

June 19, 1934.

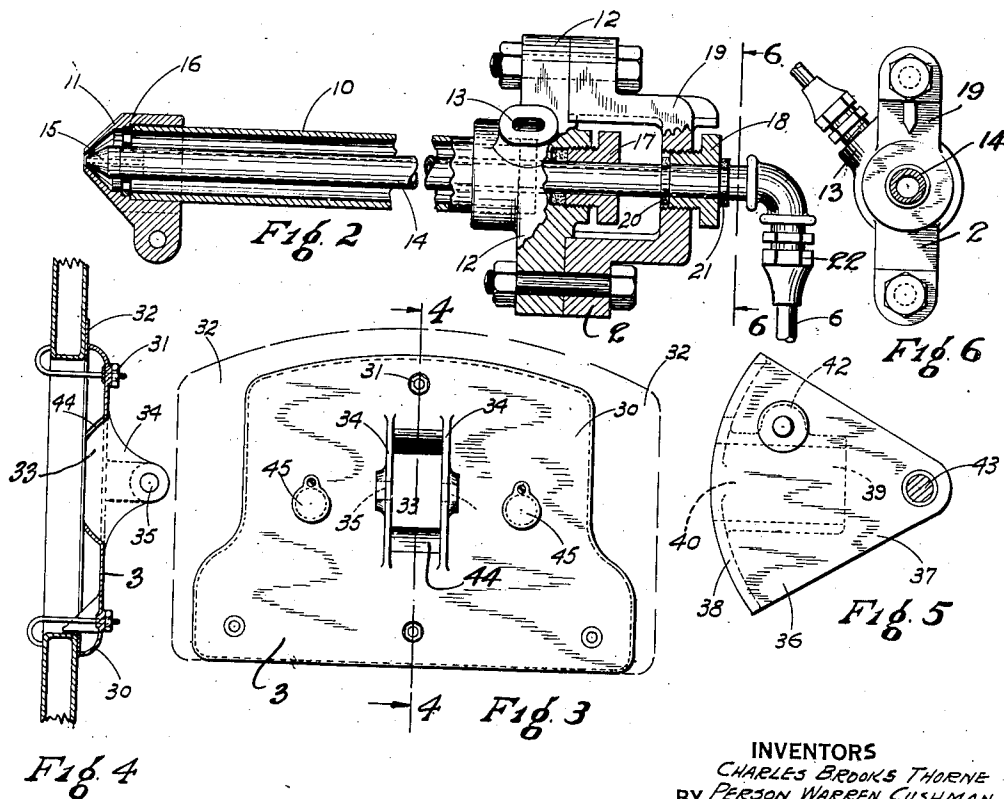
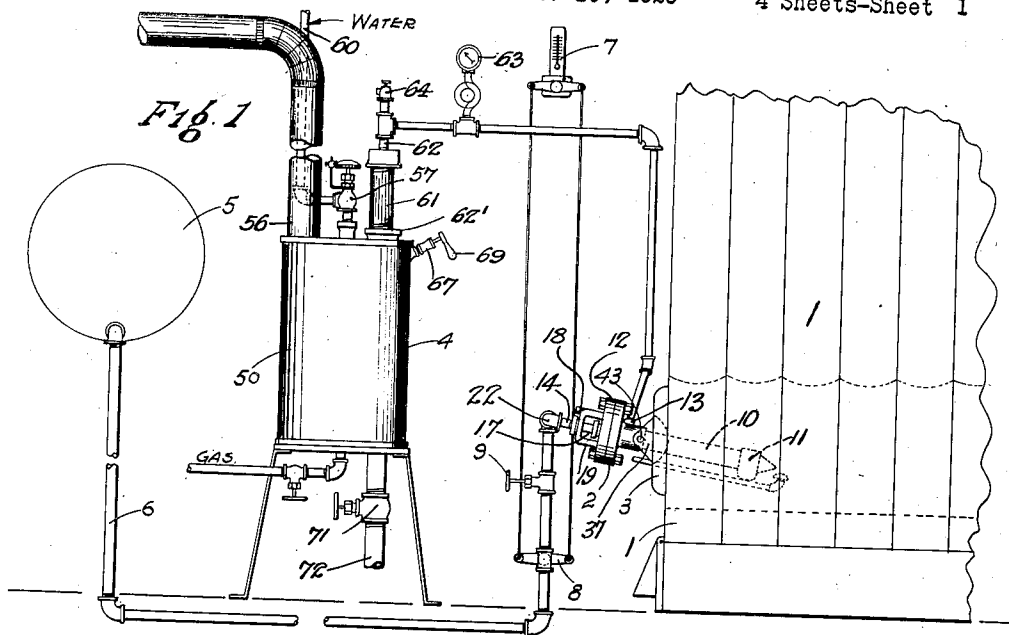
C. B. THORNE ET AL

1,963,340

OIL BURNER

Filed Oct. 16, 1929

4 Sheets-Sheet 1



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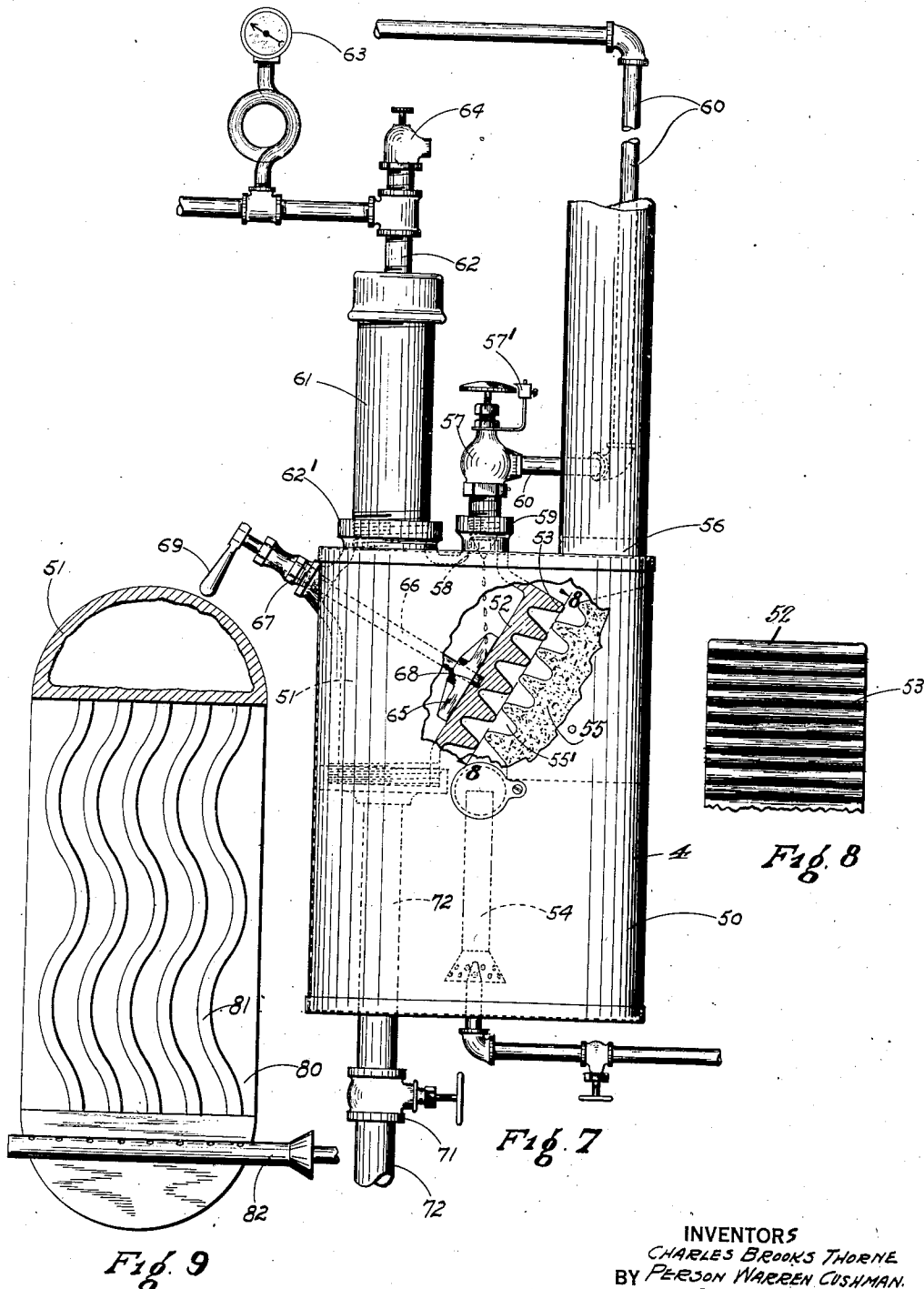
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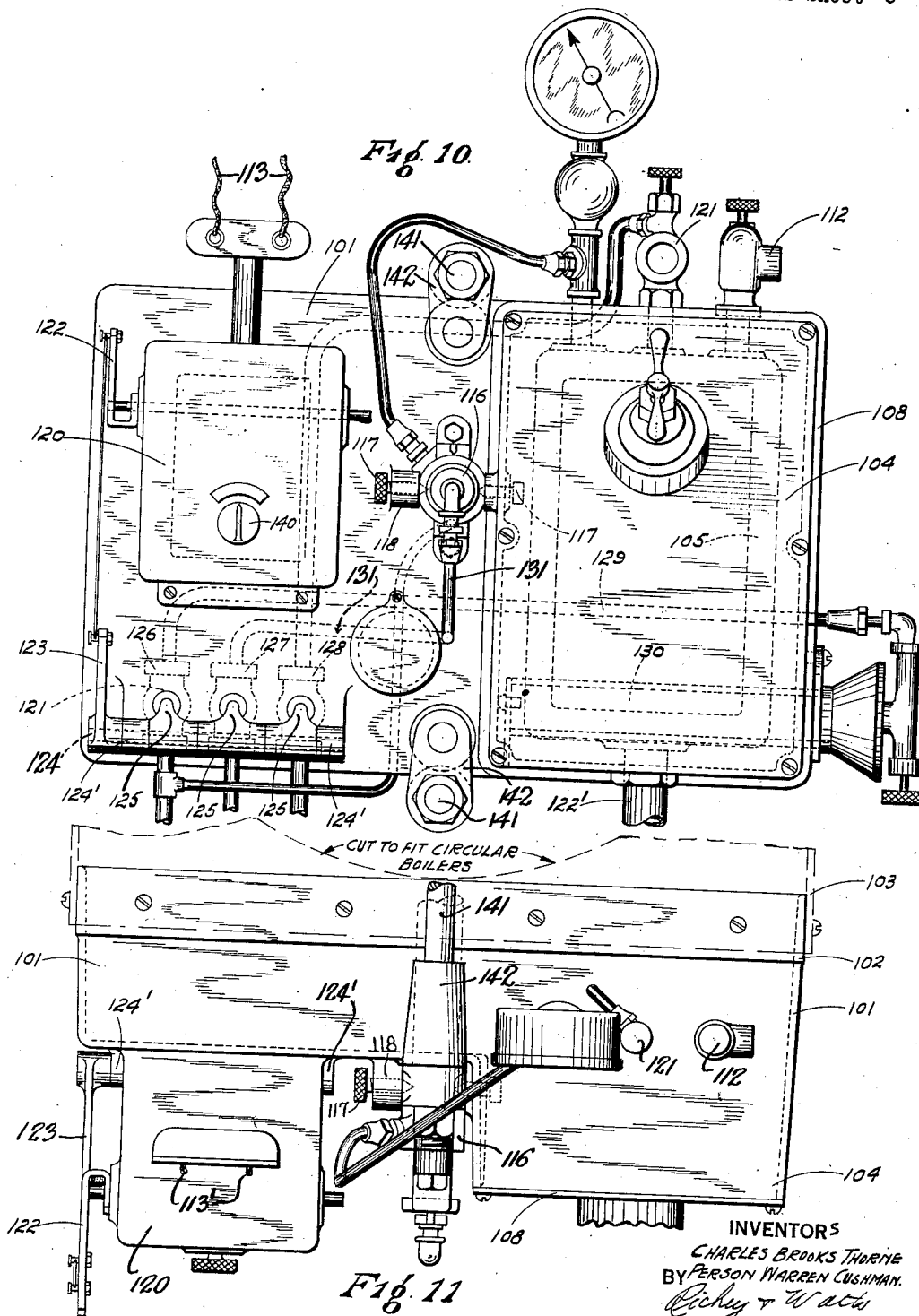
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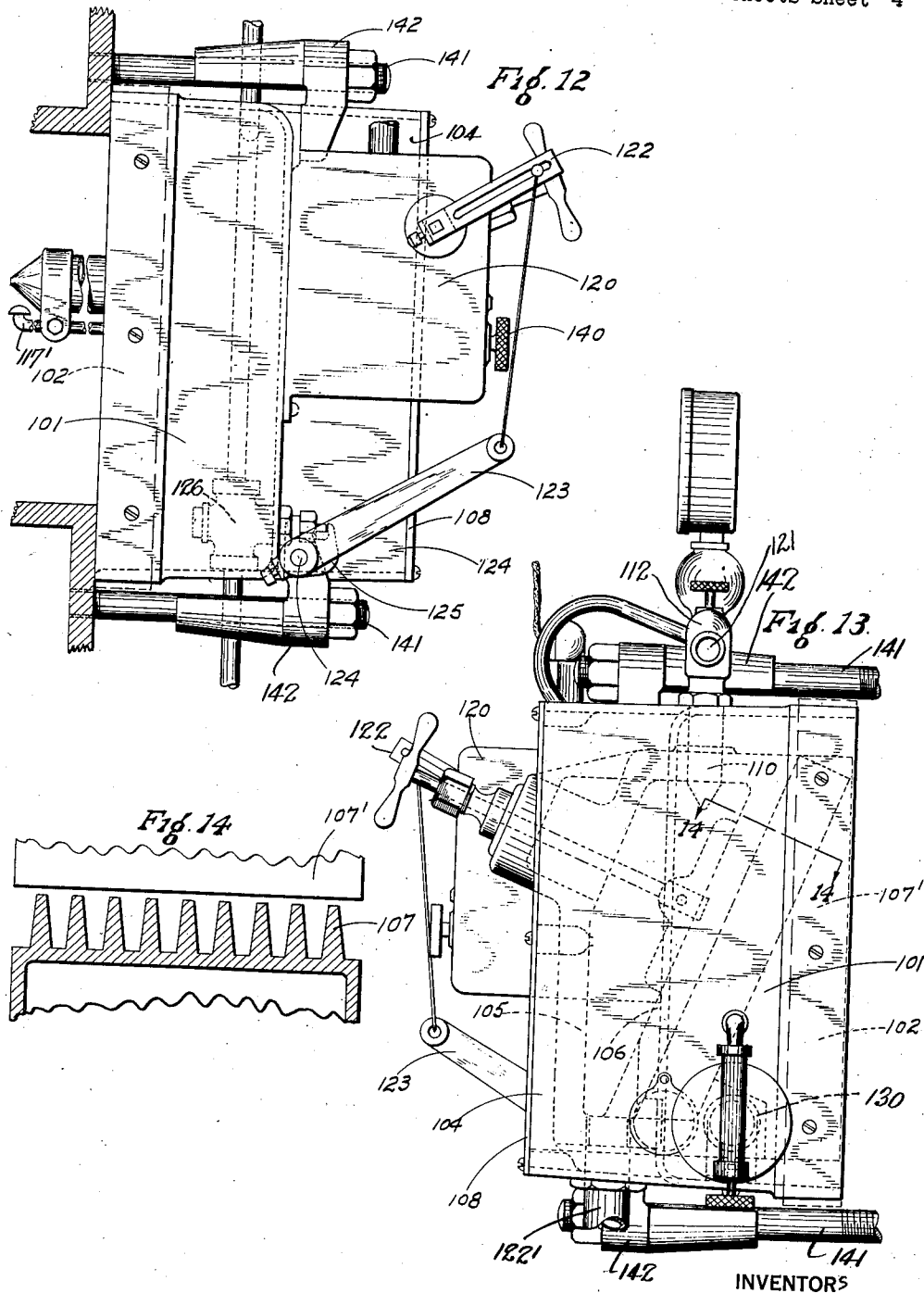
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UNITED STATES PATENT OFFICE

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OIL BURNER

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Application October 16, 1929, Serial No. 399,896

4 Claims. (Cl. 158—73)

This invention relates to oil burning equipment and relates more particularly to oil burners that utilize steam to atomize the oil.

Steam has been found to be an exceptionally satisfactory and efficient medium for atomizing fuel oil that is used for heating boilers or the like. The simplicity and ease of operation of steam atomizing oil burners, and the fact that the oil is preheated by bringing it into thermal contact with the hot steam which not only makes it easier to atomize, but also raises the efficiency of combustion, makes heaters of this type very desirable. Furthermore, oil that is so atomized and burned is free from the usual undesirable reverberation caused by combustion. However, it has always been desired to incorporate the advantages of the steam atomizing oil burner in a device that is simple, safe, and convenient for installations that may be used in homes by persons having little or no experience in operating this type of equipment.

To obtain sufficient pressure of steam for atomizing oil, where such pressure is not ordinarily available, has always been difficult, especially where the steam must be generated in a separate boiler to put the system into operation.

It is therefore one of the objects of this invention, to provide a heating apparatus particularly adapted to isolated heating installations wherein low pressure steam, vapor, hot water, hot air, or the like are used as a heating medium.

Another object of the invention is to incorporate the advantages of the steam atomizing oil burner in a device that is relatively easy to operate and is safe for small home installations.

Another object of the invention is to provide a burner adapted to operate satisfactorily at low steam pressures avoiding the necessity of a licensed fireman on the premises.

Another object of the invention is to provide an installation of a heating system that is simple in construction and operation which may be handled by a person with a limited experience.

Another object of the invention is to provide a boiler to generate the necessary steam for atomizing the oil for oil burners wherein the danger of explosion is reduced to a minimum and wherein the steam that is generated is so called "dry steam".

Another object of the invention is to provide a boiler which contains but a small amount of water and where the liability to explosion and the resultant damage therefrom are minimized.

Another object of the invention is to provide a boiler to provide steam for atomizing oil wherein

any danger from varying the water supply to the boiler is eliminated.

Another object of the invention is to provide a boiler wherein the steam can be generated and discharged to the burner continuously with a limited amount of attention on the part of the operator.

Other objects of the invention and the invention itself will become more apparent from the following description of an embodiment thereof, and wherein:

Fig. 1 is a diagrammatic view illustrating the heating system employed in the invention;

Fig. 2 is a fragmentary view mostly in section of a burner nozzle, hidden parts being shown by dotted lines;

Fig. 3 is a front elevational view of a boiler door especially adapted to receive the nozzle of Fig. 2;

Fig. 4 is a section taken on the line 4—4 of Fig. 3;

Fig. 5 is a side elevational view of a nozzle supporting element used in conjunction with the door of the furnace;

Fig. 6 is a view of the nozzle taken on the line 6—6 of Fig. 2;

Fig. 7 is an elevational view of a steam generator or flash boiler used in this invention with certain parts being broken away and shown in section and other hidden parts being shown by dotted lines;

Fig. 8 is a fragmentary elevational view of a hot plate for the flash boiler of Fig. 6;

Fig. 9 is a fragmentary elevational view of another type of hot plate.

Fig. 10 is a front elevational view of another embodiment of the invention;

Fig. 11 is a top plan view thereof;

Fig. 12 is a side elevational view thereof, certain parts being illustrated by dotted lines and indicating the method of securing the same to a furnace.

Fig. 13 is a view similar to Fig. 12 taken from the other side.

Fig. 14 is a fragmentary sectional view of a hot plate taken on the line 14—14 of Fig. 13.

Referring now to the figures of the drawings wherein like parts are designated by like reference characters;

As illustrated in Fig. 1 the invention comprises generally, a steam or hot water heater or furnace 1 of the ordinary construction, a fragment only being shown, which is a part of the regular heating system; an oil atomizing burner 2 having a nozzle 11 which is secured to the furnace door 3; a gas or oil operated flash boiler 4 adapted to

furnish steam to the nozzle; and a source of fuel supply 5, together with controls and regulators therefor.

Oil or gas may be fed from the fuel supply 5 to the nozzle by conduits 6 and may be controlled by a valve 8 actuated in response to conditions of temperature as reflected by a thermostat 7 or the line may be controlled by a hand operated valve 9. The thermostat may be placed at any convenient point in the living quarters of the domicile as is customary where thermal control is depended upon to regulate the input of fuel to the furnace. The steam as generated by the flash boiler is conducted to the nozzle 2 and atomizes the fuel, the atomized fuel being burned in the furnace.

The usual type of furnace door may be replaced by a special door 30, best shown in Figs. 3 and 4, which may be held in the regular door opening by a plurality of hook bolts 31. The doors may be of a standard shape and any openings caused by the failure of the same to fit properly may be closed by sheet metal such as illustrated at 32. The door is provided with a centrally disposed rectangular opening 33. A pair of parallel outwardly extending lugs 34 are disposed adjacent each side of the opening 33 and are provided with axially aligned apertures 35 which act as bearings to support a trunnion housing 36. The trunnion housing 36, Figure 5, is made in the form of a quadrant comprising a pair of spaced side members 37 joined along the rear arcuate edge by an end wall 38 perforated centrally as at 40. A split sleeve 39 (dotted line, Figure 5) concentric with the aperture 40 extends inwardly between the spaced side walls and is adapted to receive the barrel of the atomizing burner 2 around which the sleeve may be clamped by a bolt (not shown) intended to be inserted through the apertured ears 42.

The housing 36 is pivotally supported in the door by trunnion pins 43 disposed through the apertures 35 of the lugs 34 and screwed into threaded apertures of the housing, rotation of the housing on the trunnions is thus possible in such a manner that the nozzle 11 may be directed to throw the flame to different elevations in the boiler by turning the same about a horizontal axis. The curved wall 38 of the trunnion housing fits relatively close to the short curved portions 44 on the furnace door so that the opening may remain closed regardless of the position of the nozzle. A pair of peep holes 45 may be provided in the door on either side of the nozzle through which the flame or the nozzle may be observed. The housing also acts in the nature of a shield to prevent any blow-back of the products of combustion.

The flash boiler of this embodiment contemplates an outer housing 50 which may be made of planished iron or the like, lined with a suitable insulating material such as asbestos. The upper portion supports a steam housing 51 which, as best shown in Fig. 7, is of irregular shape and has an inclined hot plate portion 52 disposed along the one side thereof. The inner surface of the hot plate is relatively smooth and the opposite side has a plurality of tapered corrugations or ridges 53 extending transversely across the plate, against which the flame from a gas burner 54 may strike. A heat refracting member 55, which may be made of refractory tile, fire clay or the like, is supported by the housing 50 and is provided with a face having a plurality of ridges or corrugations thereon, adapted to co-operate with

corrugations 53 of the hot plate to form an irregular channel 55', between the two members, in such a manner that the flame from the burner 54 which may be fueled by gas, oil or the like may pass upward through the channel, keeping the same in intimate contact with the hot plate and utilize to the best advantage the heat of the flame. The burned gases escape at the upper end through the flue 56 provided therefor.

A drip jet 58 is provided above the hot plate and the water thereto from the water line 60 is controlled by a valve 57 on top of the housing 51. An indicator 57' may be included to show the degree of opening of the valve which controls the water from the line 60. The water drips upon the heated hot plate 52 where it is immediately flashed into steam, the hot plate having been previously heated and being retained in a heated state by a flame as described.

A steam outlet is provided through a tube 61 which is screw-threaded into a boss 62' in the top of the housing 51. The steam generated by the water dripping upon the hot plate is conducted away from the boiler through the outlet by suitable conduits such as 62, to the oil burner. A pressure gauge 63 may be interposed in the line to show the steam pressure and a safety valve 64 may also be connected in the line for use well known in the art.

Means for removing the scale on the face of the hot plate 52 comprises a blade or scraper 65 attached to a rod 66 extending through a suitable gland 67 in the side of the housing 50. The lower end of the rod is rotatably supported in a recess 68 disposed in the face of the hot plate and a handle 69 offers means for rotating the rod and thus the blade to remove the extraneous deposits. This scale may be conveniently disposed of by the provision of a cleanout valve 71 and outlet 72 directly below the plate, the operation being facilitated by flushing the plate with water from the spigot 57.

If desired a flash plate 80 as best shown in Fig. 9 may be used wherein the surface, over which the flame is directed, is provided with a plurality of sinuous longitudinally disposed parallel ribs 81. The burner 82 used with this type of flash plate is adapted to furnish a brush-like flame which travels through the grooves or channels formed by the parallel ribs 81, their course being restricted by the waves in the ribs utilizing very efficiently the heat from the flame. A co-operating member may be provided and may be similar to the refractory member 55 except that the corrugations are complementary to the ribs 81.

The vaporizing nozzle as better shown in Fig. 2 may comprise a substantially tubular housing 10 the one end being closed by a conical tip 11 and the other end by a flanged coupling 12. An inlet port 13 is provided to admit steam into the housing. A longitudinally adjustable oil conduit is concentrically supported in the housing, and comprises a pipe 14 provided with a conical jet 15 disposed in the free end. The end of the conduit is supported by a perforated wall 16. The other end of the pipe 14 extends through a packing gland 17 of the coupling 12 and through an adjusting nut 18 supported by the yoke 19 which is bolted to the flanged coupling 12. A pair of integrally formed annular collars 20 and 21 are provided on the pipe adjacent each side of the nut 18 in such a manner that the longitudinal adjustment of the jet 15 may be affected by rotat-

ing the nut 18. Suitable pipe coupling 22 connects the fuel supply line 6 to the pipe 14.

Steam is generated in the flash boiler, as described, and is conducted to the nozzle, a suitable fuel such as oil is also conducted to the nozzle. The circulation of the steam about the oil conduit preheats the oil, the steam then passes through the perforated disc in the end of the nozzle and exhausts through the aperture in the end of the nozzle. The steam flowing past the end of the jet 15 adds an eduction effect to the gravity feed, and the resultant spraying of the mixture through the tip 11, mixes the oil thoroughly with the steam. The mixture may be regulated as described by reciprocating the jet longitudinally upon rotation of the nut 18.

A flash boiler such as described has many advantages among which, the small compact size and negligible amount of water present, are outstanding. No harm can possibly result from too much or too little water being injected into the boiler. It is not necessary to vary the amount of steam generated when changes are made in the amount of oil fired, which allows steam to be generated and discharged through the burner continuously without the usual close attention of the operator.

Referring more particularly to Figures 10 to 14 inclusive, wherein is shown another embodiment of the invention, which includes a unitary structure in the form of a door adapted to replace the ordinary furnace door, and embodies most of the before mentioned features together with an automatic control therefor. The same is secured in place by bolts 141 and lugs 142 Figure 13, at the top and bottom.

The door includes a casing 101, having a base 102 which is adapted to receive thereon a metallic sheet 103 which may be suitably formed to fit the contour of the boiler to which it is applied.

A forwardly extending portion 104 of the housing is adapted to receive the flash boiler 105, which as better shown in Fig. 13 is substantially the same as that previously shown and described. The flash boiler comprises a housing having an inclined hot plate surface 106, the outer surface of the hot plate is provided with a plurality of ridges 107 which co-operate with the baffle member 107' to form channels therebetween through which the flame of the burner may flow.

The scraper element is essentially the same as that previously described and the operating handle extends through the cover plate 108 which is secured to the door.

A plurality of connections are provided upon the upper portion of the heater, the centrally disposed connection providing a water inlet 121 having a jet 110 disposed over the hot plate which allows water therefrom to be directed onto the hot plate. Steam generated within the boiler is conducted to the nozzle 116.

The nozzle 116 is of similar construction to that already described and extends through a central aperture of the door being supported by a pair of trunnions 117 threaded through lugs 118 into oppositely disposed detents on the side of the nozzle. A suitable outlet 122' is provided at the bottom or sump, and is closed by a valve not shown, through which the sediment as scraped from the hot plate may be flushed.

A thermostatically controlled valvular mechanism is located adjacent the other side of the door and includes a thermostatically controlled electric motor disposed in the housing 120, which operates, upon a predetermined fall in tempera-

ture, to raise a lever 122. The lever 122 is connected to a lever 123 secured to a shaft 124, the shaft being rotatably journaled in a pair of bosses 124'. A plurality of relatively short arms 125 are also secured to the shaft and aligned with the valve stems of valves 126, 127 and 128 which may be poppet valves.

A safety valve 112 is also provided but it has been found that the safety valve may be dispensed with because when the pressure of the steam becomes excessive it is such as to prevent the water from flowing out of the jet 110.

The valves 126 to 128 inclusive, are interposed in the gas supply line, fuel oil supply line and water supply line respectively. When the lever 122 is raised the valves are all actuated simultaneously. The valve 126 allows gas to flow to the burner 130 through the conduit 129. The valve 127 opens the fuel oil line 131 and the valve 128 opens the water supply line to the jet 110.

It may thus be seen that although all the valves are open simultaneously only the gas and water will flow. No harm can result from the small amount of water flowing as the hot plate soon flashes the same into steam. Although the oil line is open no flow will result until the steam pressure becomes sufficient to cause the eduction thereof.

Suitable pilots (not shown) may be provided for the burner under the flash boiler. Similarly a pilot light 117' is provided at the nozzle tip 116 and this pilot light is connected in any suitable manner to the gas supply line ahead of the valve 126.

The temperature at which the device is started into operation may be regulated by a control knob 140. The thermostat is located in a room above the furnace and is connected to the control mechanism through connections 113'.

It may thus be seen that we have provided a heating system that embodies the efficiency of the large plants, one that is easily operated, and one which minimizes the hazards due to any likelihood of explosion or the like.

Although we have described our invention in a certain specific embodiment, the better to explain the operation thereof, we are aware that numerous and extensive departures may be made therefrom but without departing from the spirit of our invention.

We claim:

1. In a heating device for furnaces or the like including a housing adapted for replacement of the furnace door, a flash boiler for said housing, a burner pivotally supported by said housing, a fuel line connected to the burner, a steam line connected between the burner and flash boiler, a water line connected to the flash boiler, a gas burner for the flash boiler, valves for said fuel, water and gas lines supported by the housing, common means operable to simultaneously actuate all of the control valves for regulating the operation of said device.

2. In a heating device for a furnace or the like including a housing, a flash boiler integral with the housing, a fuel oil burner supported by the housing and gas burner for heating the flash boiler, a steam outlet from the boiler, a conduit from the steam outlet to the oil burner, a fuel oil line connected to the oil burner, a gas line for the gas burner, a pilot light for the oil burner, valves for controlling the flow of fuel, water and gas respectively to the oil burner, flash boiler and gas burner, supported within said housing, common means for actuating all of said valves simul-

taneously to control the operation of said device.

3. In a heating device for a furnace or the like including a housing, a flash boiler integral with the housing, a fuel oil burner supported by the housing and gas burner for heating the flash boiler, a steam outlet from the boiler, a conduit from the steam outlet to the oil burner, a fuel oil line connected to the oil burner, a gas line for the gas burner, a pilot light for the oil burner, valves for controlling the flow of fuel oil, water and gas respectively to the oil burner, flash boiler and gas burner supported within said housing, in alignment, common means for actuating all of said valves simultaneously to control the operation thereof, comprising a shaft journaled for rotation on the housing, a plurality of cams on the shaft adapted to actuate the valves, a lever for the shaft, a motor carried by the housing and operatively connected to said lever and controllable from a point beyond the furnace.

4. In a fuel burning device for furnaces or the like, a housing, a flash boiler carried by the hous-

ing, a gas burning heater for the flash boiler, a water inlet in the top of the housing into the flash boiler, a valve for manually determining the rate of water flow to said boiler, an oil burner pivotally supported by the housing adjacent the flash boiler, and extending into the furnace, a fuel oil line for the burner, a steam line connecting the burner to the flash boiler, fuel oil, water and gas valves for the burner, flash boiler and gas burning heater respectively disposed in longitudinal alignment, a shaft rotatably supported by the housing, a plurality of cams on said shaft adapted for contact with said valves for simultaneous operation of the valves, a lever secured to the shaft for rotation thereof, a thermostatically controlled motor carried in the housing and connected to said lever on said shaft for operating the valves to thermostatic control from a point remote from the furnace.

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