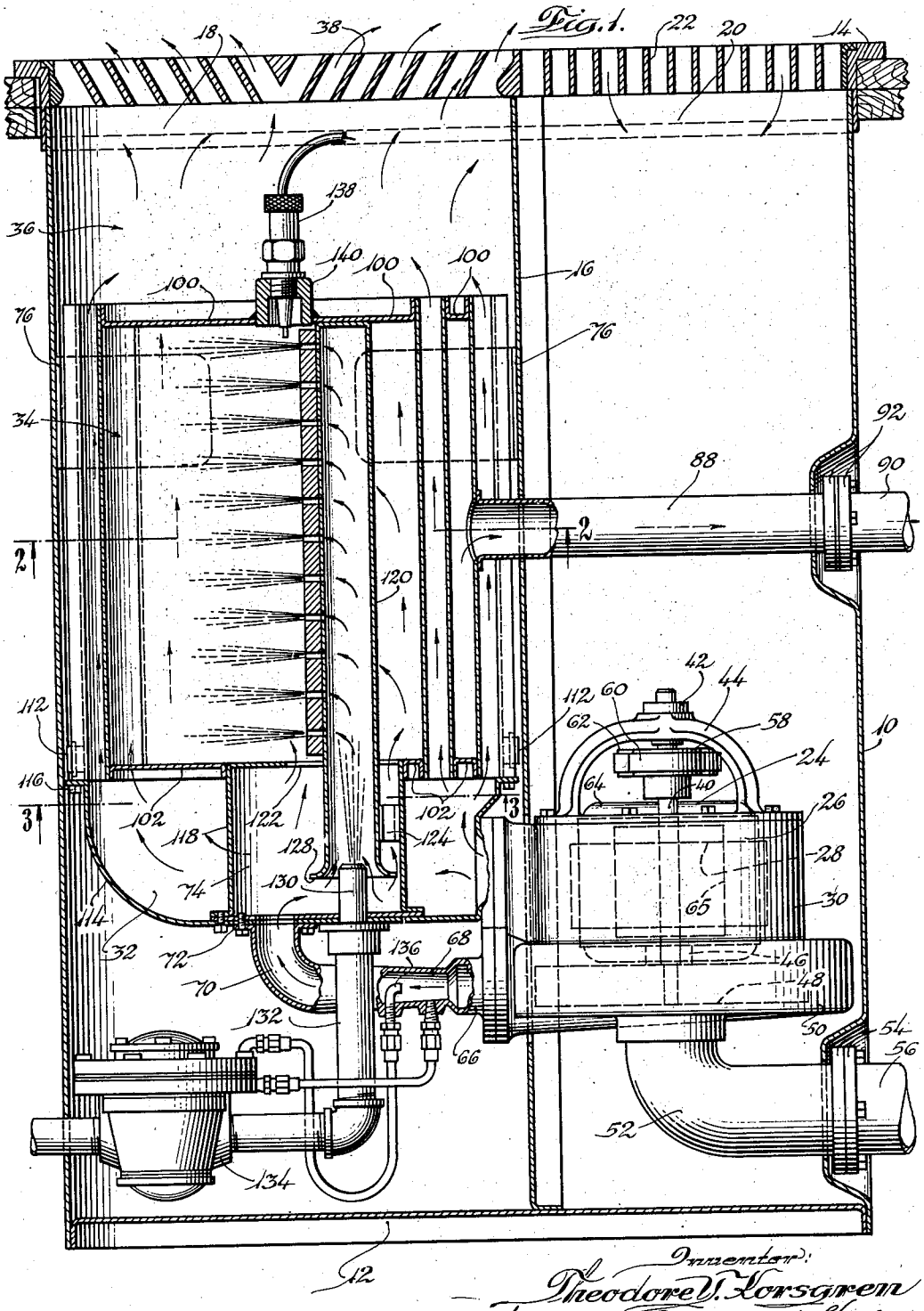
Sept. 20, 1949. T. Y. KORSGREN 2,482,552

GAS BURNING SPACE HEATER

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Fig. 1.



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Fig. 2.

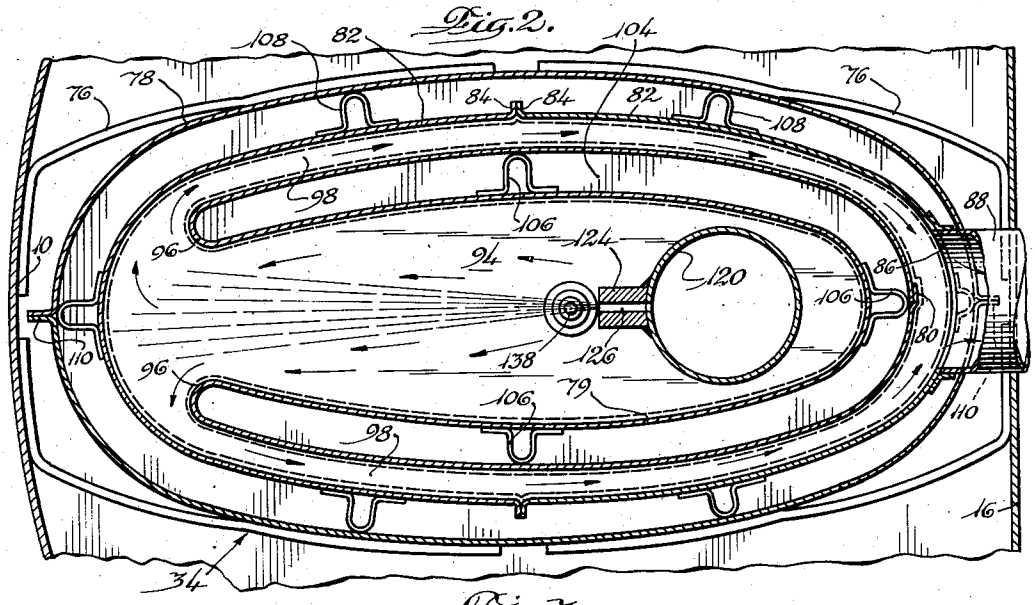
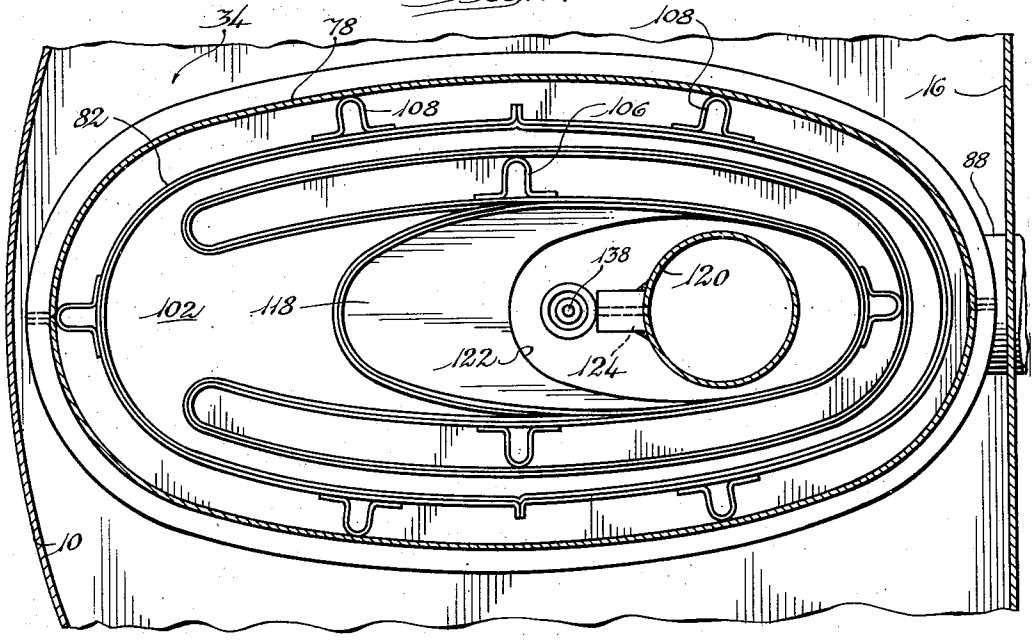


Fig. 3.



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GAS BURNING SPACE HEATER

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Application November 5, 1945, Serial No. 626,837

4 Claims. (Cl. 126—116)

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The present invention relates to gas heaters and more particularly to gas heaters of the space heater or floor furnace type.

It is the principal object of the present invention to provide a novel heater of the above type in which the ventilating air is completely separated from the combustion air throughout the heater system.

Another object of the present invention is to provide an improved gas heater well adapted to use in a sealed system in which both the air for combustion and the exhaust from the heater can be taken from or to remote points. Such a heater is illustrated in the present assignee's copending application of Theodore Y. Korsgren and Frank A. Ryder, for "Heating systems," filed May 28, 1945, Serial Number 596,130, now abandoned.

Yet another object of the present invention is to provide a novel sealed gas heater having a burner of the atmospheric or semi-secondary air type.

Another object is to provide a novel floor furnace type heater which can be installed without change in the structural elements of a conventionally constructed house or other building.

Still another object of the present invention is to provide a novel heater of the above type which can be manufactured at low cost and which will give long, trouble-free and efficient service in operation.

Other objects and advantages will become apparent from the following description of a preferred embodiment of my invention which is illustrated in the accompanying drawings.

In the drawings, in which similar characters of reference refer to similar parts throughout the several views:

Fig. 1 is a somewhat diagrammatic longitudinal sectional view, taken on a vertical plane substantially medially through a heater embodying the present invention;

Fig. 2 is a horizontal sectional view along the line 2—2 of Fig. 1 looking upwardly as indicated by the arrows; and

Fig. 3 is a horizontal sectional view similar to Fig. 2 but taken in the direction indicated by the arrows along the line 3—3 of Fig. 1.

Inasmuch as the present invention relates principally to the construction and operation of the heating portion of a floor furnace as opposed

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to the control system for such a furnace, the control system has not been illustrated since it might tend to obscure the invention.

Referring to Fig. 1 of the drawings, the heater mechanism is enclosed within a vertically disposed generally cylindrical case 10, the lower end of which is closed by a bottom plate 12, while the upper end is secured, as by spot welding or riveting, to a flanged ring 14. The ring 14 is circular and is of such a size that it will fit into a circular opening cut through the floor of a building between the conventional joist spacing so that no structural members of the house or other building need be cut in installing the heater. Thus no special box type reinforcing of the floor structure is necessary.

The space within the casing 10 is divided into two compartments by a vertical partition 16. As illustrated in Fig. 1, the space to the left of the partition is indicated by the numeral 18 and houses the heat exchanger and burner portion of the heater, as well as some control and regulating equipment, while the right hand space 20 encloses the blowers and other operating mechanism which will be described presently.

Air to be heated passes downwardly from the room, through a grill 22 formed in the ring 14 and located above the space 20 and into the inlet 24 of a blower 26. The blower has a Sirocco type wheel 28 which forces the air into the usual type scroll case 30 from which it passes through the partition 16 to a plenum chamber 32 of the burner and heat exchanger mechanism indicated generally by the numeral 34. As will be explained in greater detail presently, the air passes upwardly from the plenum chamber 32 through the heat exchanger portion of the heater and into a plenum chamber 36 above the heat exchanger. From here the heated air passes outwardly through a grill 38 located above the heat exchanger and within the ring 14. If desired, the outlet grill 38, and the inlet grill 32 can be formed as a single casting or stamping which rests in nested removable relation to the ring 14 as shown.

The blower 26 is comprised of the usual type scroll case 30 which houses a Sirocco rotor 28 mounted upon a shaft 40. This shaft extends vertically and is journaled at its upper end in a bearing 42 mounted in the spider 44 attached to the face of the scroll case 30. The lower

end of the shaft extends through a similar bearing 46 carried at the lower face of the scroll case 30. Beyond the bearing 46 the shaft 40 carries a second blower wheel 48 of the centrifugal type mounted to rotate within a second scroll case 50. The two scroll cases 30 and 50 are arranged back to back with the scroll case 50 having an inlet opening at the lower face thereof connected to an elbow 52 which extends through the heater wall 10 and there is connected by a pair of matched flanges 54 to a combustion air intake pipe 56.

In a position between the upper face of the scroll case 30 and the upper bearing 42, the shaft 40 is provided with a pulley 58 connected by a V belt 60 to a drive pulley 62 secured to the shaft of an electric motor 64, the motor being mounted upon the scroll case by a bracket 65. It is apparent, therefore, that whenever the motor 64 is energized, the shaft 40 will be rotated, thus driving the Sirocco-type wheel 28 which draws in ventilating air through the grill 22, and centrifugal-type blower wheel 48 which draws in combustion air through the pipe 56. If desired, the scroll cases 30 and 50 can be formed as a single casting or fabricated member as shown in Fig. 1, or, if preferred, these two blowers can, of course, be separate.

The outlets of both scroll cases extend through the partition 16 and the combustion air scroll case 50 is connected through a combustion air fitting 66 having a Venturi throat 68 to an elbow 70 equipped with a flange 72 by which it is connected to a combustion air plenum chamber 74, the purpose of which will be explained presently. The outlet of the ventilating air scroll case 30 is connected to the ventilating air plenum chamber 32 previously mentioned.

The burner and heat exchanger portion of the apparatus is generally oval in shape and is vertically mounted by means of brackets 76 which are welded to the shell 78 of the heat exchanger and bear against the side wall of the case 10 and the partition 16.

As best seen in Figs. 2 and 3, the combustion chamber and a portion of the heat exchanger is formed of a single sheet 79 of stainless steel or other heat and corrosion resistant material which is first bent to deep U form, with the upper straight portions of the U subsequently being bent outwardly and around generally parallel to the more central portion of the sheet until the ends overlap in a position opposite the center of the sheet. At this point they are welded together as at 80. The bent and welded sheet 79 is enclosed within an oval chamber bounded at the outside by similar metal sheets 82 formed in two halves, the halves being provided at their edges with flanges 84 which are seam-welded together. The portion of the sheet 82 opposite the welded seam 80 has an opening through which exhaust gases pass to an exhaust fitting 88 welded to the sheet 82 around the opening. The exhaust fitting 88 extends through the side wall 10 and is connected to a length of exhaust tubing 90 by means of matched flanges 92.

The heat exchanger just described provides a combustion space 94 which is generally oval in cross section. This combustion space is bounded by the inner surface of the sheet 79 and at its outer end, that is, at the point where the sheet 79 is rolled over and bent backwardly as at 96, the combustion space 94 is connected to two reversely extending passages 98 formed between the backwardly bent portions of the sheet 79

and the enclosing oval case made up of the sheets 82.

The passages 98 and the chamber 94 are closed at their ends by an upper header plate 100 and a similar lower header plate 102, both of which are flanged at their edges and welded to the sheets 79 and 82. These header plates are formed with U-shaped slots which permit ventilating air to enter the U-shaped space 104 located between the outer surface of the inner portion of the sheet 79 and the inner surface of the outer portion of this same sheet.

The heat exchanger just described is kept in alignment by means of small U-shaped sheet metal spacer elements 106 which extend longitudinally within the slot 104 and are welded to the inner portion of the sheet 79 while resting with their centers against the outer portions of this sheet.

Similarly, longitudinally extending spacer elements 108 are welded to the outer surface of the oval sheets 82 and space the oval jacket 78 therefrom, this jacket 78 preferably being made in two halves which are welded together, as at 110.

At its lower end, the outer case 78 is provided with brackets 112 arranged in spaced relation around the periphery to which a casing 114 which forms the ventilating air plenum chamber 32 is connected by means of bolts 116.

The combustion air plenum chamber 74 is comprised of a compartively deep drawn oval cup 118 located within the ventilating air plenum chamber 32 and welded to the lower header plate 102 which the upper surface thereof extending into a complementary shaped flanged opening formed in the header plate.

The burner proper is comprised of a tube 120 somewhat longer than the combustion chamber 94. It is positioned vertically within the combustion chamber and extends through an opening 122 in the upper surface of the combustion air plenum chamber cup 118. At its upper end the burner tube 120 is closed and may be secured in place by welding to the upper header plate 100. It is also supported by means of a bracket 124 which secures the lower portion of the tube to the side wall of the cup 118. The side of the tube 120 toward the exit end of the combustion chamber is provided with a jet strip 124 welded thereto which has a plurality of jet openings 126 formed therethrough so that a gas and air mixture under pressure in the tube 20 will issue through the jet passages 126 and be directed toward the opposite end of the combustion chamber. A bell mouth 128 is formed at the lower end of the tube 120 and is in alignment with an aspirating gas nozzle 130 which is connected by means of a supply pipe 132 to a gas regulator valve 134 of any suitable type. The one shown is illustrated and described in detail in the previously mentioned Ryder case and acts to proportion the rate of gas flow in accordance with the pressure differential produced between the venturi 68 and a small scoop-like connection 136 located somewhat downstream of the most constricted portion of the venturi.

As may be seen in Fig. 3, the opening 122 in the combustion air plenum chamber 74 is generally oval in shape and is considerably larger than the burner tube 120 and jet strip 124. Its purpose is to permit air to enter the combustion chamber 94 to complete the combustion of the gas and air mixture introduced through the tube 120, the mixture being ignited by a spark plug 138

threaded through a bushing 140 welded to the header plate 100 adjacent the end of the jet strip 124. Although not shown, this spark plug is connected to a usual type ignition transformer.

The heater above described operates in the following manner. When the motor 64 is energized, thereby driving blower wheels 28 and 48, ventilating air is drawn downwardly through the grill 32 and blower 30 and forced into the ventilating air plenum chamber 32. This air passes upwardly through the longitudinally extending U-shaped slot 104 and through the oval space provided between the ventilating air case 78 and the outer combustion air sheet 82. The ventilating air, therefore, absorbs heat from the entire surface of sheet 79 as well as from the entire surface of the sheet 82, both of these sheets being heated by the hot products of combustion which pass from the combustion chamber 92 to the exhaust 88. The hot ventilating air passing from the heat exchanger at the top thereof flows into the plenum chamber 36 and thence through the grill 38 to the space to be heated. Meanwhile, air for combustion has been drawn in through the pipe 56, elbow 52 and blower 50 and has been forced therefrom through the elbow fitting 70 to the combustion air plenum chamber 74. A portion of this air passes through the opening 122 into the combustion space 94 where it surrounds the burner tube 120 and jets 126. Another portion of the combustion air is aspirated by gas under pressure flowing through the pipe 132 and from the aspirating nozzle 130 into the bell mouth opening 128. Although it forms no part of the present invention, it will be appreciated that the valve 134 supplies gas under pressure to the aspirating nozzle 130 as soon as combustion air flows through the venturi 79 in sufficient quantity. As is fully explained in the previously referred to Ryder application, the rate of gas flow is regulated by the valve 134, so that as the combustion air rate increases the gas rate also increases. The rate of heat output, therefore, can be controlled by the electric power input to the motor 64.

The size of the bell mouth 128 and the aspirating effect of the nozzle 130 are so proportioned that the mixture of gas and air within the tube 120 is too rich to burn properly. The gas, however, has been sufficiently diluted, so that as soon as it issues from the jets 126 and mixes with the additional portion of the combustion air supplied through the opening 122 the mixture quickly reaches the proper ratio for efficient combustion. As previously mentioned, the hot products of combustion pass from the combustion chamber 94 into the two rearwardly extending passages 98 and to the exhaust connection which leads to the exhaust pipe 88.

Having described my invention, what I claim as new and useful and desire to secure by Letters Patent of the United States is:

1. In a gas heating appliance, the combination comprising a fuel gas nozzle, means to supply gas under pressure to said nozzle, a combustion air aspirator associated with said nozzle so that flow of gas from said nozzle aspirates air to form a gas and air mixture, a longitudinally extending member of horseshoe-shaped cross section defining a combustion chamber having a generally elliptical cross section, a tubular gas burner contained longitudinally in said combustion chamber near the closed side of said horseshoe-shaped member and having a plurality of mixture outlet openings therein directed generally toward the open side of said horseshoe-shaped member, conduit means connecting said aspirator to said burner, means forming a plenum chamber enclosing said aspirator, means forming a secondary combustion air flow path from said plenum chamber to said combustion chamber, means forming a heat exchanger connected to receive hot products of combustion from said combustion chamber, said heat exchanger having an exhaust connection, and blower means for delivering combustion air to said plenum chamber under pressure whereby a portion of said air under pressure in said plenum chamber flows directly to said combustion chamber while another portion of said air under pressure is aspirated by said aspirator before being delivered to said combustion chamber.

2. In a gas heating appliance of the type described, a longitudinally extending member of horseshoe-shaped cross section defining a combustion chamber of elliptical cross section, a tubular gas burner having a plurality of mixture outlet openings therein directed generally toward the open side of said horseshoe shaped member contained longitudinally in said combustion chamber near the closed side of said horseshoe-shaped member, means forming a sealed enclosure for said burner and said combustion chamber, an exhaust connection for the last said means, an inlet connection for said sealed enclosure, a source of combustion air under pressure, means connecting said source to said inlet connection, and means for supplying a mixture of fuel gas and air under pressure to said burner whereby said mixture burns in an atmosphere maintained above the ambient air pressure.

3. In a gas heating appliance, the combination comprising a fuel gas nozzle, means to supply gas under pressure to said nozzle, a combustion air aspirator associated with said nozzle so that flow of gas from said nozzle aspirates air to form a gas and air mixture, a longitudinally extending member of horseshoe-shaped cross section defining a combustion chamber having a generally elliptical cross section, a tubular gas burner contained longitudinally in said combustion chamber near the closed side of said horseshoe-shaped member and having a plurality of mixture outlet openings therein directed generally toward the open side of said horseshoe-shaped member, conduit means connecting said aspirator to said burner, means forming a plenum chamber enclosing said aspirator, means forming a secondary combustion air flow path from said plenum chamber to said combustion chamber, means forming a heat exchanger connected to receive hot products of combustion from said combustion chamber, said heat exchanger having an exhaust connection, said heat exchanger forming means and said member defining ventilating air passages encompassing said combustion chamber, and blower means for delivering combustion air to said plenum chamber under pressure whereby a portion of said air under pressure in said plenum chamber flows directly to said combustion chamber while another portion of said air under pressure is aspirated by said aspirator before being delivered to said combustion chamber.

4. In a gas heating appliance of the type described, a longitudinally extending member of horseshoe shaped cross-section defining a combustion chamber of elliptical cross-section, a tubular gas burner having a plurality of mixture outlet openings therein directed generally toward the open side of said horseshoe shaped member contained longitudinally in said combustion

chamber near the closed side of said horseshoe shaped member, means forming an enclosure for said burner and said combustion chamber, means for admitting combustion air to said enclosure, means for emitting products of combustion from said enclosure, means for promoting the flow of air into said enclosure and the products of combustion from said enclosure, and means for supplying a mixture of fuel gas and air to said burner.

THEODORE Y. KORSGREN.

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