June 14, 1927.

1,632,402

A. E. GRANT

OIL BURNER

Filed May 2, 1921

2 Sheets-Sheet 1

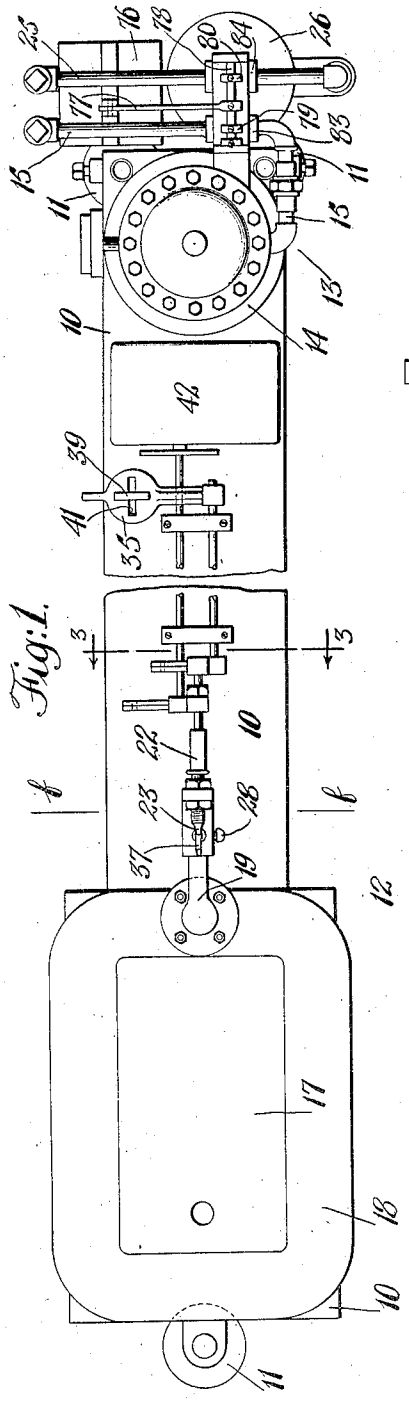

Fig. 1.

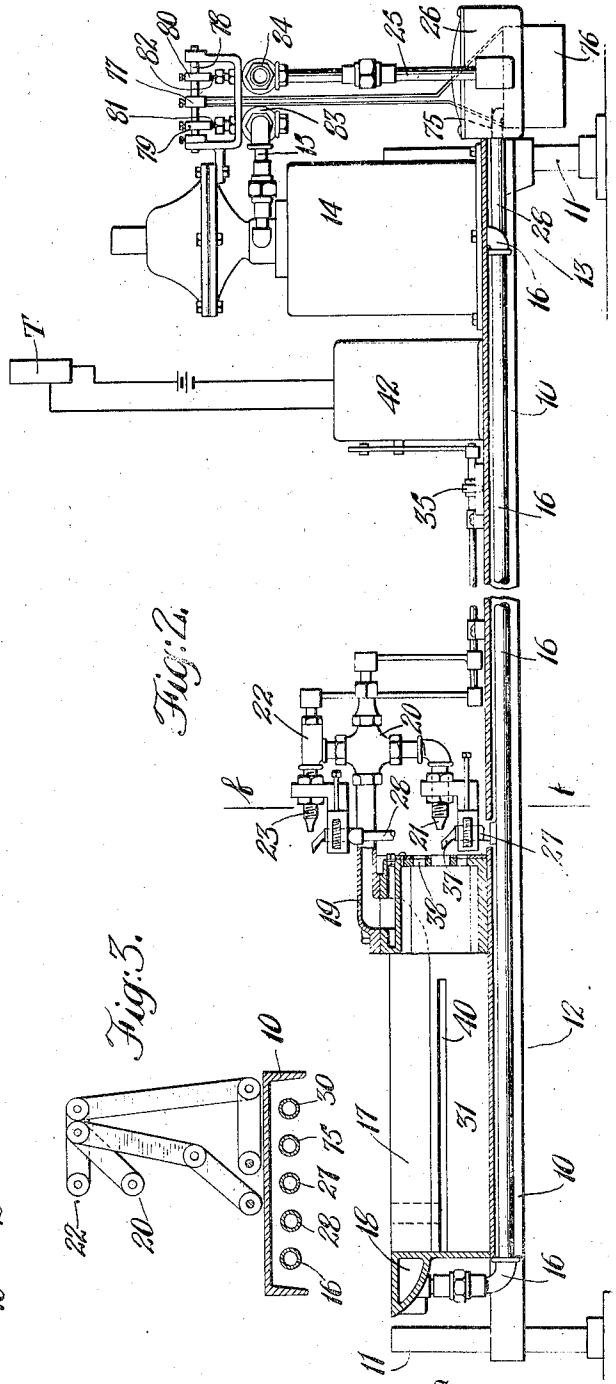

Fig. 2.

Fig. 3.

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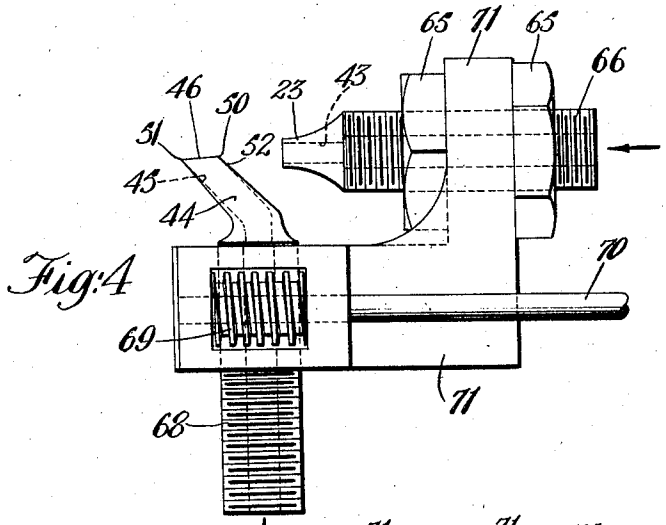

Fig. 4

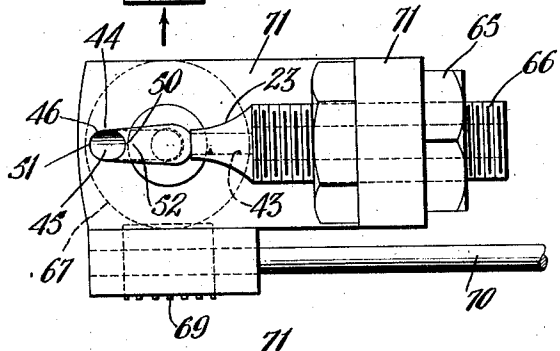

Fig. 5.

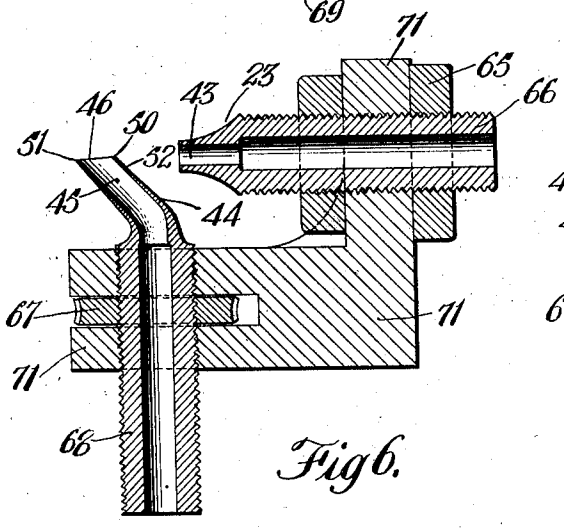

Fig 6.

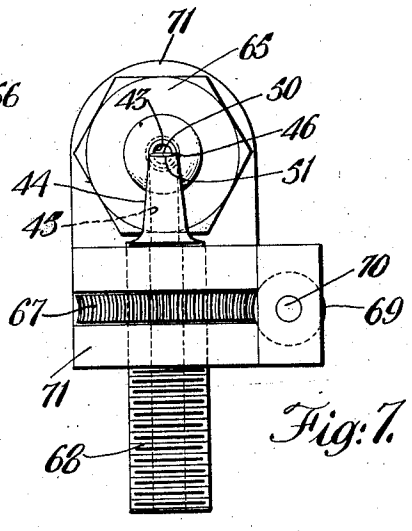

Fig. 7.

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UNITED STATES PATENT OFFICE.

ALBERT E. GRANT, OF NEW YORK, N. Y., ASSIGNOR TO CALOROIL BURNER CORPORATION, A CORPORATION OF DELAWARE.

OIL BURNER.

Application filed May 2, 1921. Serial No. 466,183.

This invention relates to oil burners and particularly to burners for a heavy oil such as crude petroleum. The chief object of the invention is to provide a burner which will burn crude petroleum in an efficient manner and without requiring constant attention and frequent cleaning. Further objects of the invention particularly in adapting the burner for a furnace or boiler will appear from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a plan view of apparatus illustrating one embodiment of the invention,

Fig. 2 is an elevational view of the same with parts in section,

Fig. 3 is a sectional view on line 3—3 of Fig. 1, and

Figs. 4 to 7 are views of the flame forming nozzle on enlarged scale.

In the embodiment of the invention shown in the drawings a base or stand 10 is supported by three legs 11 adjustable in length to position the apparatus horizontally with one end 12 in the fire space of a furnace or boiler and the remainder of the apparatus to the right of line *f*—*f* projecting outward from the front of the fire space. On the outer end 13 of the base 10 is mounted the pressure reducing and equalizing tank 14 receiving the water supply through pipe 15 and passing it on at reduced even pressure through pipe 16 leading to the extreme inner end of the steam generator 17 which is a casting forming a hollow conduit 18 heated by the burner. Steam from the generator 17 passes out through the conduit 19 to the valve 20 and when this valve is open the steam passes down to lower nozzle 21 and also upward to valve 22 controlling the flow to upper nozzle 23, the valve 22 independently shutting off or turning on the steam to this upper nozzle. The oil supply enters by the pipe 25 passing to float feed chamber 26 from which the oil is led by the pipes 27—28 leading to the lower and upper nozzles respectively. A gas pipe 30 is provided leading to the lower combustion chamber 31 in the space enclosed by the generator 18.

When the generator has been heated sufficiently to get up steam the valve 20 is opened by turning the lever or handle 35 and the steam passing out of nozzle 21 draws up oil from the pipe 27 through the inclined pipe 37. Air is also drawn into the mixture of steam and vaporized oil and a shutter device 38 may be provided to control the amount of air. In this way a flame forming mixture is projected into the lower combustion chamber 31 and is ignited by the priming gas flame from the pipe 30. The gas supply may now be turned off by turning the handle 39 of the gas valve of pipe 30 to the crosswise position shown in Fig. 1, the oil lever 35 being, however, turned from its position in this figure.

The steam opening of the lower nozzle 21 is relatively small and produces a relatively small flame simply filling chamber 31 and passing out through the slot 40 and around the generator 17. This lower smaller flame is in effect a pilot flame which is in constant operation throughout the entire season or during a cold spell. It serves to maintain a supply of steam and to keep the fire space of the furnace or boiler warm and ready for the upper larger flame of the nozzle 23.

The upper nozzle 23 has its steam supply controlled by the valve 22 operated through intermediate linkages by a motor in box 42 which motor may be controlled from a distant point such as a thermostat T operating the motor to open or close the valve 22 according as the temperature at the point T is below or above a set normal. This permits each of the nozzles 21—23 to be made or set for a given size of flame without requiring any further adjustment. The upper nozzle will have a much larger passage than the lower nozzle and its size will depend upon the particular installation so that the burner may be adapted for various sizes and types of heaters simply by changing the size of the nozzle 23 and arranging the deflecting means for the flame from this nozzle to fit in the corresponding fire space. In this way also maximum efficiency of both nozzles is attained.

The flame forming nozzle of this invention is shown in enlarged scale in Figs. 4 to 7 and comprises essentially a steam nozzle such as 23 having a passage 43 directed for instance horizontally and an oil pipe 44 inclined preferably about 45° in the direction of the jet and having an oil passage 45. The end of the oil pipe 44 is positioned in

the path of the steam jet and is slightly inclined downward with relation to the axis of this jet so that the passage opens in the direction of the jet. The edge 46 of the oil pipe 44 is preferably made thin with the surrounding surfaces rounded. The rear point 50 of the edge 46 is slightly higher than the front point or lip 51 and the steam jet striking along the back surface 52 is deflected upward and outward sweeping around the edge 46 on smooth lines and merging finally with the other jet lines. The result is not only the creation of a vacuum but a drawing of the steam particles along the edge 46 keeping it clean and free from any accumulation of thickened oil. The point 50 is preferably positioned in the jet above the center line of the opening 43 and for the structure shown in the drawings it has been found that the most efficient action is obtained with point 51 at a distance of nearly one third of the radius of passage 43 above the center.

The distance between the nozzle 23 and oil pipe 44 along the axis of the jet will depend upon the particular results desired and upon the steam pressure and the size of the orifice 43. In the example shown in the drawings the point 51 is spaced from the end of the nozzle about three times the diameter of the nozzle passage 43. In the flame forming nozzle of this invention the diameter of the oil duct or passage 45 is very large and the oil is sucked therethrough from a lower constant level so that a constant resistance is imposed on the oil feed due to the distance the oil has to be raised to reach the edge 46. In the nozzle 23 with a steam orifice 43 of one eighth of an inch and relatively low steam pressure of less than twenty pounds per square inch the oil passage 45 may be one quarter of an inch in diameter. In nozzle 21 with a steam orifice of less than one sixteenth of an inch corresponding to drill No. 50 the oil passage 45 will preferably be about one eighth of an inch. This large oil passage and high suction and direct action of the steam on the edge 46 provide a flame forming nozzle that not only efficiently draws up and vaporizes and mixes the oil but also avoids all stoppage or stuffing of the oil passages. The steam stream surrounds the oil which does not come into contact with the air until at some distance from the nozzle so that the flame never approaches the oil in liquid form and the temperature of the oil passage at the edge 46 is constantly that of the steam.

Relative adjustment of the steam and oil passages may be provided as by nuts 65 threaded on the nozzle stem 66 and by worm wheel nut 67 threaded on the stem 68 of the oil pipe. The worm wheel 67 is turned by worm 69 on rod 70 and this adjustment automatically locks the parts at each setting. All the parts may be mounted in a single frame 71. The relatively low level of the oil in float chamber 26 withdraws the oil from each nozzle whenever the corresponding jet is stopped so that the feed of the oil automatically ceases with the stopping of the steam. In order to prevent the feeding of the oil into hot combustion chambers without ignition the gas supply and the steam supplies through valve 20 are interlocked as indicated at 35—39 in Fig. 1. The handle 39 of the gas valve is provided with a slot 41 arranged to fit over handle 39 and lock the lever 35 with valve 20 closed when the gas supply is shut off. In order to release the lever 35 for opening of the valve 20 it is necessary to first turn the handle 39 of the gas valve to open the gas valve before the lever 35 can be raised to open the steam valve 20. Therefore if the combustion chambers are hot the pilot gas flame will light in advance of the turning on of the oil flames and these in turn will be immediately ignited by the gas flame.

In case, as through an accident, there is any leakage of oil or water this collects and drains off through the pipe 75 and into the pan 76 hung from the end of the lever 77. Fluid dripping into the pan 76 when accumulated in sufficient quantity will pull down on the lever 77 and turn the shaft 78 so that the cams 79—80 will be turned to release the plungers 81 and 82. These plungers 81 and 82 when released will close the valves 83 and 84 in the water and oil supplies respectively to turn off both of these supplies. In order to turn on these supplies again it is necessary to slide the shaft 78 to the right depress the plungers 81 and 82 and lift the lever 77 back to normal position and then slip the shaft 78 and cams 79 and 80 back from the depressed plunger. The apparatus is thus effectively safeguarded against flooding the premises by the accumulation of dripping liquid.

The apparatus of this invention positions all parts for convenient inspection and adjustment. The large flame forming nozzle may have its jet directed against fire brick baffles to guide the flame in any desired manner suiting the requirements of the furnace stove or boiler in which it is installed. The apparatus is adaptable to a wide variety of uses and the invention is not confined to installations of the type shown in the drawings but is intended to cover such further uses as fall within the scope of the appended claims.

I claim:—

1. A portable burner to be installed in connection with a furnace, comprising a unitary base member adapted to be supported within the furnace at one end, steam generating and flame forming apparatus detachably mounted at the furnace end of said base member, fuel and water control means de-

tachably mounted on the other end of said base member, and connections between said steam generating and flame forming apparatus and control means extending along said base.

2. In an oil burner the combination with a steam generator, nozzles fed thereby, an oil supply for the jets from said nozzles, means for collecting any leaking fluid from said apparatus, and means for shutting off the steam and oil supply by said collecting means comprising cam control valves.

3. In an oil burner the combination with a steam generator, nozzles fed thereby, an oil supply for the jets from said nozzles, means for collecting any leaking fluid from said apparatus, means for shutting off the steam and oil supply by said collecting means comprising cam control valves, and means for tripping the cams of said valves.

4. In an oil burner adapted to be inserted in the fire space of a furnace, the combination with a steam supply, of a gas supply for priming, valves controlling said supplies, and interlocking means between said valves locking said steam supply until said gas supply valve has been opened.

5. In an oil burner the combination with a flame forming means, of a steam supply therefor, a gas supply for said burner and means for interlocking said steam supply and said gas supply so that the gas supply must be turned on in advance of the steam supply.

6. In an oil burner the combination with a steam generator, of a lower burner and an upper burner heating said generator and receiving their supply of steam therefrom, a common valve for the steam supply to said burners, and a separate automatically operated valve for the steam supply to one of said burners.

7. In an oil burner the combination with a steam supply, of a lower burner and an upper burner, a common valve for the steam supply to said burners and a separate valve for the steam supply to one of said burners, said second valve being controlled by a thermostat.

ALBERT E. GRANT.