

Dec. 1, 1964

F. W. HOTTENROTH ETAL

3,159,201

COMBUSTION APPARATUS AND COMPONENTS

Filed Oct. 30, 1961

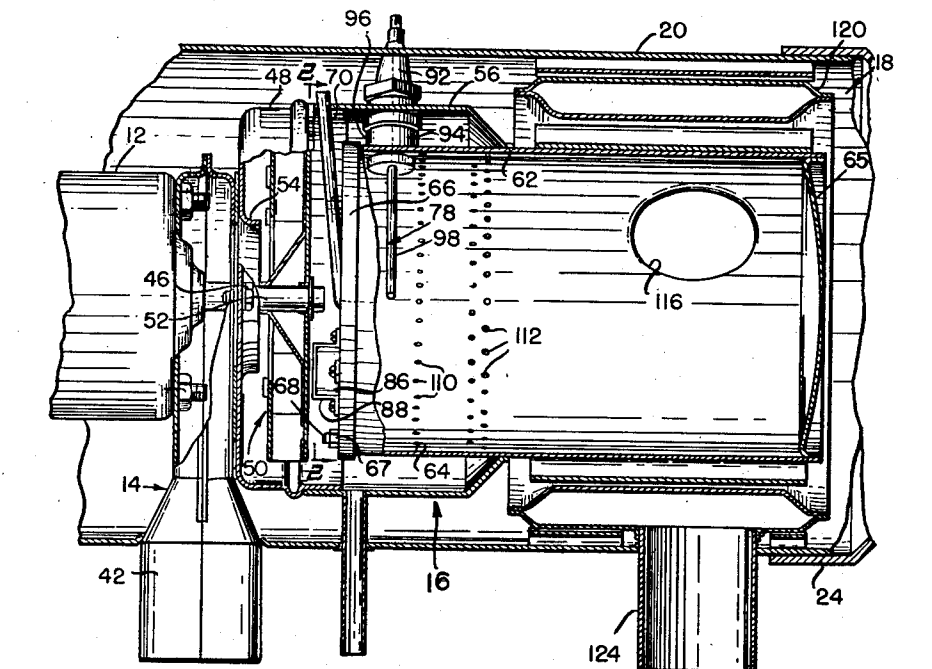


Fig. 1

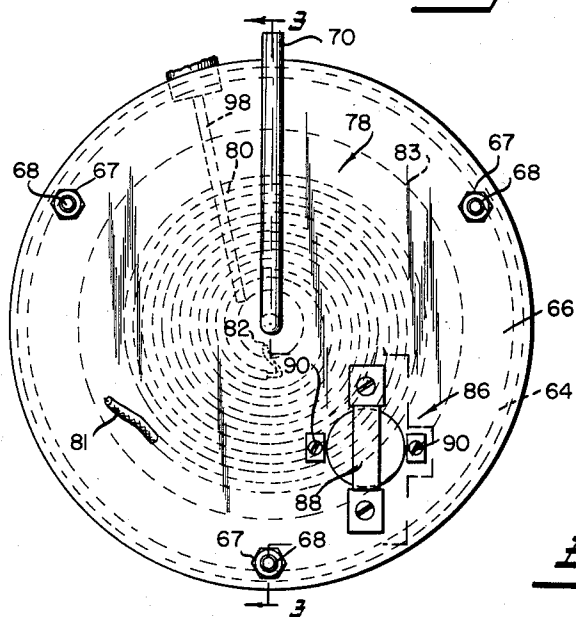


Fig. 2

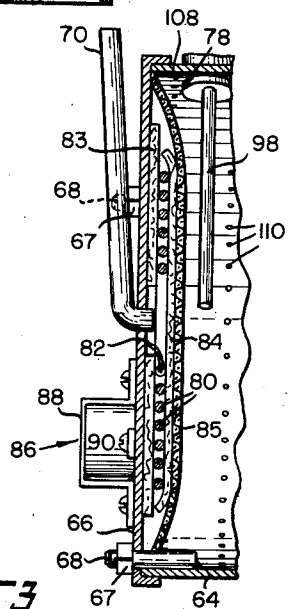


Fig. 3

INVENTORS

Fred W. Hottenroth

Richard C. Spooner.

BY *Strauch, Nolan + Nasle*

ATTORNEYS

1

2

3,159,201

COMBUSTION APPARATUS AND COMPONENTS
Fred W. Hottenroth, Santa Monica, Calif., and Richard C. Spooner, Fairview Park, Ohio, assignors to Hupp Corporation, Cleveland, Ohio, a corporation of Virginia
Filed Oct. 30, 1961, Ser. No. 148,509
3 Claims. (Cl. 158—28)

This invention relates to combustion apparatus and more particularly to forced draft heating apparatus which supplies a stream of heated air for heating vehicles in extremely cold climates and for similar purposes.

Heaters of the general type to which this invention relates are disclosed in copending applications Serial No. 849,659 filed on October 29, 1959 for Heaters, now Patent No. 3,092,095 and Serial No. 54,402 filed September 7, 1960 for Heaters. Such heaters are particularly useful for heating vehicles in extremely cold climates where heaters of other types have proved to be inadequate, unsafe, unreliable or excessively costly to operate. The heaters operate on a variety of fuels such as gasoline, kerosene, jet fuel or diesel fuel without change or adjustment and have an extraordinarily high specific output. These heaters incorporate two entirely separate air circuits, one for combustion air and one for fresh air to be delivered to the space to be heated.

It is the principal purpose and object of the present invention to provide for use in such heaters novel ignition systems including novel and particularly efficient preheating units to effect reliable and safe starting of the heaters even under the most adverse weather conditions and even with fuels which are viscous or difficult to vaporize.

Additional objects and advantages of the present invention will become apparent as the description proceeds in connection with the accompanying drawings in which:

FIGURE 1 is a vertical section of the combustion chamber burner-heat exchanger sub-assembly of the heater incorporating the ignition system of the present invention;

FIGURE 2 is an enlarged section taken along line 2—2 of FIGURE 1 illustrating the fuel vaporizer preheating coil and thermostat; and

FIGURE 3 is a transverse section taken along line 3—3 of FIGURE 2 showing further details of construction.

For present purposes the invention will be disclosed as applied to a heater which is structurally substantially the same as the heater disclosed and claimed in the aforesaid copending application Serial No. 54,402. The improvement of the present invention resides primarily in a fuel distribution and ignition system.

Referring more particularly to the drawings, the principal components of the heater, including the fresh air blower (not shown) the drive motor 12, the combustion air duct assembly 14, the combined combustion chamber-burner assembly indicated generally at 16 and the heat exchanger assembly indicated generally at 18, are mounted in coaxial relation within a tubular casing member 20. The cold fresh air is drawn into the casing 20 through an inlet cover (not shown) and the heated fresh air is delivered from the unit through the outlet cover 24. Each of these covers may take a number of forms depending upon the conduit system with which the heater is associated.

The internal components, all of which are secured together to form a unitary sub-assembly, are mounted in the housing 20 in coaxial relation therewith as described in detail in said application Serial No. 54,402.

The combustion air duct assembly 14 is secured by a plurality of stud and nut assemblies 46 to the bottom of a cup member 48 which surrounds the combustion air blower assembly indicated generally at 50. The blower 50 is removably mounted on the end of the motor shaft

52 which extends through the aligned openings 44 and 54 in the combustion air duct 14 and the cup 48, respectively. Suitable sealing gaskets are provided between the combustion air duct and the motor and between the duct assembly and the cup 48 to provide an airtight structure when the units are assembled.

The larger end of an annular combustion chamber housing member 56 is positioned with a close sliding fit over the outer surface of the cup member 48 and the parts are suitably secured together. The end of member 64 nearest the air outlet cover 24 is closed by end plate 65 peripherally welded to the inner surface of member 64, while the opposite end of member 64 is closed by a cap 66 held in place by three nuts 67 screwed on three bolts 68 welded to the interior surface of member 64.

Fuel is supplied to the burner through a supply tube 70 the end of which is welded to the center of cap 66. The fuel conduit extends to the interior of the device through aligned openings in the cup 48, the housing member 56 and the main housing member 20 and is suitably connected to a source of fuel under pressure which is delivered at a fixed rate through conduit 70 to the center of a fuel distribution and ignition assembly indicated generally at 78. The assembly 78 (shown in detail in FIGURES 2 and 3) includes a preheater coil 80 which is a spiral of sheathed resistance wire attached to cover 66 and located inside of member 64. One end 81 of coil 80 protrudes through a hole in cover 66, to which the outside of the sheath is brazed, the end of the resistance wire on the outside of the cover forming a terminal for attachment to the circuit wire. The opposite end of the preheater coil is brazed to the cover at 82 to form a ground connection.

Between preheater coil 80 and cover 66 is a washer 83 of felted ceramic material of circular shape with an opening in the center. A circular disc 84 of the same material is held against the opposite side of the preheater coil by a wire screen 85. This felted ceramic material is sold by the Carborundum Company under the name of Fibrefrax. The two pieces 83 and 84 serve as wicks or fuel distribution members. Wire screen 85 is formed so that it fits over parts 80, 83 and 84 and is spot welded at its edge to cover 66. The characteristics of the felted ceramic layers 83 and 84 are such that the fuel supplied to them is immediately distributed substantially uniformly over their entire area, thus providing an extensive vaporization surface in intimate contact with the preheater coil. Since they are fabricated from ceramic material, their service life is as long as the metal components of the heater.

On the outside of cover 66, opposite to coil 80 is a preheat thermostat 86, which is attached to cover 66 by a strap 88, fastened with two screws. Thermostat 86 is a commercial snap action, normally open, single pole switch which snaps the circuit closed when its temperature rises above a fixed value, and snaps it open again when the temperature falls. The thermostat 86 has two terminals 90 for attachment of the circuit wires.

Ignition is effected by spark plug 92 mounted in a collar 94 brazed to the members 56 and 64. The collar 94 is provided with vent openings 96 to keep the plug 92 clean. The spark plug 92 is provided with an electrode 98 which terminates closely adjacent the center of the screen 85 to form a spark gap at this point, connected to ground. Since the entire screen 85 forms the electrode, the required spark gap will be maintained even if the electrode 98 and the screen 85 have deteriorated after extended service.

Combustion air is supplied to the burner through three sets of openings 108, 110 and 112 formed on the wall of the combustion chamber member 64. As more fully explained in Serial No. 54,402, the size and spacing of these openings is such that they provide a progressively

increasing air supply from left to right as viewed in FIGURE 3.

The combustion gases pass from the interior of the combustion chamber 64 through passages 116 into the interior of the heat exchanger assembly indicated generally at 18 as described in detail in said application Serial No. 54,402. The combustion gases exit from the heat exchanger through a conduit 124 welded to the outer heat exchange member 120, the conduit 124 extending outwardly through the main housing member 20 for connection to a conduit for disposition of the exhaust gases as desired.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a liquid fuel burner, means to vaporize and ignite the fuel comprising: a combustion chamber assembly having an essentially flat imperforate end wall; a flat non-combustible wick assembly mounted within said combustion chamber and covering at least the central portion of said flat end wall and subjected to the heat of the burner flame; a flat coil of sheathed resistance wire positioned within said wick; a metal screen retainer for said wick; an electrode having its inner end closely adjacent said retainer to form a spark gap therewith; a fuel supply conduit extending through said end wall and having its discharge end adjacent to said wick; means to produce a high voltage discharge across said

spark gap; means to deliver fuel through said conduit; means to connect said resistance wire to a source of electrical current; and means to supply combustion air to the burner in the vicinity of the wick.

2. The burner according to claim 1 wherein the wick is composed of two sheets of felted ceramic fibers, between which is sandwiched said flat spiral coil of sheathed resistance wire, said fuel supply conduit having its discharge end located to discharge fuel between said sheets.

3. In a liquid fuel burner having a combustion chamber provided with an imperforate end wall, means to vaporize and ignite the fuel, comprising: a flat non-combustible wick assembly comprising two sheets of felted ceramic fibers mounted within the burner on said imperforate end wall and subjected to the heat of the burner flame; a flat coil of sheathed resistance wire positioned between and in contact with said sheets; a fuel supply conduit having its discharge end located to discharge fuel between said sheets; means providing a spark gap adjacent to said wick; means to produce a high voltage discharge across said spark gap; means to deliver fuel to said wick; means to connect said resistance wire to a source of electrical current; and means to supply combustion air to the burner in the vicinity of the wick.

References Cited in the file of this patent

UNITED STATES PATENTS

2,174,818	Brace	Oct. 3, 1939
2,214,912	Valjean	Sept. 17, 1940
2,445,341	Trimble et al.	July 20, 1948
2,458,630	Palko	Jan. 11, 1949
2,520,159	Long	Aug. 29, 1950
2,582,827	Gibson	Jan. 15, 1952
2,630,167	Diehl	Mar. 3, 1953
2,712,352	Manor et al.	July 5, 1955
2,966,944	Downs	Jan. 3, 1961

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,159,201

December 1, 1964

Fred W. Hottenroth et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 10, after "together." insert -- The smaller end of the housing member 56 is welded as at 62 to the outer surface of a cylindrical combustion chamber member 64. --.

Signed and sealed this 4th day of May 1965.

SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents