Aug. 1, 1933. H. F. CARTER 1,920,186

HEATING SYSTEM

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Fig. 1.

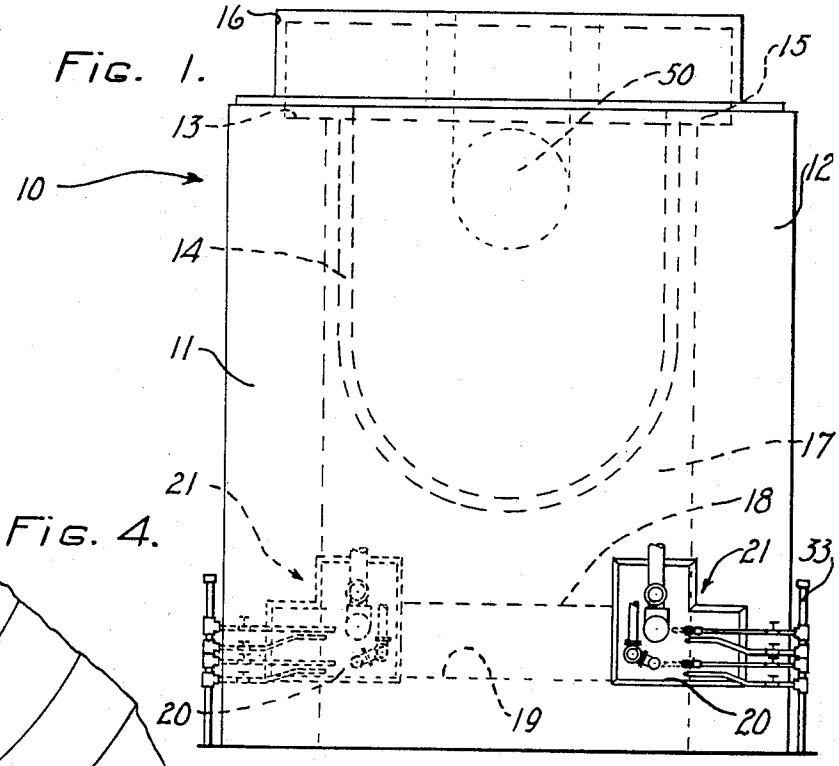
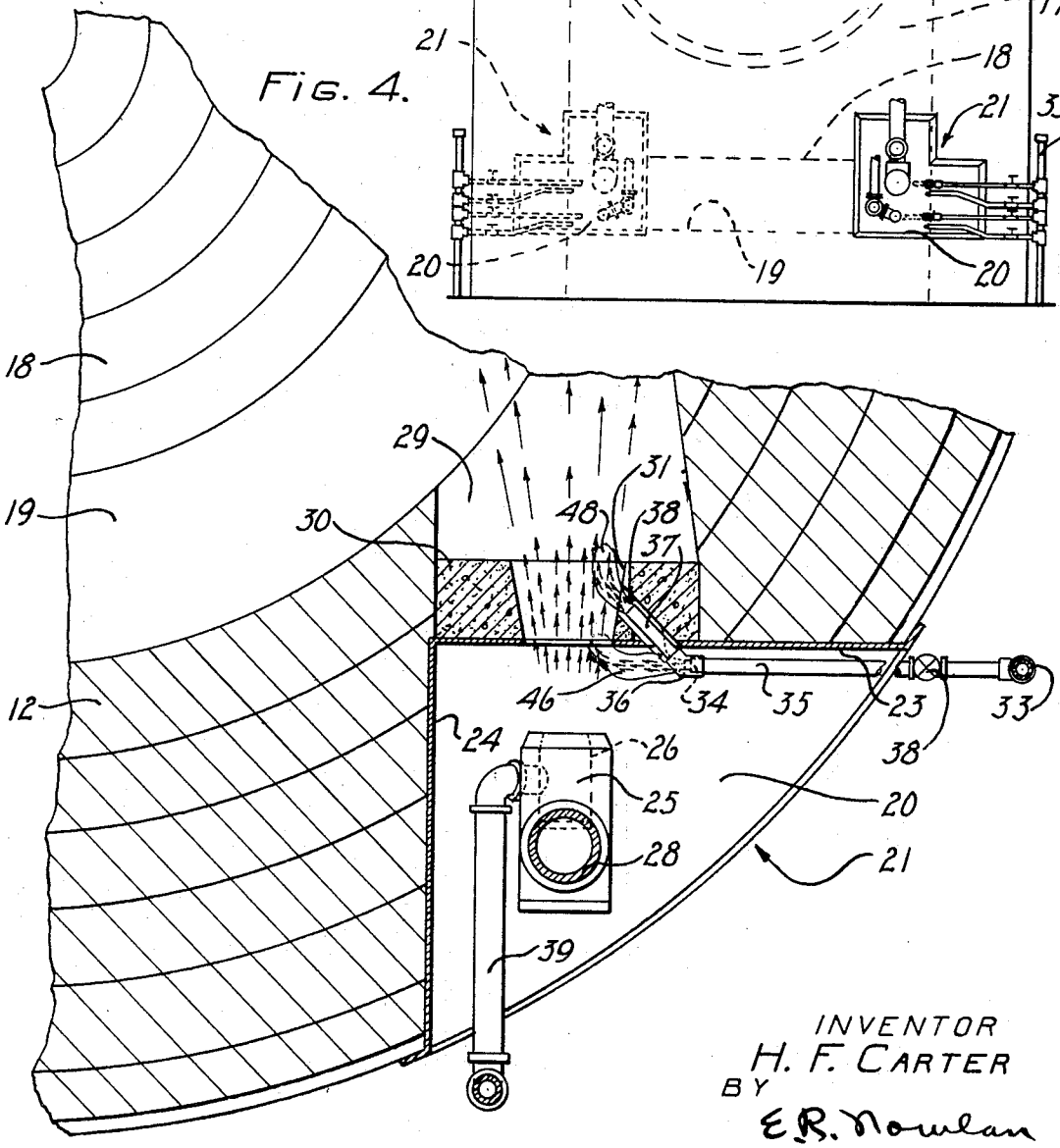


Fig. 4.



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FIG. 2.

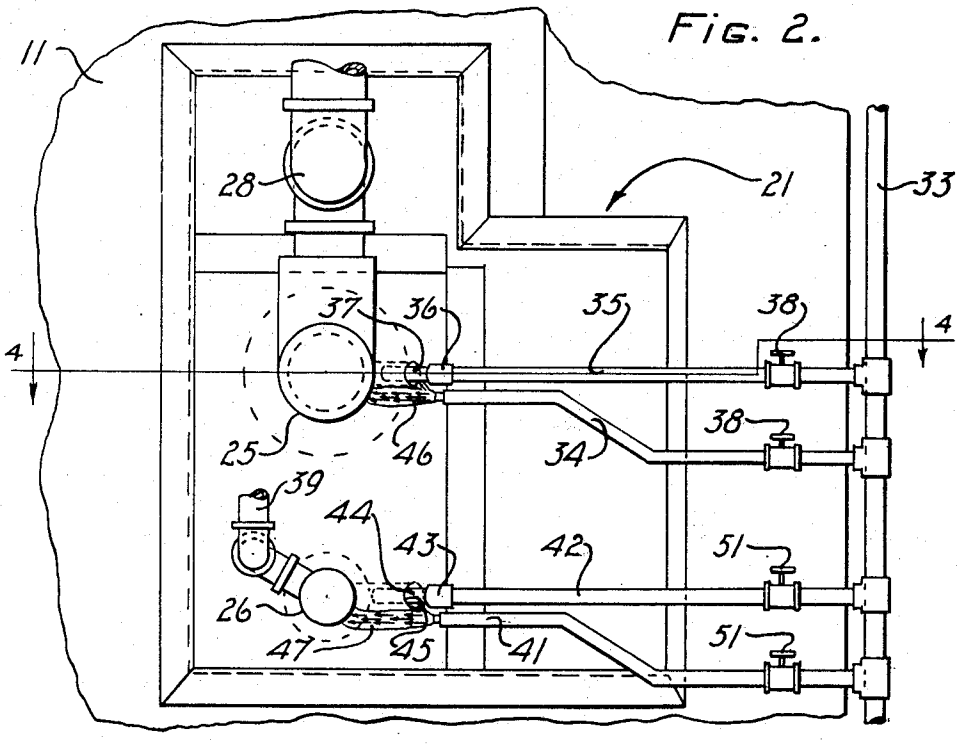
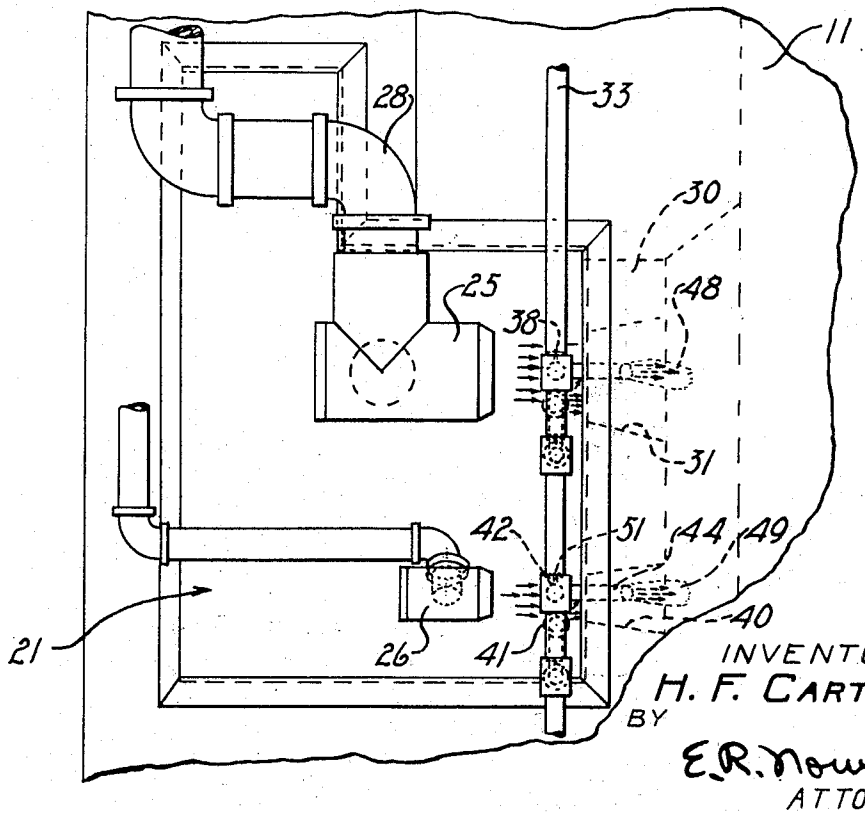


FIG. 3.



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HEATING SYSTEM

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Application December 10, 1930. Serial No. 501,217

7 Claims. (Cl. 158—1.)

This invention relates to heating systems and more particularly to heating systems utilizing fluid fuel.

In melting lead or other metals having relatively low melting points, the metal, in some instances, is placed in a kettle and suspended in the combustion chamber of a circular furnace. The furnace is fired by fuel oil which is sprayed into the combustion chamber and ignited by a gas pilot burner.

An object of the invention is to provide a heating system which will be safe, economical and reliable.

A pair of gas pilot burners are positioned to project angularly disposed flames across the path of an oil spray being fed into a combustion chamber. In one embodiment of the invention, a furnace is provided with a combustion chamber and, through the wall thereof, with a duct leading to the chamber. A fuel oil supply nozzle or burner so positioned outside the chamber as to direct a spray of fuel oil through the duct, and a pilot burner located outside the chamber projects a flame at right angles to the path of the spray prior to its entering the duct, to ignite the fuel. A second and concurrently operated pilot burner is positioned to project a flame through a pass in the chamber wall, which flame encounters the spray stream within the duct.

A better understanding of the invention may be had by reference to the following detailed description read in connection with the accompanying drawings forming a part thereof, in which

Fig. 1 is a schematic elevational view of a heating system embodying the invention;

Fig. 2 is a fragmentary enlarged view showing details of one heating unit shown at the right in Fig. 1;

Fig. 3 is an enlarged fragmentary view taken from the right in Fig. 1, showing the heating unit of Fig. 2 in side elevation, and

Fig. 4 is a fragmentary section taken on the line 4—4 of Fig. 2.

Referring to the drawings, wherein similar parts are indicated by identical reference numerals, a heating system 10 consists of a furnace 11 having a circular vertical wall 12 of fire brick, or other suitable heat resisting material. At the inner upper edge thereof the circular wall is provided with an annular recess 13 in which is engaged a kettle 14 of any suitable type having a projecting annular flange 15 which rests in the recess 13. Over the furnace and kettle is placed a lid 16 of any suitable type for confining heat therein and protecting the contents of the kettle. The area inside the wall of the furnace comprises a combustion chamber 17, which is provided with a central raised floor 18, and annular groove or channel 19 being provided between the raised floor 18 and the wall of the furnace. The furnace is also provided with a flue 50 connected to any suitable exhausting blower or high chimney (not shown) for creating a strong draft through the combustion chamber.

At diametrically opposed points in the periphery of the wall 12 are formed a pair of angular recesses 20—20, in each of which is mounted a heating unit generally designated by the numeral 21. It will be understood that the heating units 21—21 may be identical, and it is therefore thought necessary to describe only one in its entirety. Accordingly, the recess 20, shown in full lines in Fig. 1, and as more clearly indicated in Fig. 4, includes a face wall 23 and a side wall 24 extending at right angles thereto. Stationed in the recess 20 by any suitable supporting means (not shown) the heating unit 21 consists of an upper burner or fuel oil spraying nozzle 25, and directly therebeneath a smaller burner or spraying nozzle 26. The burner 25 is connected in a supply line 28 through which is furnished under pressure a spray of fuel oil for firing the furnace, the burner being pointed in such direction that the fuel oil spray travels horizontally toward and at right angles to the plane of the face wall 23. The circular wall 12 of the furnace is provided with a duct 29 which extends tangentially with respect to the channel 19 from the combustion chamber to the face wall 23 of the recess. Adjacent the outer end of the duct 29 is provided a sealing wall 30 of any suitable fire-proof material. This wall, and the face wall 23, are provided with an aperture 31, of lesser diameter than the duct in order to exclude air, and which is horizontally aligned with the mouth of the nozzle 25 and flared in the manner shown (Fig. 4) so that the spray from the nozzle 25 passes therethrough without obstruction, being drawn through the duct 29 and into the combustion chamber by the strong draft of the flue 50.

To the right of the furnace, as viewed in Fig. 1, is positioned a supply line 33 for supplying illuminating gas fuel to a pilot arrangement including a pilot tube 34, which extends horizontally along the face wall 23 on a level with the nozzle 25 and terminates a short distance from the path of the fuel spray as shown in Fig. 2. Immediately above the pilot tube 34 and extending parallel therewith from the supply line 33

is a second pilot tube 35. This tube is provided with an elbow joint 36 in which is fitted a shorter length 37 of similar tubing, which is inclined from the vertical plane of the pilot tube 34 to extend into the outer end of a diagonally disposed passageway 38, which is formed through the material of the sealing wall 30, opening at the inner end thereof on the inner surface of the aperture 31. The outer end of the passageway 38 is just above the end of the pilot tube 34 and a portion of the illuminating gas which flows from the tube 34 is drawn through the passageway and exteriorly of the tube 35 by the draft of the flue 50. A valve 38 is mounted in each of the tubes 34 and 35 for controlling the flow of gas therein.

The lower nozzle 26 forms part of an auxiliary burner arrangement similar to that described above in relation with the larger nozzle 25, being connected in a supply line 39 through which may be furnished under pressure a spray of fuel oil. Also, this burner is pointed in such direction that the fuel oil spray moves horizontally at right angles to the plane of, and toward, the face wall 23. The sealing wall 30 and the face wall 23 are provided with an aperture 40 which is horizontally aligned with the mouth of the nozzle 26 and is flared so that the spray from the nozzle 26 passes therethrough without obstruction and by the draft of the flue 50, through the duct 29 and into the channel 19 of the combustion chamber. Directly beneath the pilot tube 34 and connected to the supply line 33 is a pilot tube 41 which extends horizontally along the face wall 23 on a level with the nozzle 26 and terminates a short distance from the path of the spray therefrom, as shown in Fig. 2. Immediately above the pilot tube 41 and extending parallel therewith from the supply line 33 is a second pilot tube 42. This tube is provided with an elbow joint 43 in which is fitted a shorter length 44 of similar tubing, which is inclined from the vertical plane of the pilot tube 41 to extend into the outer end of a diagonally disposed passageway 45, which is formed through the material of the sealing wall 30, coinciding with the passageway 38, and opening at its inner end on the inner surface of the aperture 40. The outer end of the passageway 45 is just above the end of the pilot tube 41, and a portion of the illuminating gas which flows from the tube 41 is drawn into the passageway and exteriorly of the tube 44 by the draft of the flue 50. A valve 51 is mounted on each of the tubes 41 and 42 for controlling the flow of gas therein.

In operation the kettle is loaded with a proper charge of metal to be melted and both heating units 21—21 are placed in operation. The pilot tubes or burners 34, 35, 41 and 42 are lighted, gas being obtained from the supply line 33 by turning valves 38 and 51, and both the large and small burners 25 and 26 are operated. The spray therefrom is directed to pass through the apertures 31 and 40, respectively. In so doing, it will be observed (as best indicated by the arrows in Figs. 3 and 4) that the spray encounters first gas flames 46 and 47 from the pilot burners 34 and 41, respectively. These flames ignite the streams of spray, which are carried through the apertures in the sealing wall into contact with diagonally directed flames 48 and 49 from the pilot burners 35 and 42, respectively, the burning spray being continually forced along the duct 29 and into the combustion chamber 17 of the furnace. It will be noted that the spray from the lower burner 26 passes through the aperture 40, the lower portion of the duct 29 and in the annular channel 19 of the combustion chamber. Since the duct extends tangentially with respect to the combustion chamber and the channel, the pressure of the spray in the channel 19 sets up a rotary circulation within the combustion chamber thus evenly distributing the developed heat throughout the interior of the furnace.

Both pilot burners at each nozzle are kept in operation with the nozzle so that the stream of spray, in passing into the duct 29, passes in succession one pilot flame extending at right angles across its path outside of the sealing wall, and a second pilot flame extending diagonally across its path inside the sealing wall. Under such conditions explosions, backfiring, etc., occurring within the combustion chamber or duct, may extinguish either of the pilot lights by exerting pressure, in the case of the upper nozzle 25, through the aperture 31 to extinguish the flame 46 from the pilot burner 34, or through the passageway 38 to extinguish the flame 48 from the pilot burner 35. However, due to the divergent paths afforded the expanding gases of explosion namely, either the aperture 31 or the diagonal passageway 38, the pressure is not sufficiently great at both points as to extinguish both pilot flames 46 and 48 during the same explosion. If the explosion takes place through the aperture 31 to extinguish the burner 34, the burner 35 remains lighted and immediately relights the pilot 34 by igniting that portion of the gas from pilot 34 which is drawn around the burner 35 by the draft. If the explosion takes place through the passageway 38, the pilot 35 may be extinguished but, since the pilot 34 is placed below the outer end of the passageway, it is not extinguished, and the pilot 35 is immediately relighted by that portion of the flame from the pilot 34 which is drawn into the passageway 38 to envelop the pilot 35. The same method of operation is used in connection with the lower burner 26, the pilots 40 and 41 thereof cooperating to maintain either flame 47 or 49 playing upon the stream of spray at all times when the nozzle is in operation.

In usual practice, the upper burner may be thermostatically controlled by any suitable means (not shown) so that it is cut off automatically when the temperature of the metal reaches a predetermined point, leaving the pilots thereof burning, however. The lower burner is maintained in operation continually in order to keep the metal from cooling too rapidly when the upper burner is cut off. When the temperature of the metal drops too far, the upper burner is again operated, the fuel therefrom being instantaneously ignited by the pilots 34 and 35 thereof.

By projecting the flames from the two pilot burners across the path of the fuel supply at spaced points, the necessity for manual relighting of the pilot light upon its extinguishment, and close attention thereto, is obviated and the possibility of the discharge of oil into the furnace without combustion, and the consequent risk of possibly disastrous explosion and waste of fuel is removed.

What is claimed is:

1. In a heating system, a combustion chamber, a duct leading to the combustion chamber for conducting fuel thereto, and means at one end of the duct for projecting flames across the path of the fuel at spaced points to ignite the fuel, said

means comprising a wall having an aperture communicating with said duct and a passageway diagonally disposed with respect to said aperture and extending into said aperture, a pilot tube adjacent said aperture remote from said duct, and a second pilot tube located in said passageway.

2. In a heating system, a combustion chamber, a wall having an aperture and a passageway into said aperture, a nozzle for supplying fuel to the chamber through the aperture, and a plurality of pilot burners positioned to direct flames between the nozzle and the combustion chamber to ignite the fuel, one of said pilot burners located in said passageway, and another of said pilot burners located adjacent and beneath the end of said passageway remote from said aperture, said first mentioned pilot burner having a smaller perimeter than the inside of said passageway.

3. In a heating system, a nozzle, a wall having an aperture co-axial with the mouth of said nozzle and having a larger area at the end remote from said nozzle than at the end adjacent said nozzle, a combustion chamber having a duct and an annular groove for supplying fuel to the system in a path through said aperture, and a plurality of pilot burners positioned to project flames across the path of the fuel at spaced points to ignite the fuel, said duct extending tangentially to said annular groove and having a larger area than that of said aperture.

4. In a heating system, a combustion chamber, a heating unit, a wall located between said combustion chamber and said heating unit, said wall having an aperture into said combustion chamber and a passageway extending diagonally into said aperture, said heating unit directing fuel to the chamber through said aperture, and a plurality of pilot burners positioned to project flames across the path of the fuel at spaced points to ignite the fuel before it reaches the chamber, one of said pilot burners positioned within said passageway and another of said pilot burners positioned external to and below said passageway so that a portion of the flame therefrom is projected into said passageway external to said first mentioned pilot burner.

5. In a heating system, a wall having an aperture therein and a passageway extending diagonally into said aperture, a heating unit for supplying fuel to the system in a predetermined path through said aperture, and a plurality of pilot burners positioned to project flames in different directions across the path of the fuel to ignite the fuel, one of said pilot burners positioned to project a flame through said passageway into said aperture, and another of said pilot burners positioned to project a flame adjacent said aperture.

6. In a heating system, a combustion chamber having an aperture, means positioned outside the chamber for projecting a stream of fuel into the chamber by way of the aperture, a pilot burner for projecting a flame at a predetermined angle across the stream between said fuel projecting means and said aperture, and a second pilot burner for projecting a flame into said aperture across the stream at a different angle.

7. In combination, a furnace having a combustion chamber, a duct extending through the furnace to the combustion chamber, a wall partially closing the duct and having an aperture, means positioned outside the furnace for projecting a stream of fuel through the aperture, means for projecting a pilot flame at a predetermined angle across the fuel stream on one side of the wall, and means for projecting a second pilot flame through the wall into the aperture and across the fuel stream.

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