

May 5, 1925.

R. O. HUMPHREY.

1,536,583

HYDROCARBON BURNER

Filed Feb. 18, 1922

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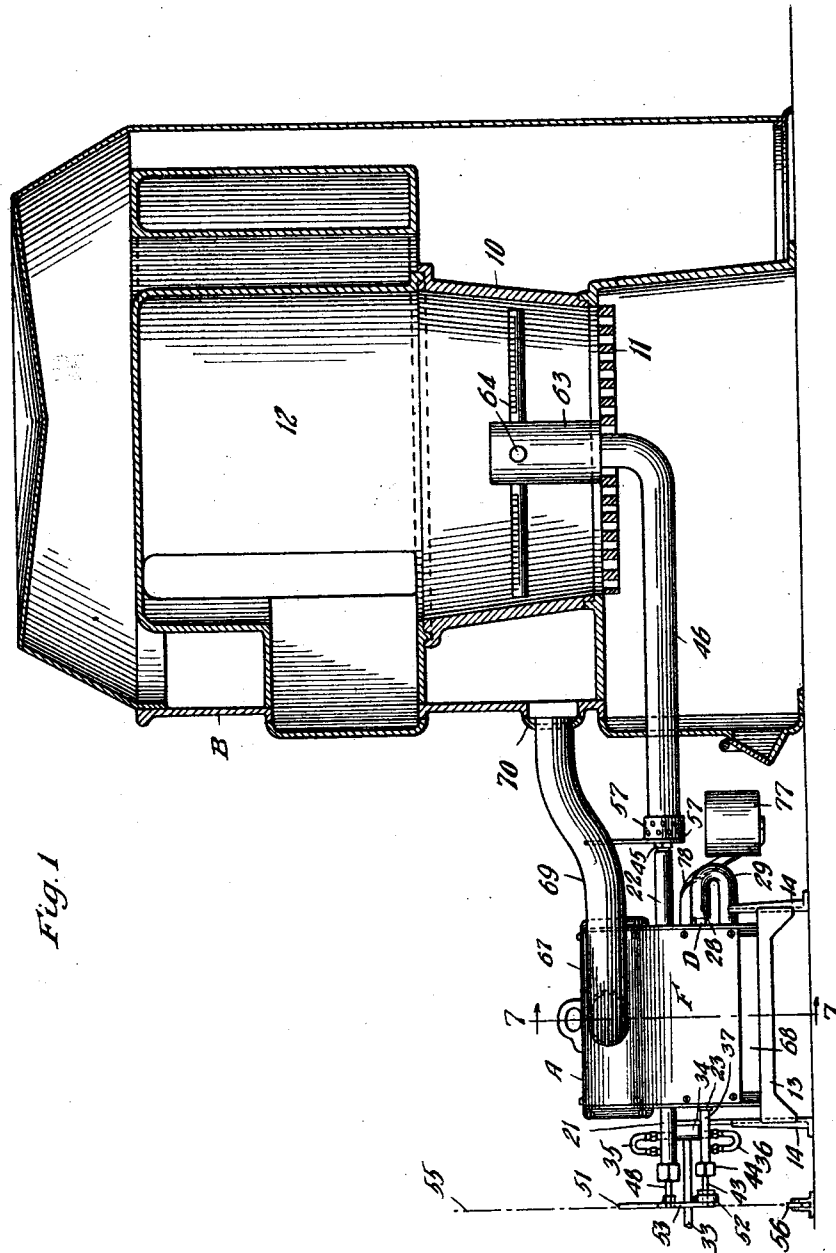


Fig. 1

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4 Sheets-Sheet 2

Fig. 3

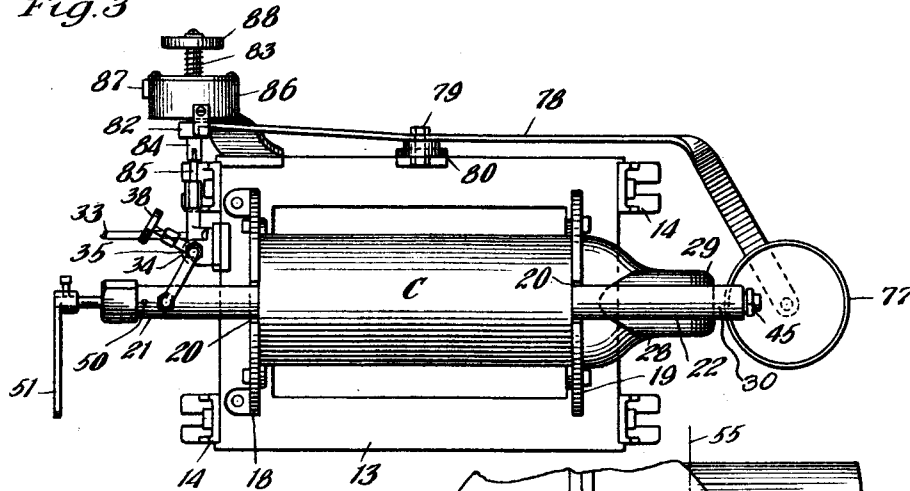
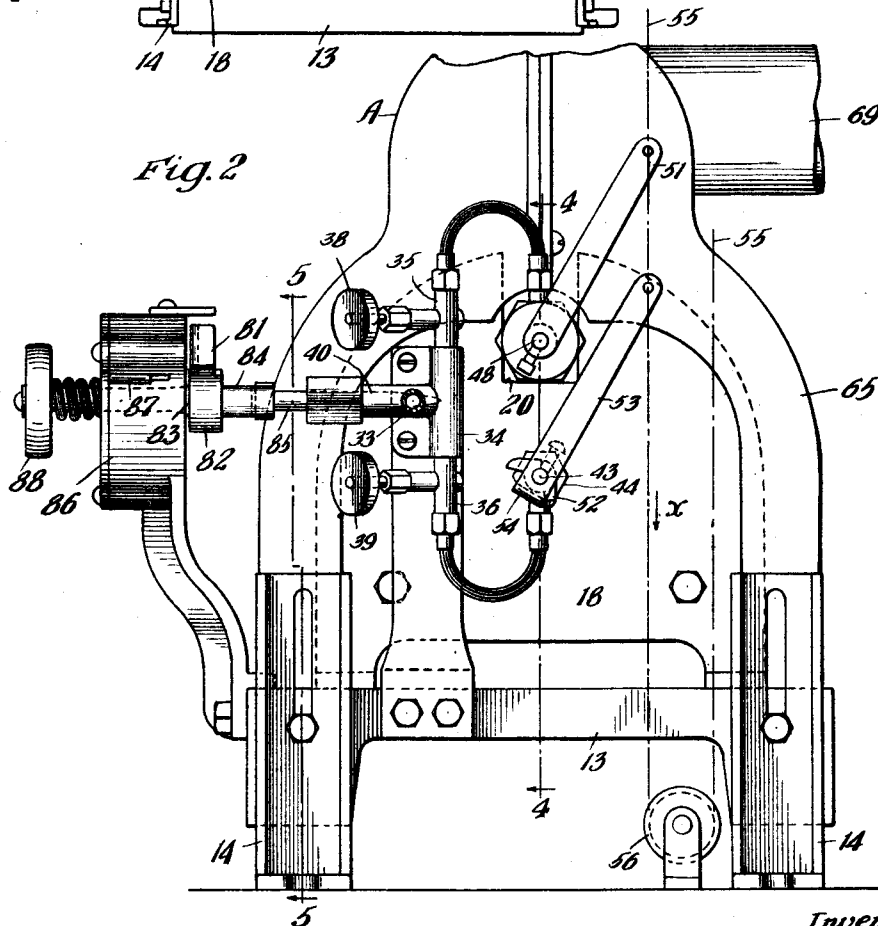


Fig. 2



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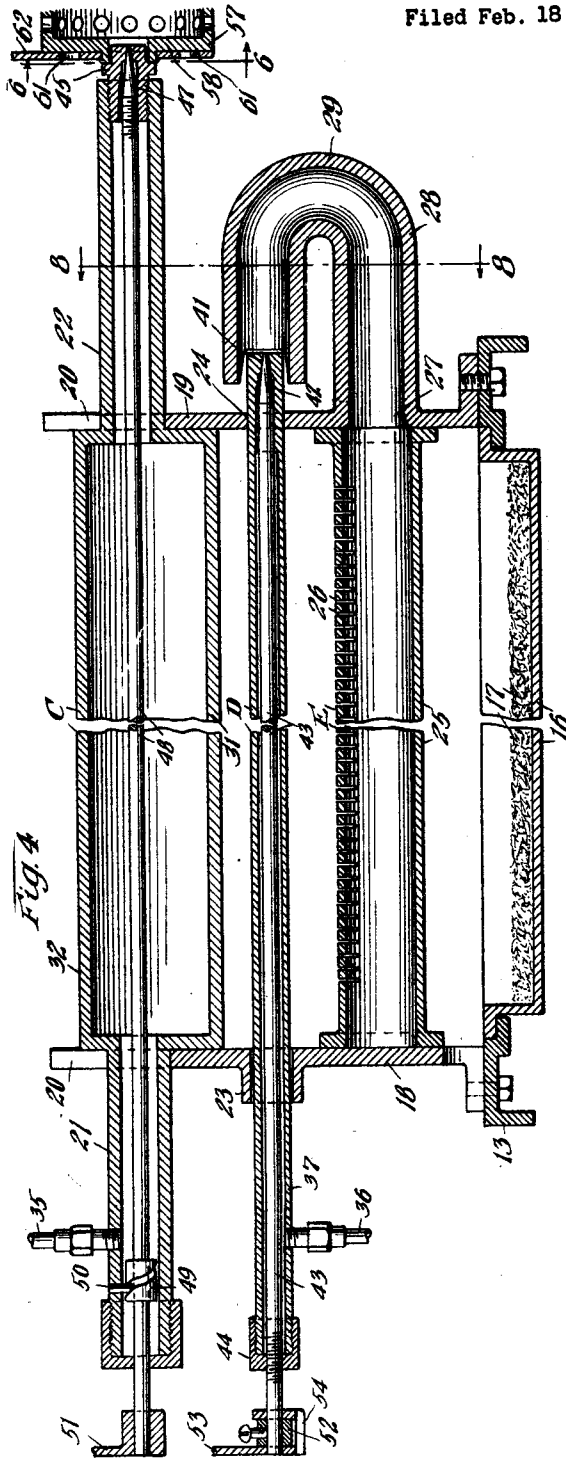
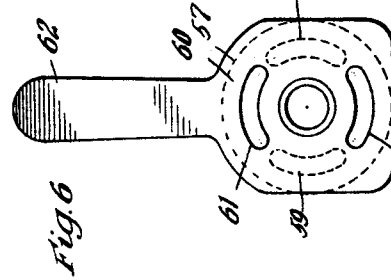
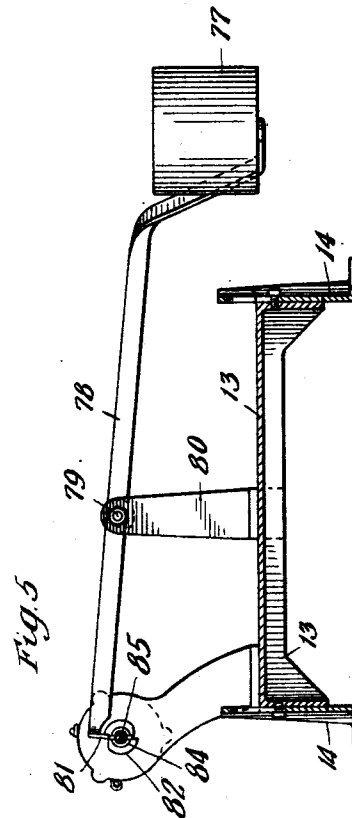
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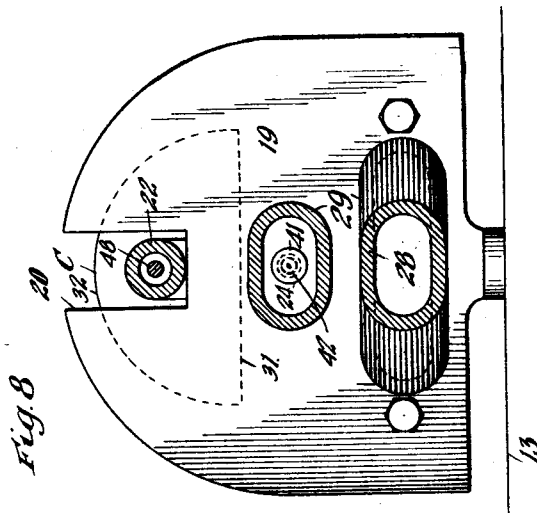
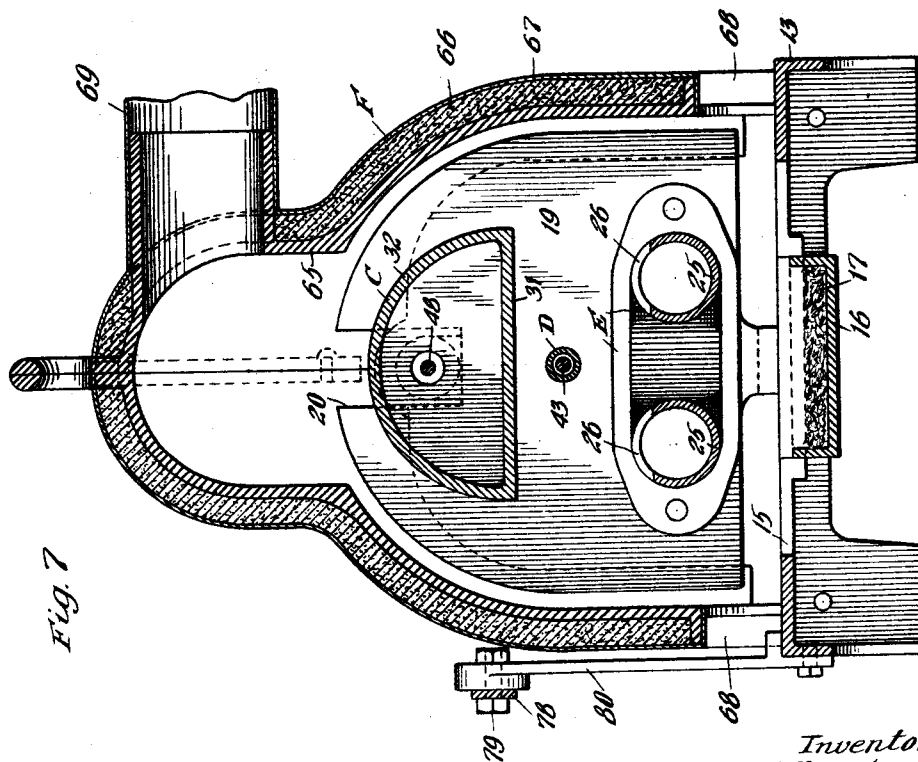
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

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HYDROCARBON BURNER.

Application filed February 18, 1922. Serial No. 537,366.

To all whom it may concern:

Be it known that I, RALEIGH O. HUMPHREY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Hydrocarbon Burners, of which the following is a full, clear, concise, and exact description reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in hydrocarbon burners.

One object of the invention is to provide a burner adapted to use kerosene or other relatively low grade hydrocarbon fuel and wherein the fuel is continuously vaporized before being mixed with air.

Another object of the invention is to provide a hydrocarbon burner wherein are employed main and auxiliary vaporizing generators providing the vaporized fuel for maintaining the necessary temperature of both generators and all fuel vaporized in the main generator being utilized productively.

Another object of the invention is to provide a hydrocarbon burner which is especially adapted for use with furnaces, hot water heaters and the like to replace the usual fuel, said burner having means for automatically regulating the amount of vaporized fuel and provided also with means for automatically shutting off the supply of the hydrocarbon fuel to the burner when the flame is extinguished from any cause.

Other objects of the invention will more clearly appear from the description and claims hereinafter following.

In the drawings forming a part of this specification, Figure 1 is a combined side elevation and vertical sectional view of a burner embodying my improvements and a hot air furnace with which the burner is adapted to be employed. Figure 2 is an enlarged end elevational view of the improved burner shown in Figure 1. Figure 3 is a top plan view of the improved burner with the cover or casing removed. Figure 4 is an enlarged vertical, longitudinal sectional view of the burner corresponding to the section line 4—4 of Figure 2. Figure 5 is a detail vertical sectional view corresponding to the section line 5—5 of Figure 2. Figure 6 is an elevational view of an air

controlled valve for the mixer and corresponds approximately to the section line 6—6 of Figure 4. Figures 7 and 8 are vertical sectional views taken transversely of the burner and corresponding with the section lines 7—7 of Figure 1 and 8—8 of Figure 4, respectively.

In said drawings, my improved burner is designated generally by the reference character A and the hot air furnace with which it is shown associated is indicated by the reference character B. The furnace B is shown as provided with a fire pot 10, grate 11, combustion chamber 12 and suitable flues customary in air furnaces. As will be understood by those skilled in the art, my improved burner may be employed with hot water or steam heaters.

The improved burner, as shown, employs a main base or bed plate 13, to the four corners of which are vertically adjustably attached pedestals or feet 14—14 so that the height of the burner from the floor or other support may be adjusted, as will be understood. The base plate 13 is cut away centrally as indicated at 15 in Figure 7 and disposed within said opening is a removable pan 16 filled with absorbent material 17 so that a priming pan is thereby provided to be used when the burner is first started.

Secured to the base plate 13 near each end thereof are vertically extending standards or end plates 18 and 19, the latter being arranged parallel as shown best in Figure 3. Said end plates 18 and 19 are preferably bolted or otherwise detachably secured to the base plate 13. The end plates 18 and 19 are notched at the tops thereof as indicated at 20 in Figures 7 and 8 and within said notches 20 are adapted to be received the extended ends 21 and 22 of the main generator C.

Below the main generator C is located the auxiliary generator D, preferably in the form of a pipe, which is extended through a sleeve or bearing 23 provided in the end wall 18 and through an opening 24 in the end wall 19.

Below the auxiliary generator D and extending between and secured to said end walls 18 and 19 is the burner proper designated generally by the reference character E. Said burner proper E, as shown, consists of two horizontal and parallel ar-

5 ranged pipes 25--25 laterally separated and each provided on the top thereof with a series of transversely extending burner slots 26--26. The pipes 25 are supplied with vaporized fuel mixed with air through openings 27--27 in the end wall 19 which are in communication with a mixing chamber 28 provided in an integral goose neck pipe 29, the upper end 30 of which is extended over the delivery end of the auxiliary generator D.

10 The main generator C, as shown best in Figure 7, is of semi-cylindrical formation having a flat bottom wall 31 and a curved upper wall 32. The width of the flat bottom wall 31 is slightly greater than the distance from the outside point on one pipe 25 to the outside point on the other pipe 25 so that the flame arising from the pipes 25 will strike against the flat bottom wall 31 of the main generator and heat the latter intensely, at the same time heating the auxiliary generator D which is located between the main generator and the burner proper and intermediate the pipes 25 of the burner proper.

15 The fuel is applied to the burner from a tank, not shown, which may be arranged to feed the fuel either under gravity or under air pressure, the fuel being supplied through a main feed pipe 33 (see Figures 1 and 2) which leads into a T-coupling 34 from which are extended upper and lower branch feed pipes 35 and 36 leading to the extended end 21 of the main generator C and the extended end 37 of the auxiliary generator D respectively. In the branch pipes 35 and 36 are individual manually operated control valves 38 and 39, respectively. There is also a main control valve 40 for the main supply pipe 33, said valve 40 being operated automatically, as hereinafter explained.

20 The fuel supplied to the auxiliary generator D, through the branch feed pipe 35, flows along the pipe-like generator D and will be vaporized and ejected as a vapor through the discharge nozzle 41 into the goose neck mixing chamber, heretofore referred to. The amount of vaporized fuel delivered from the auxiliary generator is controlled by a needle valve 42 having a rod 43 which extends out of the left hand end, as viewed in Figure 4, and has threaded connection with a nut 44.

25 The fuel supplied to the main generator C through the branch pipe 35, is vaporized within the main part of the generator and is delivered through the extension 22 and finally through a nozzle 45 into the air mixing pipe 46. The amount of vaporized fuel delivered through the nozzle 45 is controlled by another needle valve 47 carried at the end of an operating rod 48, the opposite end of said rod 48 having a steep pitch thread sleeve 49 secured thereon and with which

cooperates a pin 50 so as to produce relatively great movement longitudinally or axially of the needle valve 47 for comparatively small arcs through which the operating rod 48 is turned, for the purpose hereinafter described.

30 The outer end of the operating rod 48, as shown in Figures 2 and 4, has rigidly secured thereto a lever 51. The other valve operating rod 43, at its outer end, has rigidly secured thereto a two-armed bushing 52 and a loosely mounted lever 53, the inner extended end 54 of which works between the arms of the bushing 52 to provide for a predetermined amount of angular lost motion. The levers 51 and 53 are extended in the same general direction and are adapted to be connected to and to be simultaneously and similarly operated by a chain or cable 55 which passes around a suitable pulley 56, said chain or cable being operated by a suitable motor, not shown, the motor in turn being controlled by any of the well known types of thermostats so that when the temperature of a room heated from the furnace B, reaches a predetermined maximum, the motor will be operated so as to move the chain or cable in the direction indicated by the arrow *x* and when the room temperature reaches a predetermined minimum, the chain or cable is operated in the opposite direction. In this manner, automatic control of any improved burner is readily obtained, as will be understood.

35 It is of course desirable that the auxiliary generator be never entirely shut off automatically except in extreme cases and it is also desirable that said auxiliary generator be maintained at a fairly constant temperature without waste of fuel. For this purpose, the lost motion is provided for between the lever 53 and the needle valve rod 43 so that, although the operating rod 48 for the control valve of the main generator C will respond quickly and fully to all movements of the chain 55, on account of the steep pitch thread and pin 49--50, the auxiliary generator D will not be affected by small or minor movements of the chain 55 and will only be affected when a relatively great change is required in the amount of fuel vaporized for the burner proper E. In this manner, while only a slight amount of vaporized fuel may be required in the furnace or other heating apparatus, nevertheless the temperature of the main generator as well as the auxiliary generator can be maintained without unnecessary waste of fuel and in condition to immediately start vaporizing any quantity of fuel in the main generator when heat is required in the furnace.

40 The vaporized fuel from the main generator C is supplied to the mixing pipe 46 as hereinbefore explained. The latter, at its

admission end, is provided with a circumferentially perforated bushing 57. Said bushing 57 is also provided in the wall 58 thereof adjacent the needle valve, with a pair of diametrically disposed arcuate slots 59—59 which are adapted to be covered and uncovered by a rotatable valve 60 having corresponding diametrically disposed slots 61—61 (see Figure 6). The plate valve 60 has a handle 62 adapting it for manual control.

The air mixing pipe 46 is entered through the ash door or other suitable opening of the furnace beneath the grate and then extended upwardly through the latter into a cylindrical chamber 63 from which are extended laterally a series of burner pipes 64—64, the latter of course being located within the fire pot 10.

The generators C and D and the burner proper E are enclosed or covered over by a casing or shell F, the latter being supported on the base plate 13 and removable therefrom. Said shell or casing F consists preferably of an inner cast iron wall 65 covered with a layer of asbestos or mineral wool 66 and an outer layer of sheet metal 67. As will be understood by those skilled in the art, vents 68—68 are left on the sides so as to admit the necessary amount of air for combustion. To utilize the heat from the burner proper, which would otherwise be dissipated from within the casing F, the products of combustion are led through a lateral pipe 69 and conducted to the interior of the furnace through any suitable opening in the front thereof, generally the usual flue door 70, so that said products of combustion are utilized productively in heating the air or water, as the case may be.

To automatically shut off the supply of fuel to my improved burner, in the event the generators or burner proper are stopped for any reason, I employ the following arrangement. Disposed beneath the discharge nozzle 45 on the main generator and below the perforated bushing is a drip pan 77 carried on the end of a lever 78 which is pivoted intermediate its ends as noted at 79 to an upright arm 80 secured to the base plate 13. The opposite end of said lever 78 is formed with a latch or trigger finger 81 cooperable with a notched or shouldered wheel 82 rigid with a horizontally extending shaft 83. Said shaft 83, on its end nearest the main shut-off valve 40, carries a slotted clutch member 84 which in turn cooperates with a second clutch member 85 on the end of the operating rod for the valve 40. Said shaft 83 is rotatably mounted in suitable bearings provided by a spring housing 86 and within the latter, said shaft 83 has one end of a coil plate spring 87 secured thereto, the opposite end of said

spring being secured to the housing. The shaft 83 is extended beyond the end of the housing 86 and carries a hand wheel 88.

The arrangement is such that the spring 87 tends to rotate the shaft 83 in counter clockwise direction in Fig. 5 for closing the valve 40. When the valve is opened manually by the use of the hand-wheel 88, the finger 81 by engagement with the notched wheel 82 holds the valve open, the lever 78 being slightly overbalanced for holding the finger 81 by gravity in operative position. When, however, the pan 77 begins to fill with liquid fuel dripping from the main generator, the lever 78 will be overbalanced in the opposite direction and thus release the shaft 83 and allow it to rotate counterclockwise under the influence of the spring 87 and thus close the main valve 40 and prevent further supply of fuel to either of the generators.

I claim:

1. In a hydrocarbon burner, the combination with a main vaporizing generator of elongated form and with a substantially broad flat side at the bottom, of a smaller auxiliary generator positioned centrally beneath the main generator, means for supplying fuel to each of said generators, a burner proper consisting of two burner units located beneath said main and auxiliary generators and at either side of the auxiliary generator and adapted to project flames therefrom against the flat side of the main generator, and means for supplying vaporized fuel admixed with air from said auxiliary generator to said burner proper.

2. In a hydrocarbon burner, the combination with a main vaporizing generator of elongated form and semi-cylindrical cross section with the flat side thereof at the bottom: an auxiliary generator arranged parallel with and centrally below said main generator; means for supplying fuel to both of said generators; a burner proper consisting of two similar burner units extending parallel with and located below said main and auxiliary generators; and means for supplying vaporized fuel admixed with air from said auxiliary generator to said burner proper.

3. In a hydrocarbon burner, the combination with a main vaporizing generator; of an auxiliary vaporizing generator in the form of a pipe; a burner proper comprising twin arranged laterally separated slotted pipes disposed below said auxiliary generator and the main generator; and means for supplying said burner proper with vaporized fuel.

4. A hydrocarbon burner adapted to be used in conjunction with a hard fuel heating apparatus located exteriorly of said apparatus, said hydrocarbon burner including a fuel-vaporizing generator, a burner

proper, means for conducting vaporized fuel admixed with air to the interior of said apparatus; a casing over said generator and burner proper; and a vent pipe
5 from said casing leading to the interior of said apparatus.

5. A hydrocarbon burner comprising, a base, end walls, twin slotted burner pipes extending between said end walls, an aux-
10 iliary generator located above and intermediate said twin burner pipes and arranged parallel to the latter, an air mixing

chamber between the delivery end of said generator and the admission end of said burner pipes, and a main vaporizing gener- 15 ator extending between said end walls and located above said auxiliary generator and the burner pipes.

In witness that I claim the foregoing I have hereunto subscribed my name this 20 1st day of February, 1922.

RALEIGH O. HUMPHREY.

Witness:

UNA C. GRIGSBY.