March 10, 1964 J. J. KLEIN 3,124,193

OIL BURNER ASSEMBLY

Filed April 28, 1961 3 Sheets-Sheet 1

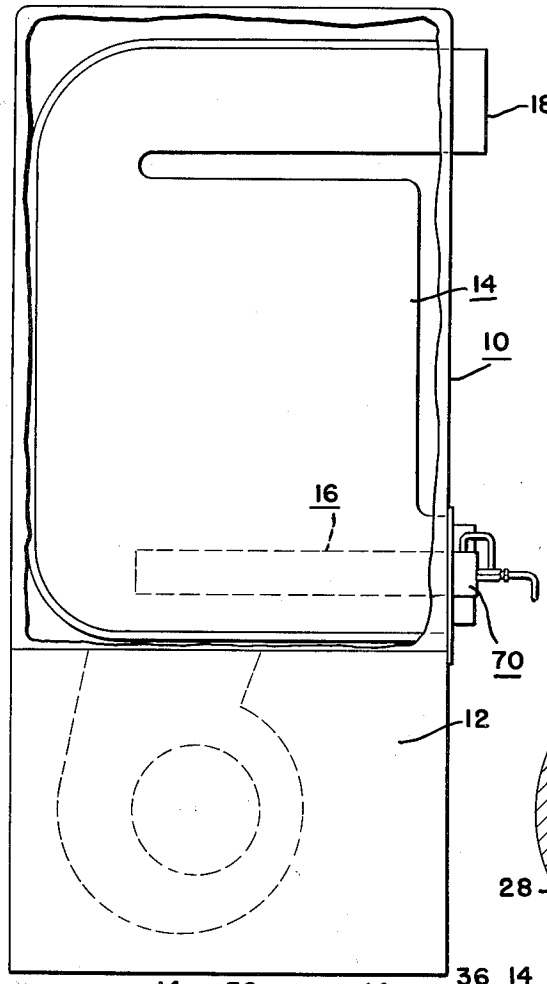
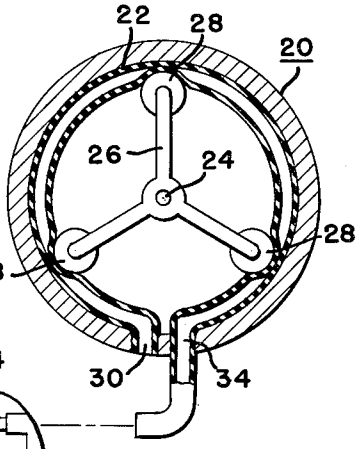



Fig. 1



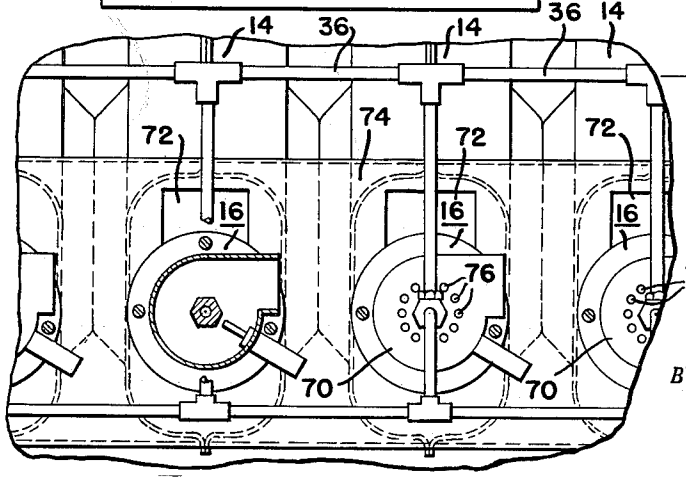




Fig. 2

INVENTOR.
John J. Klein
BY
W. E. Finken
His Attorney

March 10, 1964 J. J. KLEIN 3,124,193

OIL BURNER ASSEMBLY

Filed April 28, 1961 3 Sheets-Sheet 2

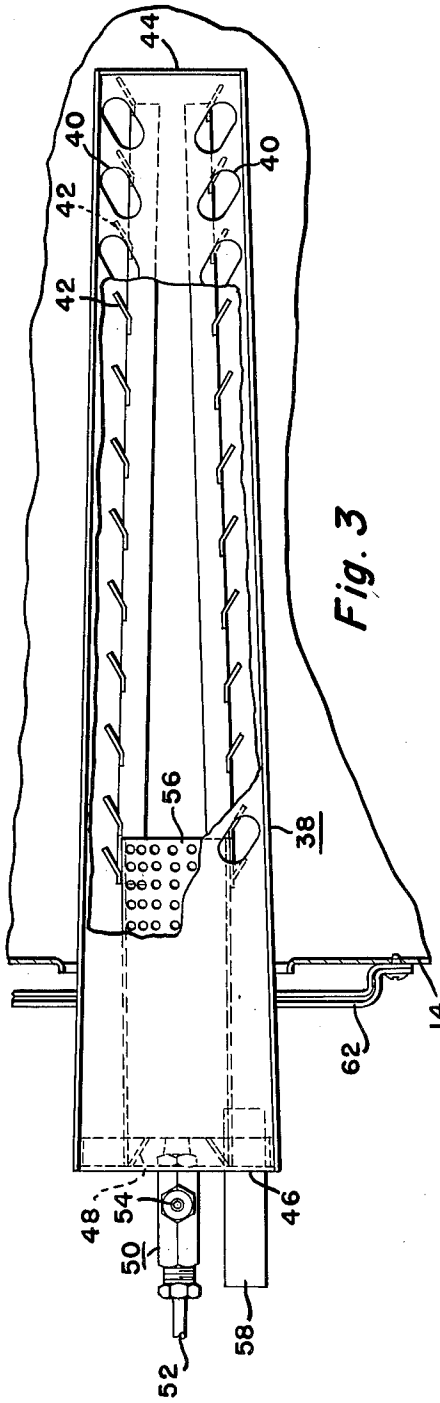



Fig. 3

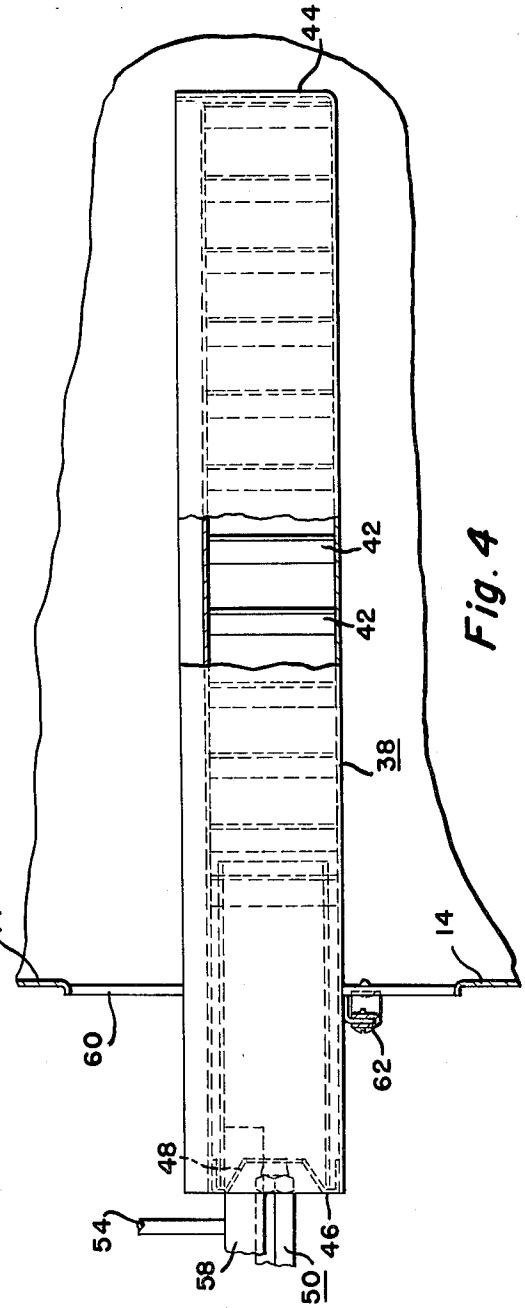



Fig. 4

INVENTOR.
John J. Klein
BY
W. E. Finken
His Attorney

March 10, 1964 J. J. KLEIN 3,124,193

OIL BURNER ASSEMBLY

Filed April 28, 1961 3 Sheets-Sheet 3

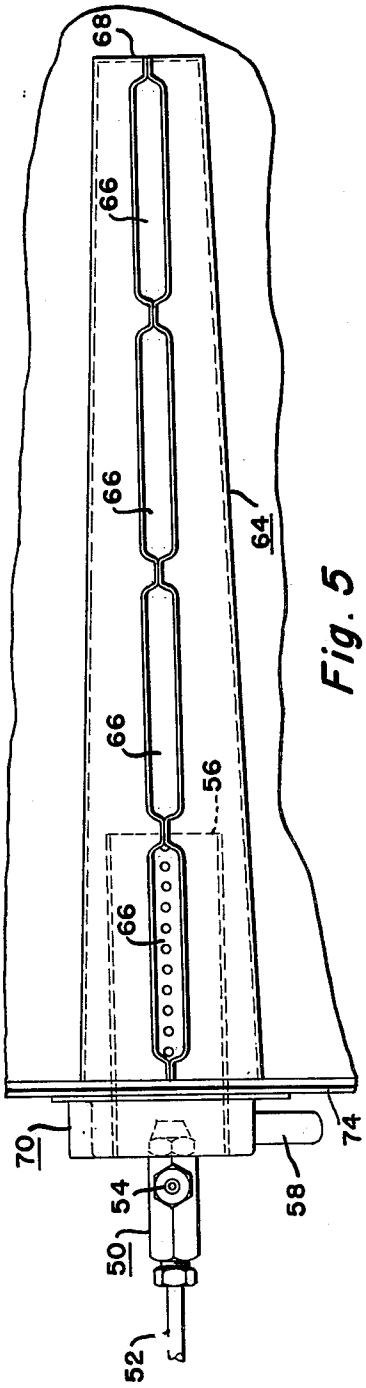



Fig. 5

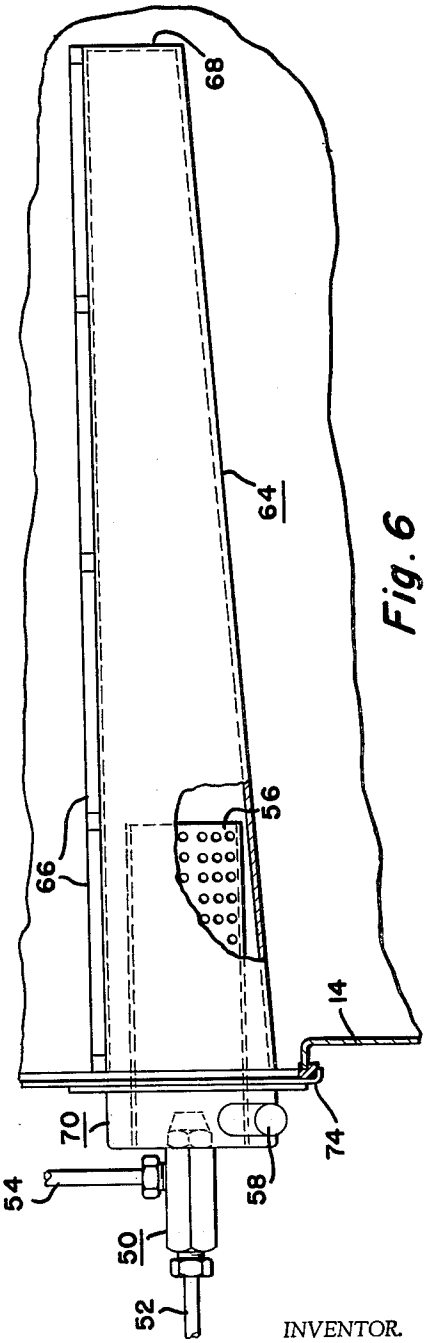



Fig. 6

INVENTOR.
John J. Klein
BY
W. E. Finken
His Attorney

United States Patent Office 3,124,193 Patented Mar. 10, 1964



3,124,193

# OIL BURNER ASSEMBLY

John J. Klein, Rochester, N.Y., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Apr. 28, 1961, Ser. No. 106,429
7 Claims. (Cl. 158—28)

This invention pertains to liquid fuel burning apparatus, and particularly to an improved oil burner assembly which can be used interchangeably with gas burners.

Heretofore, the majority of oil burners used in domestic furnaces have been of the gun-type wherein the oil is atomized by a nozzle and ignited in a blast tube. This type of burner assembly is not interchangeable with sectional gas burners since sectional gas burners are ordinarily used with sectional type radiators, or heat exchangers. This invention relates to an oil burner assembly which can be used with sectional radiators thereby enabling the use of the same radiator design in both gas and oil furnaces. In this manner substantial savings can be realized in the manufacture of furnaces of both types.

Accordingly, among my objects are the provision of an improved oil burner assembly which is interchangeable with sectional gas burners; the further provision of an oil burner assembly including means for vaporizing the major portion of the oil which thereafter burns in the gaseous stage; and the still further provision of an oil burner assembly including an aspirating nozzle that discharges an air-oil mixture into a perforated tube which is heated to incandescence to completely vaporize the oil and facilitate its combustion as a gas at the ports of the main burner.

The aforementioned and other objects are accomplished in the present invention by burning a portion of the air-oil mixture introduced by an aspirating nozzle in a perforated tube to effect substantially complete vaporization of the remaining oil which is burned as a gas. Two embodiments of the improved oil burner assembly are disclosed herein, both embodiments utilizing a perforate metal tube having an open inner end and an apertured outer end, this tube constituting a vaporizing chamber for the major portion of the oil. Air-oil mixture is introduced into the vaporizing chamber by means of an aspirating nozzle. The oil can be supplied by gravity where the oil supply is above the level of the nozzle, and the requisite air is supplied by a pump. Conventional irgnition electrodes are disposed within the perforate vaporizing chamber for igniting a portion of the air-oil mixture introduced therein by the aspirating nozzle, and the mixture which is burned within the perforate tube heats it to incandescence. In this manner the remaining oil is completely vaporized.

The perforate tube is disposed within a generally tapered, or conical main burner which, in one embodiment, comprises a box having a series of ports, in its upper surface, and a row of flame deflectors between the upper and lower walls of the burner box between the ports. In another embodiment the burner comprises a tapered sheet metal tube having a row of elongated spaced apart slots in the upper surface thereof. In both embodiments, the major portion of the oil is vaporized within the perforate tube and burns as a gas at the ports of the conical main burner. The main burner is also heated to incandescence during operation.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein preferred embodiments of the present invention are clearly shown, and wherein similar reference numerals denote similar parts throughout the several drawings.

In the drawings:



FIGURE 1 is a side view, in elevation, with certain parts broken away depicting a furnace equipped with the oil burner assembly of this invention.

FIGURE 2 is a fragmentary view, partly in section and partly in elevation, from the rear of the burner assembly.

FIGURE 3 is a view, partly in section and partly in elevation, with certain parts broken away, of the burner assembly constructed according to one embodiment of this invention.

FIGURE 4 is a side view of the burner in FIGURE 3 likewise shown partly in section and partly in elevation.

FIGURE 5 is a top view in elevation of the burner assembly constructed according to the second embodiment of this invention; and

FIGURE 6 is a side view of the burner assembly of FIGURE 5, shown partly in section and partly in elevation.

With reference to FIGURES 1 and 2, a furnace is shown comprising a cabinet 10 having a blower compartment 12 and a plurality of sectional heat exchangers, or radiators, 14 located thereabove. A burner assembly 16 is located in the lower portion of each radiator, and each radiator has an outlet 18 adapted for connection to a flue gas collector for conducting the spent flue gases to a stack.

Primary air for supporting combustion may be supplied by an air pump 20 comprising a cylindrical housing having a continuous length of plastic tubing 22 therein with the outer wall of the tube being attached to the housing. A rotary central shaft 24 supports a spider 26 carrying three rollers 28 which progressively collapse the tube 22 and draw air through an inlet 30 and discharge it through an outlet 34 at a relatively low pressure of between 2 and 10 p.s.i. The discharge 34 and the pump is connected to a manifold 36 for supplying aspirating air to the several burner assemblies 16.

With reference to FIGURE 3, in one embodiment the burner assembly comprises a tapered sheet metal burner box, or outer casing, 38 having two rows of burner ports 40 in its upper wall with upstanding flame deflectors 42 between the ports 40 and extending between the upper and lower walls of the burner box. The inner end of the burner box is closed by an imperforate plate 44 and the box is of decreasing cross-sectional area from its outer end to its inner end as seen in FIGURE 3 thus assuring a substantially uniform distribution of gas throughout its entire length. The outer end of the burner box 38 is formed by a cap 46 having an enlarged frusto conical central aperture 48. An aspirating oil nozzle 50 is suitably supported so as to project into this opening.

Oil is supplied to the nozzle through a pipe 52 and air under pressure is supplied through a fitting 54. The aspirated air-oil mixture from the nozzle 50 is introduced into a perforate tube 56, preferably composed of stainless steel, coaxially supported by the cap 46 relative to the opening 48. It is pointed out that the inner end of the perforate tube 56 is open and thus communicates with the interior of the burner box 38. An igniter 58 is supported in the end plate 46 and has conventional ignition electrodes, not shown, disposed within the perforate tube 56. As shown particularly in FIGURE 4, the radiator 14 has an enlarged opening 60 through which the burner extends, the burner being supported by a bracket 62. Secondary air for supporting complete combustion of the oil is supplied through the opening 60 surrounding the burner box 38.

Primary air is supplied to perforate tube 56 through the opening 48 through which the nozzle 50 projects. A portion of the air-oil mixture introduced by the nozzle 50 into the perforate tube 56 is ignited and burns within the perforate tube 56 so as to raise the temperature of the perforate tube 56 to incandescence and thereby vaporize the remaining air-oil mixture which is distributed

throughout the length of the incandescent burner box 38 and is burned as vapor at the ports 40. The total area of the burner ports 40 must be carefully controlled to provide sufficient restriction within the box to assure complete fuel vaporization.

According to FIGURES 5 and 6, in the second embodiment the burner assembly comprises a burner box 64 comprising a tapering tube of circular cross-section having a plurality of elongated burner ports 66 in its upper surface. The inner end of the tube is closed by an imperforate plate 68 and the outer end is closed by a perforate cap 70 as seen more particularly in FIGURE 2. An aspirating nozzle 50 extends through the cap 70 and delivers air-oil mixture to the perforate tube 56 coaxially mounted within the burner box 64 and supported by the cap 70. An igniter 58 likewise is supported by the cap 70 and has conventional ignition electrodes extending into the perforate tube 56. In the second embodiment, secondary air for supporting complete combustion of oil is supplied through an opening 72 in a plate 74 which partially closes the inlet opening 60 of each sectional radiator 14. Primary air for supporting combustion of a part of the air-oil mixture within the tube 56 is supplied through the row of circular holes 76 in the end cap 70 of the burner box. The burner assemblies are supported by the plate 74.

As in the first embodiment, the aspirated air-oil mixture introduced into the perforate tube 56 is partially burned therein to heat the tube 56 to incandescence. In this manner the remaining oil is completely vaporized and is evenly distributed throughout the length of the tapered burner box 64 and is burned as a vapor at the ports 66 thereof. In the operation, the burner box itself becomes heated to incandescence so as to assure complete vaporization of the oil supplied by the nozzle. The total area of the ports in the conical tube burner box must also be limited to assure complete vaporization of all of the supplied oil.

While the embodiments of the invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. Combustion apparatus including in combination, a tapered tubular casing having an imperforate inner end and a row of ports on its upper surface, an apertured cap closing the outer end of said casing, a perforate tube supported by said cap having an open inner end, said perforate tube being disposed within said casing and spaced therefrom, an aspirating nozzle extending through said cap and into the outer end of said perforate tube for discharging air-oil mixture thereinto, and ignition means disposed within said perforate tube for igniting a portion of said air-oil mixture to heat the perforate tube and the casing to incandescence whereby the remaining oil is vaporized and burns as a gas at the ports of said casing.

2. A burner assembly including in combination, a tapered tubular casing having an imperforate inner end and a row of spaced ports in its upper surface, an apertured cap closing the outer end of said casing, a perforate tube supported by said cap within said casing and having an open inner end, said perforate tube being spaced from said casing, an aspirating nozzle extending into said perforate tube for discharging an air-oil mixture thereinto, ignition means disposed within said perforate tube for igniting a portion of said air-oil mixture, and a heat exchanger enclosing at least the major portion of said tubular casing, the combustion of said portion of the air-oil mixture within said perforate tube raising the temperature of said perforate tube and said casing to incandescence whereby the remainder of the oil is vaporized and burns as a gas at the ports of said casing within said heat exchanger.



3. Oil burning apparatus including in combination, an oil burner assembly comprising a tapered tubular casing having an imperforate inner end and a row of ports in its upper surface, an apertured cap closing the outer end of said tubular casing, a perforate tube attached to said cap and disposed within said casing, an aspirating nozzle extending into said perforate tube and ignition means disposed within said perforate tube, said aspirating nozzle discharging an air-oil mixture into said perforate tube, at least a portion of which is ignited by said ignition means to raise the temperature of said tube and the major portion of said casing to incandescence, the remainder of the oil discharged by said nozzle being vaporized within said casing and burned as a gas at the ports thereof, and means for supplying secondary air exteriorly of said tubular casing to support complete combustion of the vaporized oil at the ports of said casing.

4. The apparatus set forth in claim 3 wherein said cap has a circular row of holes located radially inward of said perforate tube for supplying primary air to said perforate tube.

5. The apparatus set forth in claim 3 wherein the ports in the upper surface of said outer casing are in alignment with the axis of said tubular casing and are elongated, and wherein said burner assembly is supported by a plate having an opening communicating with the interior of said heat exchanger for supplying said secondary air.

6. The apparatus set forth in claim 3 wherein said cap has a centrally located conical aperture therein for supplying air to said perforate tube, and wherein said secondary air is supplied around the outer periphery of said casing.

7. The apparatus set forth in claim 3 wherein said ports are formed in two rows along the edges of said casing, and a plurality of flame deflectors extending between the bottom and top wall of said casing between said ports.


**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,381,708 | Hauck | June 14, 1921 |
| 2,040,558 | Lukemeier | May 12, 1936 |
| 2,041,706 | Hahn | May 26, 1936 |
| 2,302,456 | McCollum | Nov. 17, 1942 |
| 2,469,272 | Logan | May 3, 1949 |
| 2,517,015 | Mock et al. | Aug. 1, 1950 |
| 2,632,299 | Loughran | Mar. 24, 1953 |
| 2,826,248 | Angel | Mar. 11, 1958 |
| 2,844,195 | Wein | July 22, 1958 |
| 2,869,626 | Sherman | Jan. 20, 1959 |
| 2,876,763 | Hunter et al. | Mar. 10, 1959 |
| 2,980,104 | Patrick et al. | Apr. 18, 1961 |
| 2,990,877 | Tramontini | July 4, 1961 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 586,223 | Germany | Oct. 19, 1933 |