Dec. 28, 1948. G. P. KITTEL ET AL 2,457,683

PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

Filed Jan. 10, 1946 8 Sheets-Sheet 1

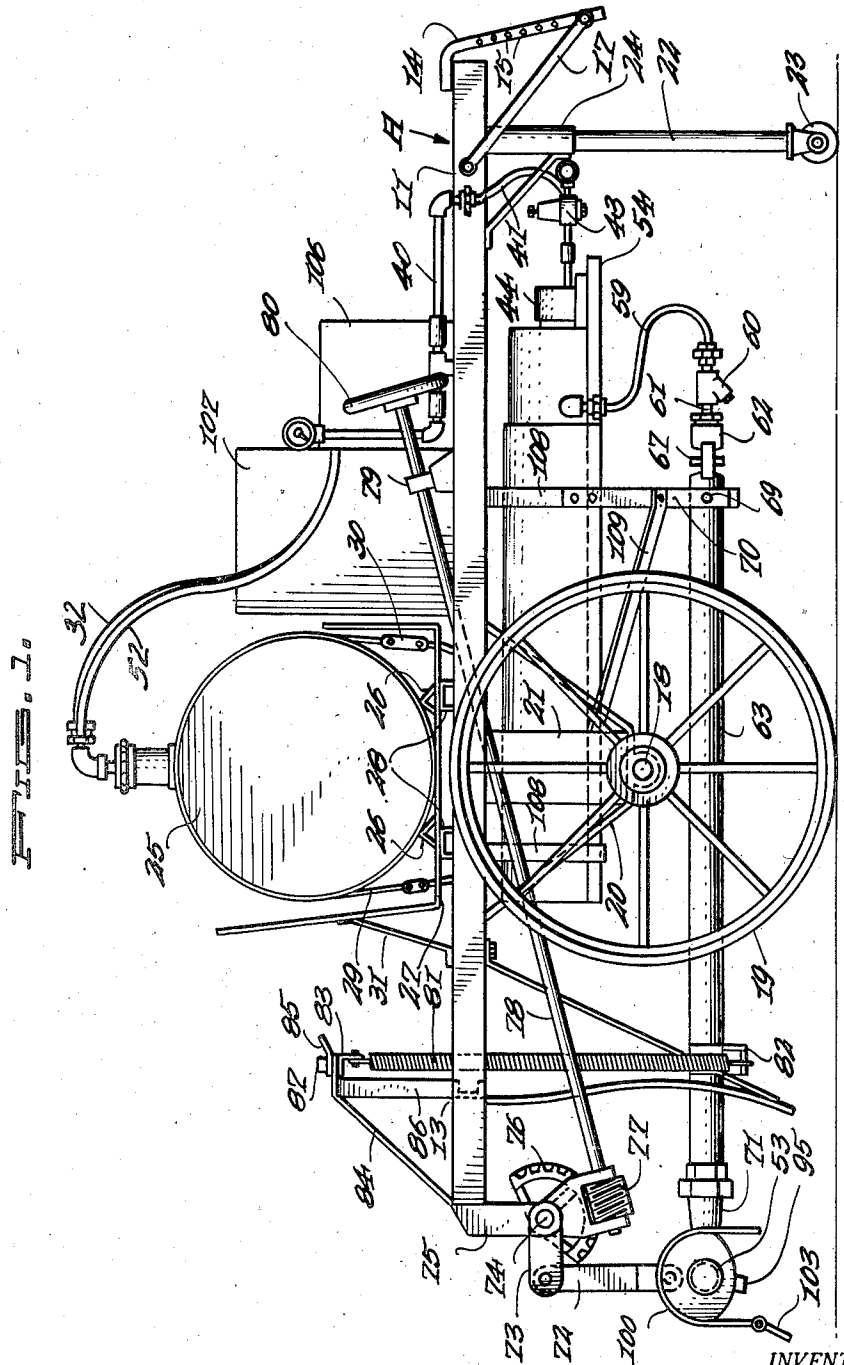


Fig. 1.

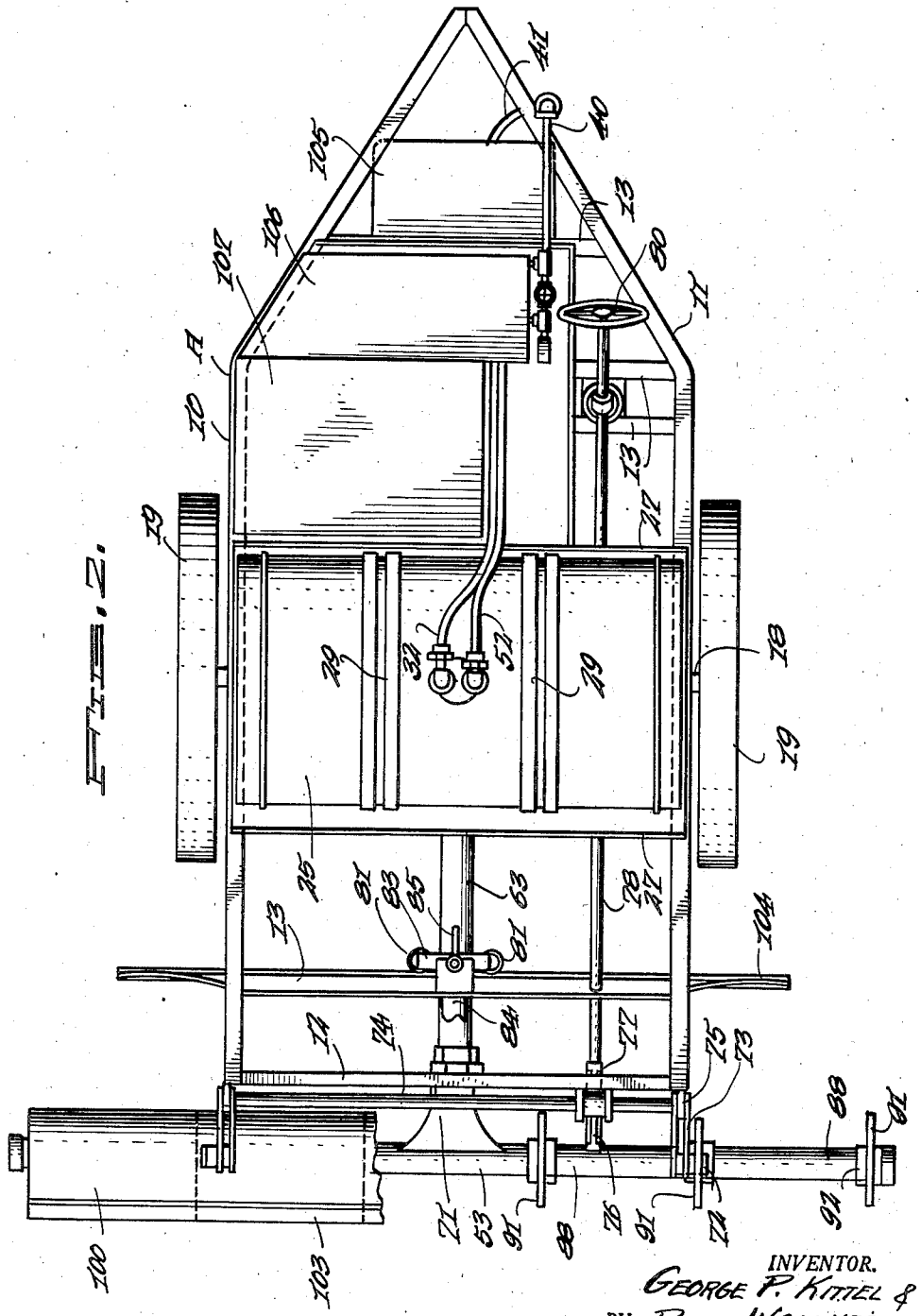
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PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

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FIG. 2.



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PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

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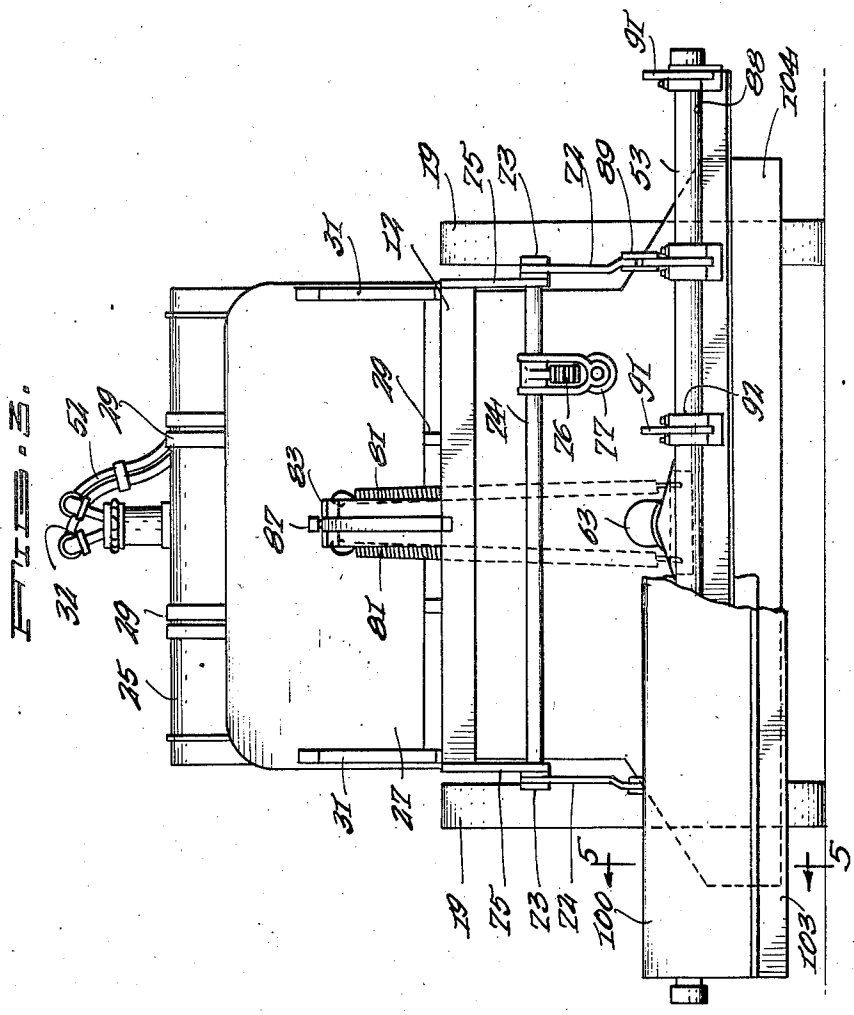


FIG. 3.

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PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

Filed Jan. 10, 1946 8 Sheets-Sheet 4

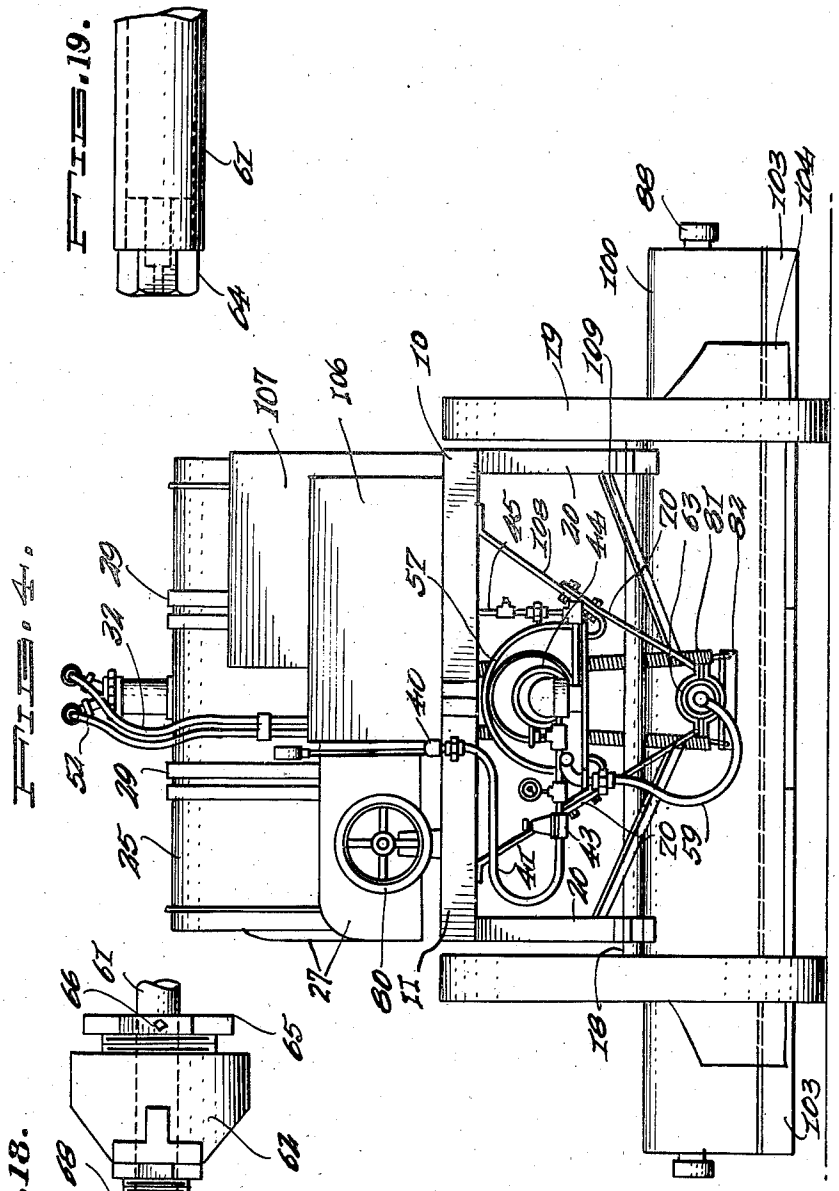


FIG. 19.

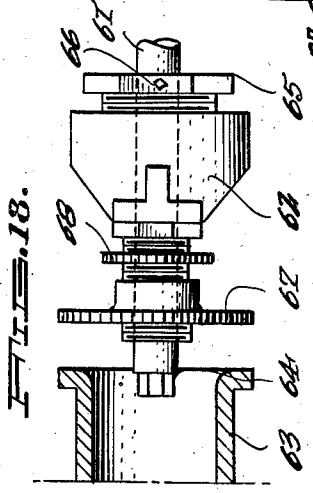


FIG. 18.

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PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

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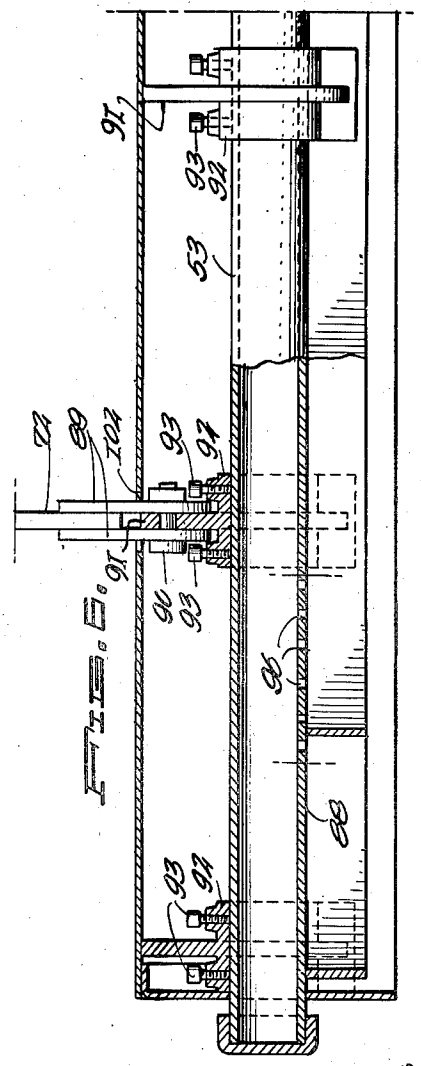


FIG. 6.

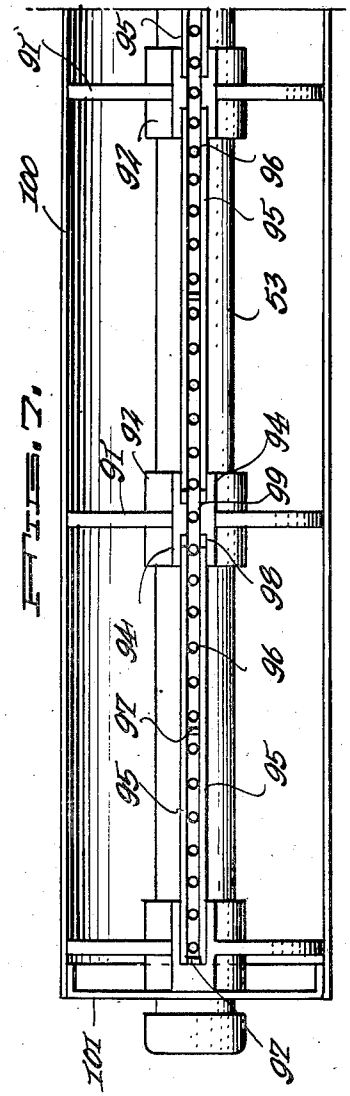


FIG. 7.

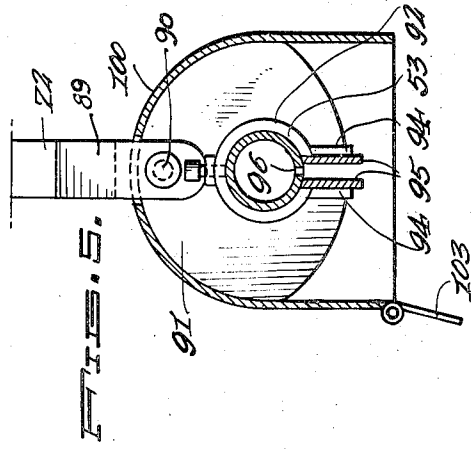


FIG. 5.

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PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

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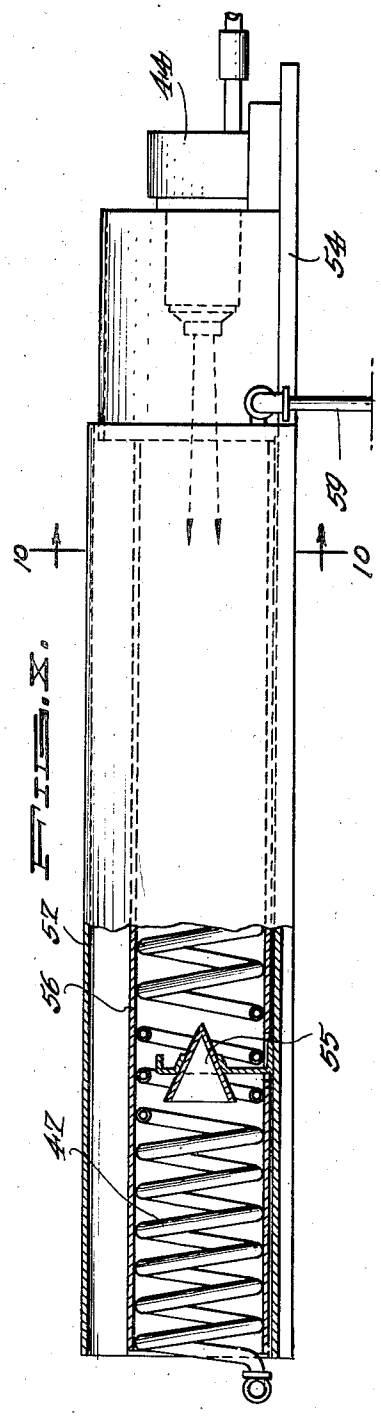


FIG. 9.

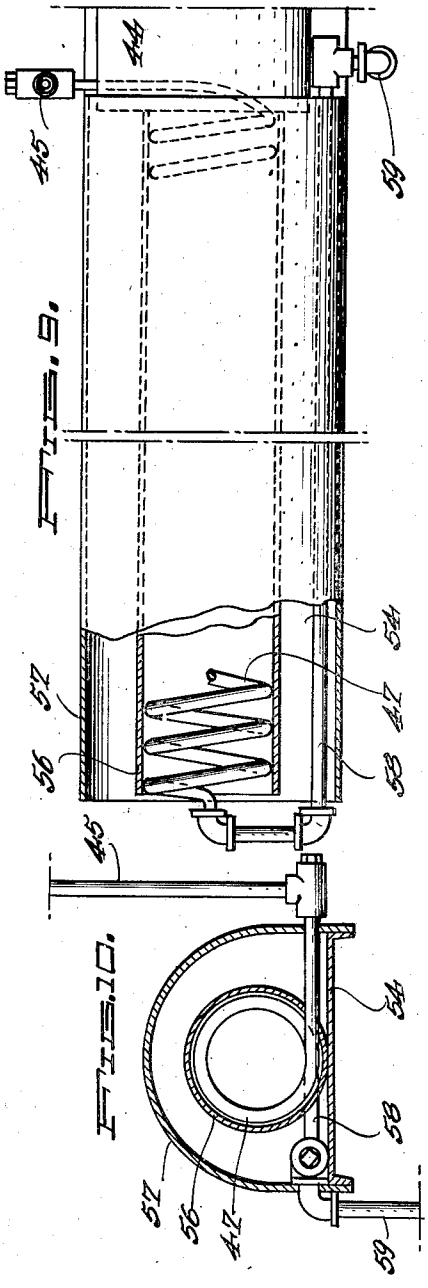


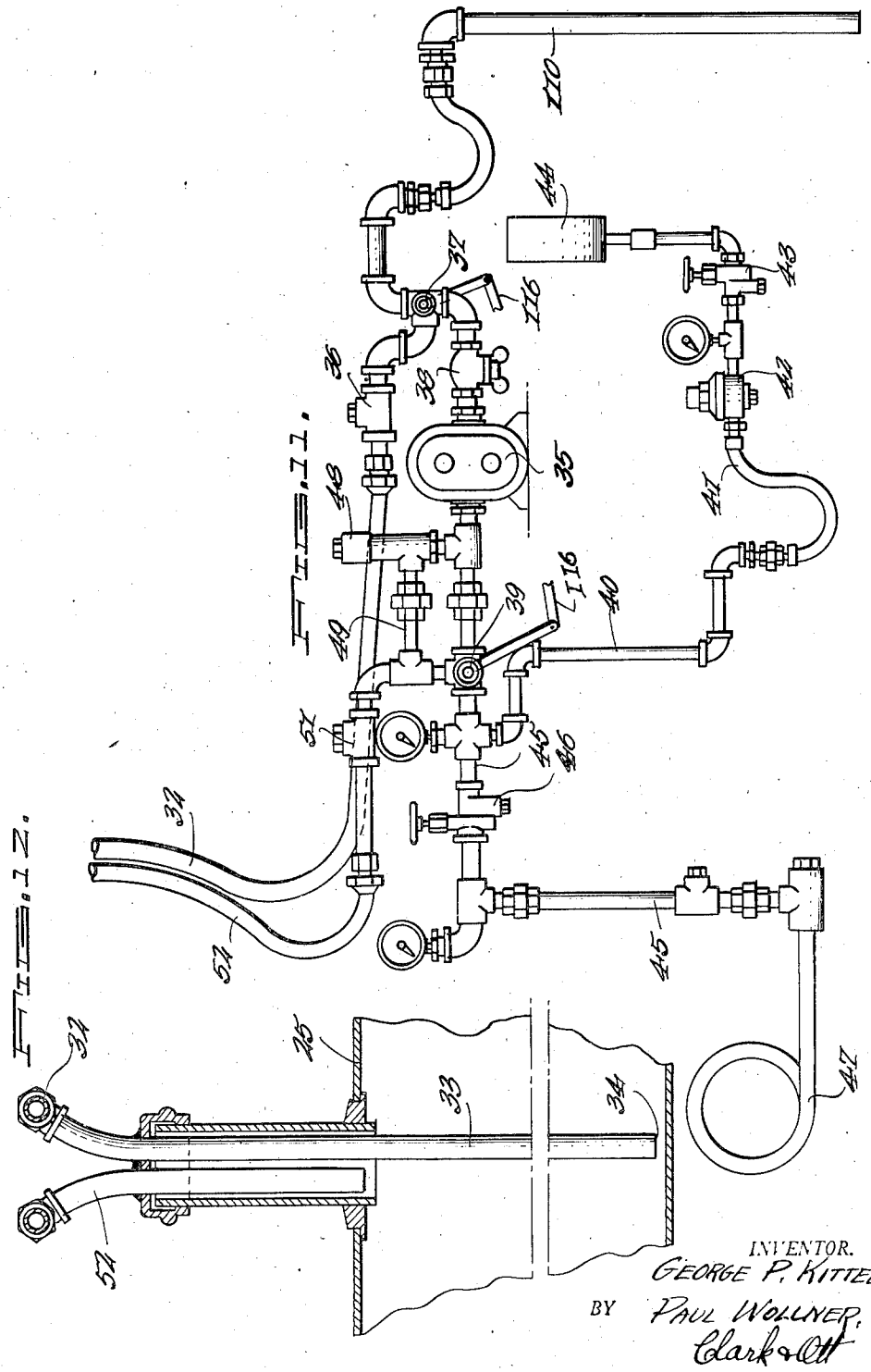
FIG. 10.

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PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

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PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

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FIG. 12.

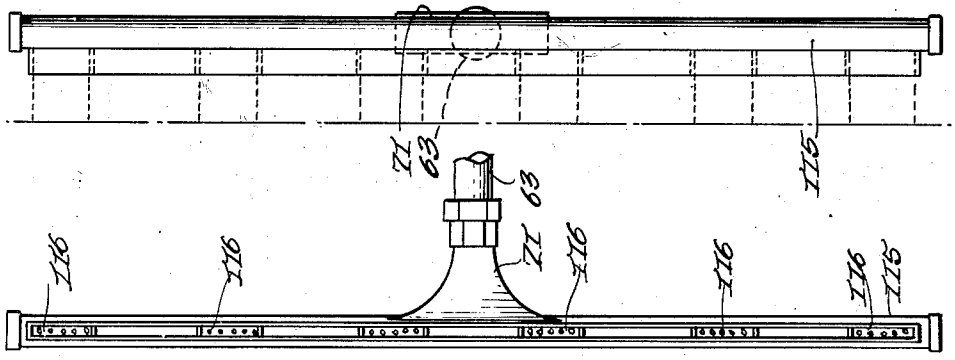


FIG. 13.

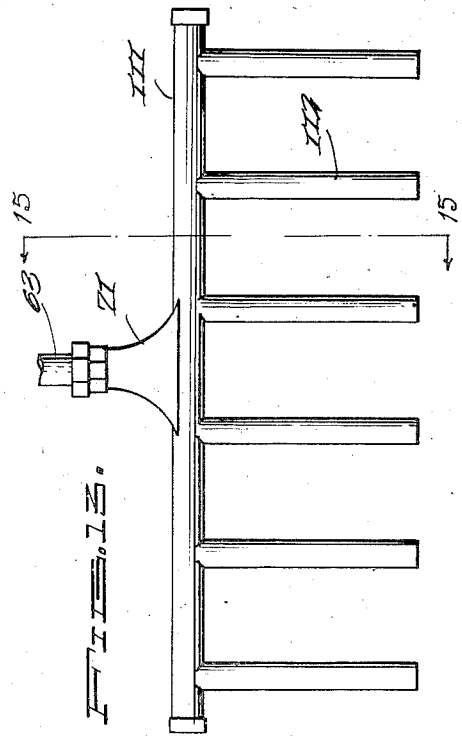


FIG. 14.

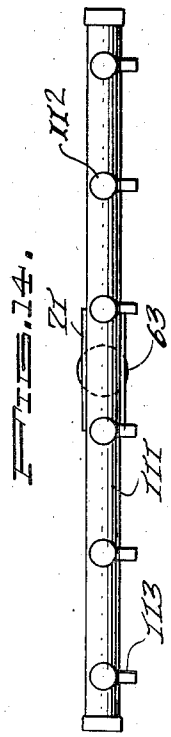
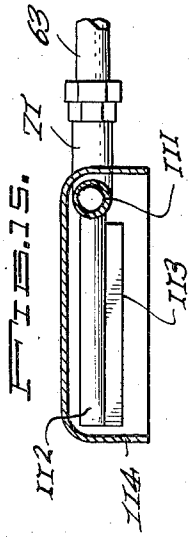


FIG. 15.



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Patented Dec. 28, 1948

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UNITED STATES PATENT OFFICE

2,457,683

PORTABLE BURNER APPARATUS FOR GENERATING AND BURNING HYDROCARBON VAPOR FUEL

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Application January 10, 1946, Serial No. 640,208

2 Claims. (Cl. 126—271.2)

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This invention relates to a burner apparatus for generating a combustible mixture of hydrocarbon vapor and air and for burning the same in a series of projected flame jets for consuming vegetation, sterilizing soil particularly seed beds, heating road surfaces and the like as the apparatus is towed or moved thereover.

The invention comprehends a burner apparatus of the indicated character which is mounted on wheels or skids and is provided with a liquid fuel reservoir from which the liquid is fed to a vaporizing device and mixed with air to provide a combustible gaseous fuel which is burned under pressure in a series of downwardly projected flame jets as the apparatus is moved or towed for consuming stubble, weeds, brush, sterilizing soils and seed beds, and the like and for heating or melting tarvia surfaces in pavement or road construction.

The invention also provides a burner apparatus which is adjustable for regulating the pressure of the projected flame jets to thereby control the temperature and length of flame thereof.

The invention has for a further object the provision of a hand operated means located at the forward end thereof for regulating the height of the burner above the ground.

The invention further has in view the provision of a burner apparatus in which the liquid fuel is completely consumed by the burning of the combustible mixture and which provides an even distribution of the heat of the flame jets over the area to be heated while providing simplicity and reliability of operation together with a high safety factor.

With the foregoing and other objects in view reference is now made to the following specification and accompanying drawings in which is illustrated the preferred embodiment of the invention.

In the drawings:

Fig. 1 is a side view of a burner apparatus constructed in accordance with the invention.

Fig. 2 is a top plan view thereof with portions broken away to illustrate the underlying construction.

Fig. 3 is a rear end view thereof with portions broken away to illustrate the underlying construction.

Fig. 4 is a front view of the same.

Fig. 5 is a vertical sectional view of the main burner taken approximately on line 5—5 of Fig. 3.

Fig. 6 is a fragmentary longitudinal vertical sectional view through the main burner.

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Fig. 7 is a fragmentary bottom plan view thereof.

Fig. 8 is a side view of the pilot burner and vaporizing coil and housing therefor with parts broken away to illustrate the underlying construction.

Fig. 9 is an enlarged fragmentary plan view thereof.

Fig. 10 is a vertical sectional view taken approximately on line 10—10 of Fig. 9.

Fig. 11 is a diagrammatic view of the piping from the fuel drum or barrel to the pilot burner and main burner.

Fig. 12 is a fragmentary vertical sectional view through the liquid fuel drum or barrel.

Fig. 13 is a top plan view of a modified form of main burner.

Fig. 14 is a view in elevation thereof.

Fig. 15 is a vertical sectional view taken approximately on line 15—15 of Fig. 13.

Fig. 16 is a bottom plan view of another form of main burner.

Fig. 17 is a view in elevation thereof.

Fig. 18 is an enlarged side view of the vaporized fuel and air mixing device showing the forward end of the mixing conduit in section.

Fig. 19 is a fragmentary side view of the nozzle and fuel line leading thereto.

Referring to the drawings by characters of reference, the burner apparatus is mounted on a supporting frame A consisting of longitudinally extending channel shaped opposite side members 10 and 11 which are welded or otherwise connected to a rear end channel shaped member 12 and to transversely extending intermediate channel shaped members 13. The opposite side members 10 and 11 converge inwardly at the forward ends thereof with the extreme forward ends secured together and provided with a forwardly and downwardly directed channel shaped bar 14 formed with aligned apertures 15 in the opposite flanges thereof for selectively receiving a tow eye 16. The bar 14 is braced on each side thereof by bars 17 secured to the lower free end thereof and to the side members 10 and 11 respectively.

The supporting frame A is mounted on a carriage consisting of a transversely extending shaft 18 on which are journaled steel wheels 19 provided as desired with hard rubber or pneumatic treads and which shaft is bolted or otherwise affixed to aligned V-shaped flat iron brackets 20 secured to and depending from the underside of the side members 10 and 11 and with vertically arranged channel shaped braces 21 welded or otherwise secured to the V-shaped brackets 20

medially thereof and to the underside of the side members 10 and 11.

A leg 22 provided with a caster 23 has its upper end slidably arranged in a sleeve 24 depending from the forward end of the side member 11 for supporting the forward end of the frame A when the apparatus is not in use and which leg is adapted to be retracted upwardly in the sleeve 24 and secured in elevated position by means of a pin or wing screw (not shown) when the apparatus is coupled to a tractor or other motor power for towing the same.

The burner apparatus includes a fuel drum or barrel 25 cradled between transversely extending angle bars 26 supported upon a sheet metal shield 27 to dispose the drum or barrel in elevated position above the shield to thereby provide an air space therebetween. A pair of longitudinally spaced channel bars 28 underlie the shield 27 and support the same and the drum or barrel 25 above the side members 10 and 11 of the frame A. The drum or barrel 25 is clamped in position on the angle bars 26 by means of a pair of inverted U-shaped metallic straps 29 extending over the top of the drum or barrel with the ends of the straps bolted to channel shaped bars welded to one of the channel shaped bars 28 and one of the channel shaped bars 13 and which straps are tightened by means of turn-buckles 30 in the forward legs thereof. The shield 27 extends angularly upward at the front and rear of the drum or barrel 25 to thereby protect the same from the heat of the burning fluid, the rear portion of the shield being braced by brackets 31 bolted or otherwise secured to the side members 10 and 11.

The drum or barrel 25 has a suction pipeline 32 extending into the top thereof which is connected with a downwardly directed suction pipe 33 having an open end 34 adjacent the bottom of the tank. The pipeline 32 is connected with the inlet side of a gear pump 35 through a check valve 36 and then through a three-way valve 37 and strainer 38, the check valve 36 functioning to prevent leakage of the fluid from the drum or barrel 25 when the pump is not in operation. From its outlet side the pump 35 is connected by a pipeline with a three-way valve 39 and from said valve through a branch pipeline 40 and flexible hose 41 to a reducing valve 42 and a combination strainer and needle valve 43 to a pilot burner 44.

From the three-way valve 39 a branch pipeline 45 leads to a combination strainer and needle valve 46 and thence to a heating coil 47. By means of an adjustable bypass valve 48 connected in the pipeline leading from the outlet side of the pump and to a pipeline 49, check valve 51 and a pipeline 52 opening into the top of the drum or barrel 25, a portion of the fuel delivered by the pump 35 is adapted to be returned to the drum or barrel 25 whereby any desired fuel pressure can be obtained on the fuel fed to the coil 47 in order to regulate the pressure of the vaporized fuel at the orifices in the main burner 53. Since the pressure required in the vapor at the orifices of the main burner 53 is usually higher than the pressure of the fuel at the pilot burner 44, the pressure of the latter may be reduced by means of the pressure reducing valve 42. The gear pump 35 is driven by any preferred motor power such as a gas engine (not shown) coupled to the pump through reduction gearing.

The pilot burner 44 may be of any preferred type of hydrocarbon burner preferably a vaporizing type adapted to project an elongated flame and the same is supported on the forward end of a channel shaped platform 54 in juxtaposition to the forward end of the coil 47 for directing a flame axially therethrough for heating and vaporizing the fuel oil pumped through said coil by the gear pump 35. A baffle 55 of heat resisting material is located coaxially with the coil adjacent the rear end thereof which functions to deflect the flame and gases issuing from the pilot burner toward the periphery of the coil. The said coil is of helical formation and is located concentrically within and in spaced relation to a cylindrical steel shell 56 supported upon the platform 54 and in spaced relation to the said shell 56 is a semi-cylindrical steel shield 57 open at its opposite ends and secured to the platform 54.

The pipeline 45 is connected to the heater coil 47 at the forward end thereof and a pipeline 58 connected to the rear end of the coil 47 extends forwardly thereof upon the platform 54 between the shell 56 and the shield 57. The pipeline 58 is connected to a flexible hose 59 of heat resisting material which latter is connected to a strainer 60 and by a pipe 61 with an adjustable head 62. The head 62 is arranged in spaced relation to the forward end of a longitudinally extending conduit 63 defining an air and vaporized fuel mixing chamber. The conduit 63 is formed with a flared forward end providing a Venturi mouth into which protrudes axially thereof a nozzle 64 provided on the free end of the pipe 61.

The adjustable head 62 includes a threaded sleeve 65 adapted to be secured on the pipe 61 by a set screw 66. The sleeve 65 has an air-shutter 67 threadedly mounted thereon for movement toward and away from the flared open end of the conduit 63 for regulating the size of the air-passage into the said conduit. A locking nut 68 threadedly mounted on the sleeve 65 is adapted to lock the shutter 67 in any desired position. The conduit 63 defining the air and vaporized fuel mixing chamber is pivotally mounted at its forward end on trunnions 69 carried by a bracket 70. The rear end of said conduit is connected to the flared inlet 71 of the main burner 53.

The main burner 53 extends transversely of the supporting frame A with the opposite ends of the burner projecting laterally outward beyond the said frame. The said burner is pivoted to the lower ends of depending arms 72 pivoted at their upper ends to the outer ends of levers 73 secured to the opposite ends of a cross-shaft 74 which latter is rotatably mounted in brackets 75 depending from the side members 10 and 11 of the frame A. A semi-circular worm gear 76 is secured to the cross-shaft 74 at one side of the transverse center thereof and meshing with said worm gear is a worm 77 secured to the lower end of a longitudinally extending inclined shaft 78 journaled in a bearing 79 and having a hand wheel 80 at the forward end thereof adapted to be turned for effecting turning movement of the cross-shaft and the raising or lowering of the main burner 53 and swinging of the conduit 63 on the trunnions 69.

The main burner 53 together with the conduit 63 is counterbalanced by means of a pair of spiral springs 81 connected at their lower ends to the opposite ends of a bracket 82 secured to the conduit 63 with the upper ends of said coils connected to the opposite ends of an angle bar 83 having a threaded spindle protruding upwardly through a supporting bracket 84 and threadedly engaged by a hand lever 85 for adjusting the tension on the springs. The bracket

84 slopes rearwardly and is welded or otherwise secured to the channel shaped member 12 at the rear of the frame. The forward upper end of said bracket is supported by a pedestal 86 secured to the underside thereof and welded or otherwise secured at its lower end to the rearmost intermediate channel shaped member 13. A locking nut 87 secures the hand lever 85 in adjusted position.

The main burner 53 consists of a heat resisting metallic pipe 88 extending transversely of the frame at the rear thereof with its opposite ends projecting laterally therebeyond so as to provide a wide area to be covered by the flame jets issuing therefrom. The pipe 88 is closed at its opposite ends and centrally thereof is in communication with the conduit 63 and is supported on the lower ends of the depending arms 72 which are respectively secured between pairs of spaced bars 89 detachably secured by bolts 90 against the opposite faces of ribs 91 extending radially outward from and formed integrally with split tubular sleeves 92 disposed in surrounding relation with the pipe 88 and secured thereto by set screws 93. The pipe 88 is also provided with a plurality of said sleeves 92 secured thereon in spaced relation between the depending arms 72 and with one such sleeve located adjacent each of the outer ends of the said pipe. The sleeves 92 have their split portions located below the pipe 88 and have downwardly directed flanges 94 at each side of said split portions between which are secured heat resisting metallic skirts 95 located on opposite sides of a series of longitudinally spaced apertures 96 opening through the pipe 88. The skirts 95 provide a passageway therebetween for the flame jets issuing from the apertures 96 and function to prevent excessive air mixing with the combustible vapors at the base of the flame jets. The skirts 95 are maintained in spaced relation by spacing elements 97 and are formed with projections 98 at the opposite ends thereof supported on shoulders defined by the inwardly offset portions 99 of the flanges 94 of the sleeves 92. A pair of skirts 95 is thus secured between each adjacent pair of sleeves 92 and provides means whereby the skirts may be removed and replaced in the event that the same become warped. In order to confine the flame jets issuing from the apertures 96 to a limited area at the rear of the apparatus a heat resisting metallic housing 100 open at the bottom is provided which is supported upon the arcuate upper edges of the ribs 91. The housing 100 is closed at its opposite ends by means of the flanged end walls 101 and is provided with apertures 102 through which the bars 89 protrude. Heat resisting metallic flaps 103 are hingedly connected to the longitudinal lower rear edge of the housing 100 for concentrating the flame within the housing and directing the same downwardly against the ground or supporting surface.

A heat resisting metallic shield 104 is secured at its upper end between the opposite side members 10 and 11 of the frame A rearwardly of the counterbalancing springs 81 which shield extends downwardly therefrom with its lower edge disposed adjacent the ground and with its opposite sides projecting laterally outward beyond the side members of the frame for protecting the parts of the apparatus forwardly thereof from the heat of the flame jets and the heated ground.

A shield 105 also fashioned of heat resisting metallic material is secured between the opposite

side members 10 and 11 of the frame A above the pilot burner 44 and extending under the housing 106 containing the piping and control valves and under the housing 107 containing the engine and pump 35.

The burner 44 may be swung to angular relation in order to facilitate cleaning thereof. The platform 54 is supported by brackets 108 secured at their upper ends to the underside of the intermediate channel shaped members 13. The forward brackets 108 have the upper ends of the brackets 70 secured thereto and diagonal brace bars 109 are secured at their opposite ends to the braces 21 and brackets 70 for bracing the latter.

A fuel intake pipe 110 is connected with the three-way valve 37 which is adapted to be turned to close the pipeline to the suction pipe 33 so that the pump 35 may then operate to fill the drum or barrel 25 when the intake pipe 110 is disposed in an outside supply and the three-way valve 39 is turned to open the passageway through the flexible hose 52. The operating stems of the three-way valves 37 and 39 are coupled together by means of a lever 116 for simultaneously opening the one and closing the other and vice versa.

In place of the main burner 53 the burner illustrated in Figs. 13 to 15 inclusive may be utilized. This burner includes a heat resisting metallic pipe 111 similar to the pipe 88 in the previous form of the invention but instead of the same being provided with a bottom outlet the pipe 111 is provided with a series of transversely spaced rearwardly directed pipes 112 which communicate therewith and have downwardly directed skirts or rims 113 extending longitudinally of and surrounding the apertures therein similar to the apertures 96 in the previous form of the invention. The pipe 111 is similarly connected with the conduit 63 and the same is adapted to be supported on the lower ends of the depending arm 72 by any desired means. A heat resisting metallic housing 114 having an open bottom is supported upon the pipes 111 and 112 and functions to concentrate the flame jets issuing from the tubes 112 and direct the same downwardly against the ground or supporting surface.

Another form of main burner is shown in Figs. 16 and 17 in which a longitudinally extending pipe 115 is provided which is similar to the pipe 88 in the previous form of the invention. In this form however a plurality of groups of apertures 116 are provided which are spaced at intervals longitudinally thereof so as to provide areas on the ground or supporting surface which are subjected to the action of the flame jets issuing therefrom and areas therebetween which are not subjected to the direct action of the flame jets.

What is claimed is:

1. In a portable hydrocarbon burner apparatus of the type including a container for receiving liquid hydrocarbon fuel and having downwardly directed burner jets for burning gaseous hydrocarbon fuel against the surface over which the apparatus is moved, means located between said container and said jets for vaporizing said liquid fuel and for mixing the fuel with air consisting of a heating coil including a plurality of helical convolutions, a pilot burner for directing a flame jet axially through said coil for vaporizing liquid fuel passing therethrough, a pump connected with said heating coil for forcing liquid fuel into said coil against the pressure of vaporized fuel therein, a nozzle connected with said coil and through which the vaporized fuel is forced by said pump

and a conduit disposed in axial alignment with said nozzle and having an open end into which the vaporized fuel is directed when issuing from the nozzle to effect an intake of air through the open end of said conduit and the mixing thereof with the vaporized fuel so as to form a combustible mixture.

2. In a portable hydrocarbon burner apparatus of the type including a container for receiving liquid hydrocarbon fuel and having downwardly directed burner jets for burning gaseous hydrocarbon fuel against the surface over which the apparatus is moved, means located between said container and said jets for vaporizing said liquid fuel and for mixing the fuel with air consisting of a heating coil including a plurality of helical convolutions, a shell surrounding said coil, a pilot burner for directing a flame jet axially through said coil and said shell for vaporizing liquid fuel passing through said coil, a pump connected with said heating coil for forcing liquid fuel into said coil against the pressure of vaporized fuel therein, a nozzle connected with said coil and through which the vaporized fuel is forced by said pump and a conduit disposed in axial alignment with said nozzle and having an open end into which the vaporized fuel is directed when issuing from the nozzle to effect an intake of air through the open end of said conduit and the mixing thereof with the vaporized fuel so as to form a combustible mixture.

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