with supporting and guiding means to normally hold it in a position for closing an end of the emergency flue-section and to guide the valve-plate into a position for closing the corresponding end of the water-heating section; said gas-burning heater comprising a gas-conduit substantially curved around said water-heating section and having an inlet for combustible gas, a plurality of gas distributing pipes distributed around said gas-conduit and secured thereto and in open communication therewith, and a plurality of sets of tubular gas-jets, each set of gas-jets being distributed along a respective gas-distributing pipe and in open communication with the latter and extending through a respective row of said radially disposed openings of the water-heating section of the furnace flue.

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