March 12, 1940. W. C. COLEMAN 2,193,270

COMBINATION ATOMIZER AND MIXER

Filed April 25, 1938

Fig. 1.

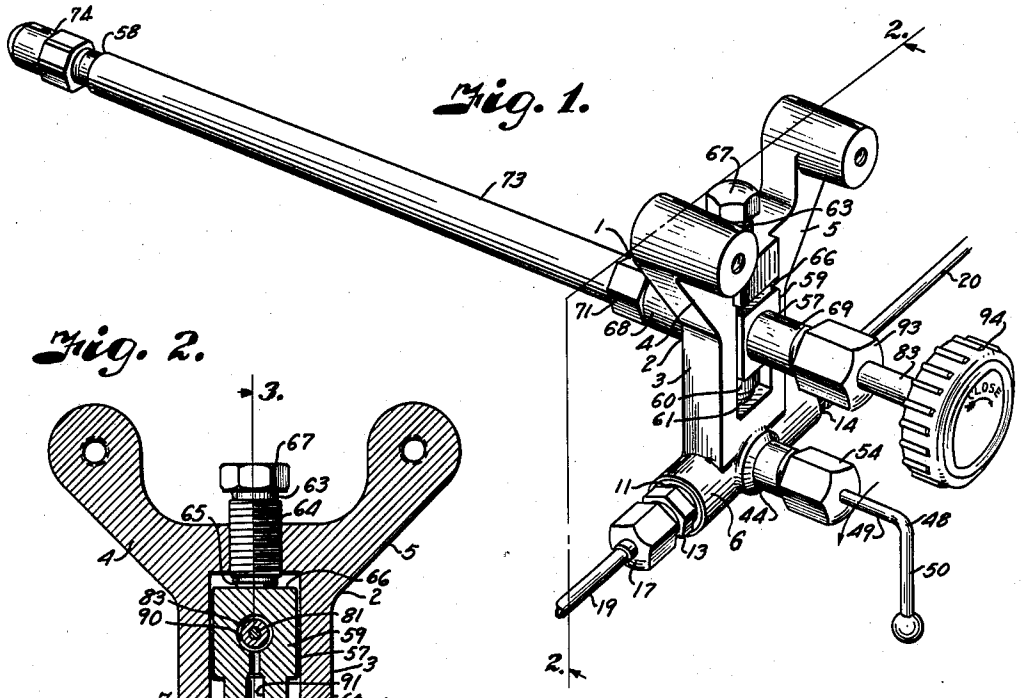


Fig. 2.

Fig. 3.

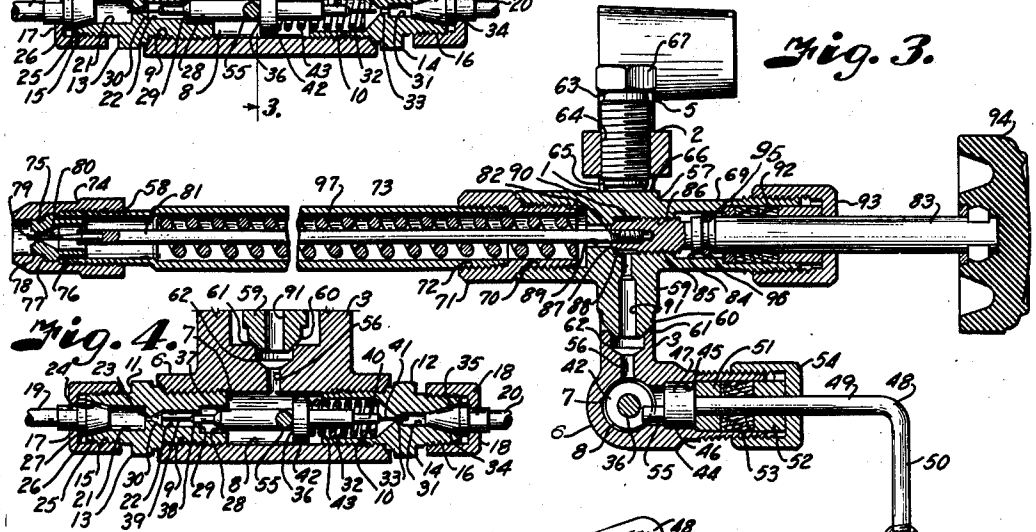
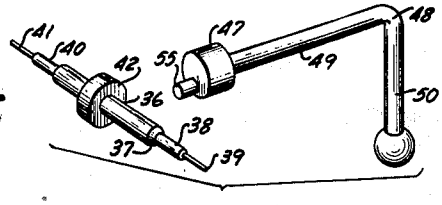


Fig. 4.

Fig. 5.



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COMBINATION ATOMIZER AND MIXER

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5 Claims. (Cl. 158—81)

This invention relates to apparatus for burning liquid hydrocarbon distillates, for example gasoline, and particularly to a combination atomizer and mixer for preparing a fuel of this character for consumption in a gas burning appliance, such as a cooking stove, heater, or the like.

In burning fuels of this character it has been the practice to provide the burners with a generating device initially heated by a small portion of the raw fuel so that the fuel in passing to the burner is vaporized in the generator. It is, therefore, necessary to wait until the generator parts become hot enough to form the liquid fuel into a gas before the burner can be lighted. Such a system results in delay in lighting the burner, inconvenience of operation, fumes from the burning of improperly conditioned fuel, and hazards brought about by difficulties in operation.

It is, therefore, the principal object of the present invention to provide a gas burning appliance with an instantaneous starter whereby the burner may be lighted immediately upon turning on of the liquid fuel.

Other important objects of the invention are to provide a safe and efficient starting device wherein the fuel is initially atomized to prepare a readily combustible mixture capable of immediate use in a burner; to provide automatic control of the fuel incidental to turning on the supply of atomizing medium so as to provide the required mixture for immediate consumption in the burner; and to provide a simple and trouble proof starter construction operable by a single control lever.

In accomplishing these and other objects of the invention, as hereinafter pointed out, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawing, wherein:

Fig. 1 is a perspective view of a combination atomizer and mixer for instantly preparing a liquid fuel for immediate consumption in a gas burning appliance.

Fig. 2 is a cross-section through the device on the line 2—2 of Fig. 1, particularly illustrating the air and fuel throttling valve in position for closing the air inlet port.

Fig. 3 is a central longitudinal section through the device on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary detail section through the air control and fuel throttle valve in open position, showing the valve in position for opening the air inlet and throttling the liquid fuel inlet.

Fig. 5 is a detail perspective view of the valve and its actuating lever.

Referring more in detail to the drawing:

1 designates a combination fuel atomizer and mixing device constructed in accordance with the present invention, and which includes a bracket 2 having a slotted body portion 3 provided with upwardly diverging arms 4 and 5 by which the bracket is attached to the frame of a stove or other appliance with which the device is to be associated. The lower end of the body carries a cylindrical barrel 6, having an axial bore 7 for providing an atomizing chamber 8. The ends of the bore are internally threaded, as at 9 and 10, to accommodate externally threaded nipples 11 and 12 for closing the ends of the bore.

The nipples 11 and 12 have intermediate, polygonal-shaped collar portions 13 and 14 to facilitate application of a wrench or the like wherewith the nipples are turned into the ends of the bore. The outer ends of the nipples are also threaded, as at 15 and 16, to accommodate unions 17 and 18 by which air and fuel pipes 19 and 20 are respectively connected with the nipples.

The nipple 11 has concentric, cylindrical bores 21 and 22 extending inwardly from the respective ends thereof and connected by an orifice 23, of such diameter as to pass the desired volume of air at a given pressure. The outer end of the bore 21 is provided with a conical counterbore 24 to engage the conical face 25 of a collar 26 attached to the end of the pipe 19, the collar having a shoulder portion 27 engaged by the union 17 to retain the conical face of the collar in leak-proof engagement with the nipple. The bore 22 is provided with a cylindrical counterbore 28 to form an annular valve seat 29, and the inner end of the bore terminates in a taper 30 to connect with a taper leading to the orifice 23.

The nipple 12 also has axial bores 31 and 32 extending inwardly from the ends thereof and which are connected through an orifice 33 of such size as to pass the required volume of liquid fuel necessary in supplying the burner appliance with which the starter is associated. The inner bore 32 is of sufficient diameter to form a seat for a spring later described, and the inner end thereof tapers downwardly toward the orifice 33, in substantially the same manner as the corresponding bore of the other nipple previously described. The bore 31 is of smaller diameter and has its outer end provided with a tapered counterbore 34 engaging a correspondingly tapered head 35 on the fuel pipe 20, the head being retained by the union 18 to provide a leak-tight joint.

Reciprocably mounted within the atomizing chamber is a valve member 36 having a beveled valve face 37 for engaging the seat 29 to normally shut off inlet of air into the atomizing chamber. The terminal end of the valve member has a reduced shank 38 extending into the reduced portion of the bore 22 to carry a cleaning needle 39 extending into the orifice 23, previously described, so that when the valve is closed the needle projects through the orifice to clear it of any accumulated matter that may be blown through the air pipe. The opposite end of the valve member terminates in a similar reduced shank 40 carrying a needle-like throttling valve 41 that is of sufficient diameter to loosely throttle the fuel inlet orifice 33, the effective port area of which is such as to admit the required amount of liquid fuel into the mixing chamber for atomization by the air admitted through the opposite orifice 23, so that a correct mixture is effected to be readily combustible when ignited at the burner. The intermediate portion of the valve member has a collar 42 that is loosely slidable within the atomizing chamber, and which is engaged by a coil spring 43 that is sleeved over the throttling end thereof and has its opposite end bearing against the spring seat of the bore 31 to normally retain the valve in position for closing the air inlet port, as shown in Fig. 2.

Extending laterally from the cylindrical portion of the bracket, at the center line thereof, is a cylindrical neck 44, having an inner cylindrical bore 45 extending through to the atomizing chamber and provided with an annular shoulder 46 to rotatably seat a retaining collar 47 on an actuating lever 48. The lever 48 includes a shaft portion 49 extending outwardly from the lateral neck on the bracket and terminates in a downwardly extending lever arm 50 by which the retaining collar is rotated within the bore. Sleeved on the shaft portion 49, and bearing against the collar 47, is a washer-like bearing 51 which cooperates with a similar bearing 52 to retain a packing element 53 therebetween for preventing leakage about the shaft portion of the lever. The packing is retained in compressed condition by means of a packing nut 54 sleeved on the lever and having threaded engagement with the laterally extending neck, as clearly shown in Fig. 3.

Projecting from the inner face of the collar 47, in eccentric relation with the axis thereof, is a pin 55 adapted to engage against the face of the collar 42 of the valve 36, the pin 55 being arranged so that when the valve is closed the lever arm is turned downwardly, as shown in Fig. 1. In this position the spring retains the air valve in closed position with the throttling needle 41 out of position relatively to the orifice 33. Liquid fuel from the pipe 20 is then free to flow in full volume into the atomizing chamber, however, when the valve is turned to the right, Fig. 1, the pin engages the collar on the valve to shift the valve and effect unseating thereof relatively to the air port and to effect withdrawal of the cleaning valve from the orifice 23. With this movement of the valve the spring 43 is compressed and the throttling needle is projected into throttling relation with the liquid fuel orifice 33 to reduce the amount of liquid discharged into the atomizing chamber. In this position of the valve, friction of the packing on the shaft portion of the control lever is sufficient to overcome action of the spring and the valve is retained in open position.

The liquid fuel or the atomized mixture thereof is discharged from the atomizing chamber through a lateral port 56 into a valve 57 of a fuel injecting and mixing nozzle 58. The valve 57 includes a substantially rectangular shaped body portion 59 located within the slotted recess of the body portion of the bracket, as best shown in Figs. 1 and 2. The body portion of the valve body has a depending boss 60, provided with a beveled face 61 to wedge within a counterbore 62 provided at the outlet end of the port 56, the beveled face of the boss being urged tightly in the counterbore by a set screw 63 that is threaded through an opening 64 in the bracket and has a cone-shaped end 65 seating on the surface 66 of the valve body. The set screw 63 is provided with a polygonal-shaped head 67 by which it is rotated.

Extending in opposite directions from the body portion of the valve are cylindrical extensions 68 and 69, the extension 68 having an internally threaded recess 70 to mount a nipple 71 which in turn is provided with a threaded socket 72. Threaded in the socket 72 is a tube 73 forming the body portion of the nozzle and which carries a nozzle tip 74 that is threaded on the outer end thereof to retain an orifice member 75. The orifice member 75 has a skirt portion 76 sleeved within the terminal end of the tube and an enlarged collar portion 77 between the end of the tube and an internal annular shoulder 78 on the tip so that the orifice member is retained in coaxial relation with the nozzle. The orifice member is provided with an orifice 79 that is formed in the outer end thereof and which is connected with a cylindrical bore having a tapered end leading to the orifice to guide a cleaning needle 80 therethrough, the needle 80 being carried on a stem 81 extending axially through the tube of the nozzle and which has its other end threaded into a socket 82 of a valve stem 83. The valve stem 83 is rotatably mounted within bore 84 of the other cylindrical extension of the valve body and has a threaded portion 85 within an internally threaded portion 86 of the bore. The inner end of the valve stem terminates in a beveled seat 87 to engage a valve seat 88 that is formed by aligning bores 89 and 90 coaxial with the valve body. The bore 90 aligns with a vertical channel 91 that connects with the port 56, previously described, so that the fuel admitted to the atomizing chamber is passed into the tubular portion of the nozzle when the valve stem is rotated to move the valve face thereon away from the seat 87.

To prevent leakage about the valve stem 83, the outer end of the bore 84 is counterbored to accommodate a packing element 92 which is retained by a packing nut 93, as in conventional practice. The outer end of the stem carries a hand wheel 94 by which the valve is rotated. In order to limit outward movement of the valve the inner end of the stem is provided with an annular groove 95, carrying a split ring 96 that engages against the inner end of the packing element when the valve is unseated.

In order to thoroughly mix the atomized fuel and to retard movement of the fuel through the nozzle after the burner has been put into operation, the nozzle tube contains a helical baffle 97 loosely sleeved over the stem 81, as shown in Fig. 3.

When the device assembled as described is mounted in a stove or the like, the nozzle extends in relation to a burner thereof so that the heat

of the burner sufficiently heats the tube to vaporize liquid fuel passed therethrough. The nozzle tip is located within a manifold (not shown), that is connected with the burner or burners and through which air is drawn for mixture with the atomized or vaporized fuel, as the case may be.

In operating the atomizing and mixing device when associated with a gas burning appliance, for example a cooking stove, the air and fuel pipes are respectively connected with suitable sources of compressed air and a supply of liquid fuel, such as gasoline, the air pipe being preferably connected with the fuel container so that the air pressure required to move the fuel is used in the atomizing chamber. When the burner is to be started the lever **48** is rotated in the direction of the arrow in Fig. 1, so that the eccentric pin comes into camming engagement with the collar **42** to effect shifting of the valve member against its spring **43** to effect unseating of the valve and withdrawal of the cleaning needle from the orifice **23**. Simultaneously the throttling needle is caused to enter the orifice **33** to reduce the volume of liquid fuel flow through the orifice. The hand wheel **94** is then rotated in the direction opposite to that of the arrow indicated thereon to unseat the valve stem so that the air and liquid fuel may flow into and through the tube-like nozzle. As soon as the air flows into the atomizing chamber the liquid therein is atomized and forced through the port **56** into the channel **91**, past the valve seat **88** into the tube of the nozzle where it is caused to be thoroughly mixed on its tortuous passage between the coils of the baffle for discharge from the orifice in finely atomized form to the burner manifold (not shown). The atomized fuel may be readily ignited when a flame is applied to the burner so that the burner will operate satisfactorily immediately upon opening of the fuel control valve. Heat from the burner heats the tube so that the fuel contacting the hot surfaces thereof begins to vaporize into gas form. When this occurs the flame will tend to blow away from the burner, warning the operator that it is time to close off the air supply to the atomizing chamber. This is effected by swinging the control lever in the opposite direction so that the spring is effective in seating the air shut-off valve. When the valve is seated the cleaning needle passes through the orifice to prevent clogging thereof. The throttling needle on the opposite end of the valve also moves out of the orifice **33** to permit the proper volume of fluid to enter the valve, which passes directly through the atomizing chamber, through the port **33**, channel **56**, valve seat **88** and into contact with the hot surface of the tube **73**, where it is thoroughly gasified and discharged through the orifice of the nozzle into the manifold, continuing operation of the burner.

What I claim and desire to secure by Letters Patent is:

1. In a device of the character described, a valve body provided with an atomizing chamber having liquid fuel and air inlets, a valve member in the valve body having a valve face for closing the air inlet, a needle-like throttle on the valve member adapted to enter said fuel inlet upon opening of the air inlet, a spring normally retaining the valve member in air inlet closing position, a collar on the valve member, an actuating lever, and an eccentric pin carried by the actuating lever and engaging the collar to effect shifting of the valve member for inlet of air and a throttled flow of liquid fuel into the atomizing chamber.

2. In a device of the character described, a valve body provided with an atomizing chamber having liquid fuel and air inlets, a valve member in the valve body having a valve face normally closing the air inlet, a needle-like throttle on the valve member adapted to enter the fuel inlet upon opening of the air inlet, a spring normally retaining the valve member in air inlet closing position, a collar on the valve member, an actuating lever, an eccentric pin carried by the actuating lever and engaging the collar to effect shifting of the valve member for inlet of air and a throttled flow of liquid fuel into the atomizing chamber, and a packing gland for sealing the atomizing chamber about the actuating lever and for frictionally retaining the valve member in open position.

3. In a device of the character described, an atomizing chamber having an inlet for admitting a liquid fuel and an inlet for an atomizing medium, a valve normally closing the inlet for the atomizing medium, means for partially throttling flow of fuel through the fuel inlet, and a common actuating connection between said valve and the throttling means for simultaneously moving said valve and throttling means to admit the atomizing medium and throttled fuel flow into the atomizing chamber.

4. In a device of the character described, an atomizing chamber having a constantly open liquid fuel inlet and an air inlet, a valve member normally closing the air inlet, throttling means on the valve member adapted to partially throttle said open fuel inlet upon opening of the air inlet, and means for actuating the valve member to simultaneously admit into the atomizing chamber a throttled fuel flow and air for forming a combustible mixture.

5. In a device of the character described, an atomizing chamber having axially arranged liquid fuel and air inlets, a valve member in the atomizing chamber having a valve face for closing the air inlet, a needle-like throttle on the valve member adapted to enter the fuel inlet upon opening the air inlet, means normally retaining the valve member in air inlet closing position and the needle-like throttle in retracted relation with respect to said fuel inlet, and actuating means connected with the valve member for shifting the valve member in the atomizing chamber.

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