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2,759,345

PORTABLE LIGHTERS

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Fig. 1.

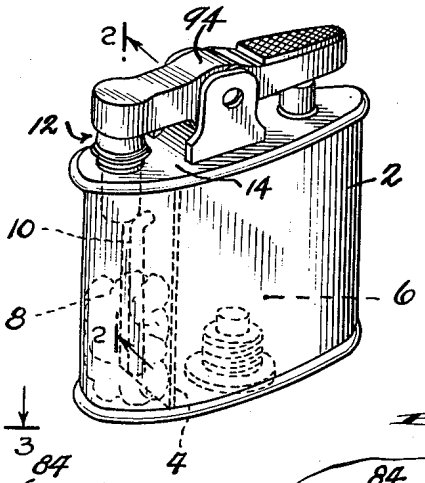


Fig. 2.

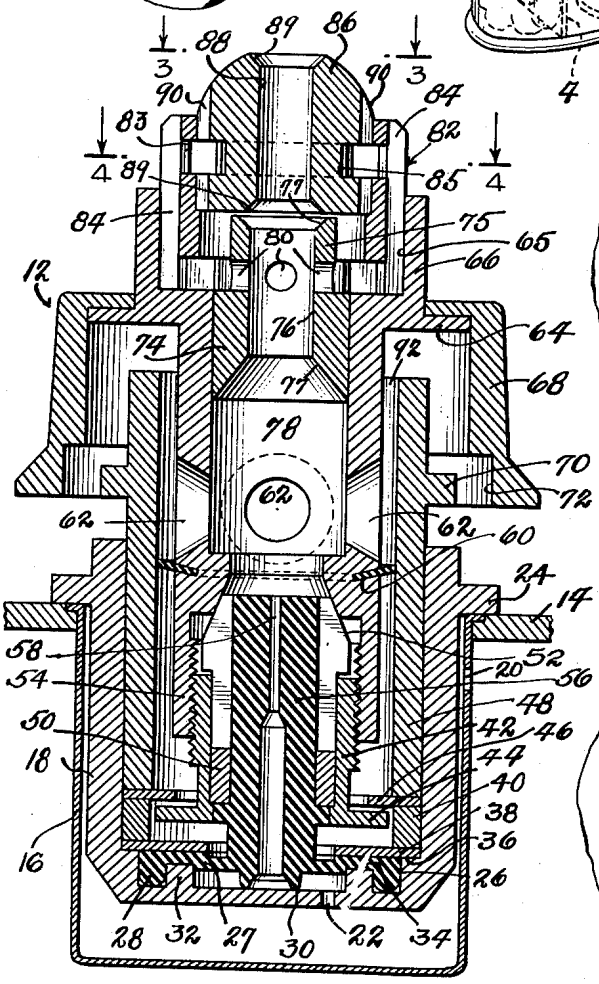


Fig. 3.

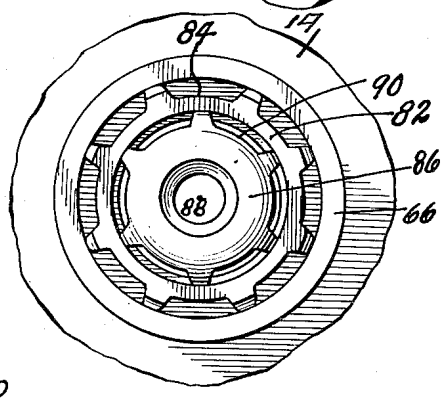
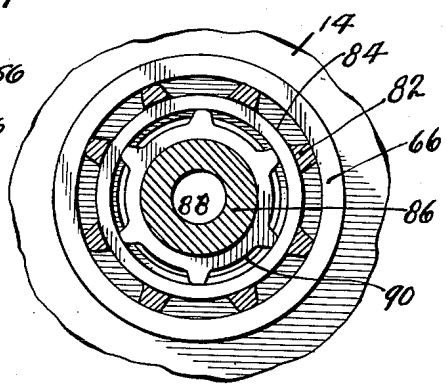


Fig. 4.



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PORTABLE LIGHTERS

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4 Claims. (Cl. 67—7.1)

My invention relates to portable lighters and the like of the gaseous fuel type, wherein a low-boiling point liquid fuel, which is maintained in its liquid form by reason of its own vapor pressure, is stored within the lighter casing. Propane and butane are examples of a suitable fuel.

One of the objects of my invention is to provide a lighter of the type above referred to wherein I employ certain new and novel structural details which make for an improved lighter so far as ease of manufacture, freedom from defective operation, and flame characteristics are concerned.

Another object of my invention is to provide a lighter of the gaseous fuel type in which means have been provided for improving the flame characteristics of the lighter and for eliminating the deposit of dust, carbon, and other foreign particles within the lighter, these deposits in prior conventional lighters often rendering the lighter inoperative.

In some respects, so far as construction is concerned, the present lighter may be similar to the portable lighter constituting the subject matter of my co-pending application Serial No. 295,154, filed June 24, 1952, now Patent No. 2,734,364 granted February 14, 1956, in that means are provided, constituting part of a valve-and-burner-unit assembly, for adjusting the fuel outlet from the lighter exterior to vary the flame characteristics of the lighter to meet varying conditions, the present invention, however, providing a construction in which a very long but rigid flame may be produced and flash-back of the flame eliminated.

Generally speaking, the lighter of this invention comprises a valve-and-burner-unit assembly adapted to be inserted in a lighter casing. The fuel for the lighter may be stored in the lighter casing, which functions as a fuel reservoir, or the fuel may be stored in a replaceable cartridge adapted to be inserted in the lighter casing.

In the accompanying drawings, wherein I have illustrated one form of my invention,

Fig. 1 is an isometric view of an embodiment of my invention;

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is a view taken on the line 3—3 of Fig. 2; and

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

Referring to the drawings in detail, 2 designates the casing of a lighter embodying my invention. I have shown this casing provided internally with a wall or partition 4, extending from top to bottom of the casing, to provide a fuel storage space or compartment 6 for the lighter fuel. This space or compartment 6 may be refilled from time to time.

It is to be understood, however, so far as this feature of my invention is concerned, that the partition 4 may be dispensed with, if desired, so that the entire casing 2 constitutes a refillable fuel reservoir, or, as above pointed out, the fuel may be stored within a replaceable cartridge.

When the partition 4 is employed, the fuel in the storage section 6 of the casing, at one side of the partition, is conducted to the fuel-feeding compartment or chamber 8 at the other side of the partition by means of a tube or conduit 10, which extends from the top of storage section 6 to near the bottom of chamber 8. As will be apparent from the drawings, the valve-and-burner-unit assembly 12, illustrated on an enlarged scale in Fig. 2, extends into the compartment 8. Preferably, though not necessarily, this compartment is packed with cotton or similar filtering and retarding material.

By providing an opening in the partition 4 near the top of the storage section or compartment 6, vapors will flow from this compartment to the feed compartment or chamber 8 until a pressure balance is established between the two compartments, to inhibit the flow of any liquid from the storage compartment to the compartment 8. It will be appreciated that, by extending the conduit or tube 10 to near the bottom of the chamber 8, I further reduce the likelihood of any flow of liquid to this chamber. It will be appreciated further that, inasmuch as the feeding compartment 8 at all times contains only fuel in the gaseous or vapor phase, I avoid the danger of bursting of the lighter casing due to a rise in the temperature of the lighter. For instance, were the two compartments filled with fuel in the liquid phase, say at 30° F., and then the temperature of the lighter were raised to, say, 80° F., there would be grave danger of bursting the lighter casing due to fluid expansion.

The valve-and-burner-unit assembly 12 is adapted to be inserted through the top 14 of the lighter and is welded, soldered, or otherwise sealed in place.

Referring to Fig. 2, in which the valve-and-burner-unit assembly has been shown on an enlarged scale as above noted, it will be seen that the same comprises a cup 16, which is inserted through the casing top 14 into the casing interior, its head resting upon the casing top in a depression provided for the purpose. The cup 16 receives a cup-shaped metal plug 18, which also extends through the casing top 14 and along the interior of the cup 16 to a point adjacent the bottom of the latter.

The cup 16 is provided near its upper end with a port 20, while the plug 18 is provided with a port 22 in its lower end.

The plug 18 adjacent its upper end is provided with an annular flange or head 24, which, as will be seen from Fig. 2, overlies the casing top 14 and may be soldered, welded, or otherwise permanently secured thereto. This construction also holds the cup 16 securely in place.

Near its bottom or inner end, the interior of the plug 18 is reduced in diameter, as seen at 26, and positioned in this reduced portion of the plug is the fuel valve. This valve comprises a head 27 and a stem and is composed of an elastic material, such, for example, as soft cured rubber or other suitable plastic. The head 27 on its lower face, as viewed in Fig. 2, is shaped to provide two concentrically disposed annuli 28 and 30, the outer ends of which lie in the same plane, the annulus 30 being disposed near the head center and constituting the valve proper.

At its inner end, the plug 18 above referred to is provided interiorly with an annulus 32, concentric with the annuli 28 and 30 and disposed between the two.

The valve head is provided also with an annular groove 34, which receives the plug annulus 32.

With the parts in the position shown in Fig. 2, it will be quite apparent that the annulus 30 is seated so that the gas inlet orifice 22, above referred to, lies outside the annulus 30 and is sealed off.

Within the plug 18 and resting upon the annular shoulder 36, provided by reducing the diameter of the interior of the plug 18, is a metal ring 38, and resting upon this ring is a large-bore metal washer 40. Passing through the bore of this washer 40 is a tube or sleeve 42, provided at its inner end with a head 44.

As in my co-pending application Serial No. 295,154, the head 44 of the tube 42 and the bore of the washer 40 are non-circular and complementary to each other, so that the washer 40 and tube 42 may not be rotated relatively to each other.

Overlying the washer 40 is a metal clamping ring 46, adapted to be held down by a sleeve 48, which is a press fit in the plug 18 and projects to the exterior of the lighter casing for a substantial distance, as illustrated in Fig. 2.

Extending into the tube 42 with a press fit is a split sleeve 50, which extends a substantial distance above the top of the tube. It should be noted (see Fig. 2) that the upper end of the split sleeve 50 is tapered, as indicated at 52.

Threaded upon the exterior of the tube 42 is an adjusting member 54, having a tapered bore to engage the tapered portion 52 of split sleeve 50 for a purpose to be hereinafter referred to.

The stem of the fuel valve is designated 56 and fits within the split sleeve 50 and is bored from end to end to provide a gas outlet port 58. Thus it will be seen that, by rotating the adjusting member 54 relatively to the split sleeve 50, the area of the gas outlet port 58 may be varied, to vary the flow of fuel from the lighter casing toward the outlet thereof.

Set into the adjusting member 54 is a washer 60 of rubber or other elastic plastic, this washer projecting outwardly from the face of the adjusting member into contact with the wall of the sleeve 48, thereby to prevent the passage of dust particles or other foreign material along the space between the adjusting member and the sleeve below the washer 60. The washer is set into the adjusting member 54 and rotates with it when the adjusting member is being adjusted.

Above the washer 60, the adjusting member 54 is provided about its periphery with air intake ports 62. I have shown four of these intakes, but, of course, this number may be varied as desired.

The upper end of the adjusting member 54 is provided with an enlarged head 64, and the head, in turn, is provided with forwardly extending annular flange 66, projecting beyond the upper or outer end of 54 for a substantial distance. Pressed upon this flange 66 is an inverted, cup-shaped member 68, the interior of which is considerably larger in diameter than the outside diameter of the upper end of the sleeve 48.

In this connection it is to be noted that the sleeve 48, above the top of plug 18, is provided with an annular flange 70, while the inverted, cup-shaped member 68, abreast of flange 70, is undercut, as shown at 72, so that a tortuous passage is provided between cup 68 and sleeve 48 for the passage of aspirated air from the exterior of the lighter casing to the mixing chamber 78 of the valve-and-burner unit assembly, the air passing into 68 between flange 70 and the undercut 72, the air then passing upwardly over the top of 48, where it is reversed in direction and passes downwardly along space 92 between sleeve 48 and adjusting member 54 until it reaches ports 62, where it again changes direction and is drawn into 54 and mixing chamber 78. This tortuous path creates a turbulence in the air aspirated into the adjusting member 54 and promotes mixture with the gaseous fuel passing through mixing chamber 78, and also reduces the likelihood of foreign matter from becoming entrained in the air stream. Should by any chance any foreign matter become entrained in the air stream, the washer 60, as above pointed out, will prevent it from falling toward the bottom of the valve-and-burner-unit assembly and interfering with the proper setting of the valve.

Above the air inlet ports 62, the bore of the adjusting member 54 is reduced substantially in diameter by a plug 74, which is a press fit in the upper end of 54.

It will be observed from Fig. 2 that the bore 76 of the plug 74 flares outwardly at each end, as shown at 77. Above the inner end of the plug 74, its bore is straight and

is considerably smaller in diameter than that of the bore of 54 below the plug. This construction provides the air-gas mixing chamber, above referred to, which extends from the throat 77 to just below the air intake ports 62.

The plug 74 projects a short distance above the top of adjusting member 54, this projecting portion, designated 75, being provided with a plurality of outlet ports 80 for the passage of the air-and-gas mixture from the mixing chamber 78. The drawings show four of these ports regularly spaced about the periphery of the plug, but, of course, it will be understood that this number may be varied.

Pressed into the cup-shaped space 65, provided by the flange or extension 66 of the adjusting member 54, is a tubular member 82. This member projects for a substantial distance above the top of the annular flange 66 and is provided in its periphery with a plurality of longitudinally extending grooves, designated 84, each of which communicates with the axial bore 76. As will be seen from Fig. 4, eight of these grooves have been illustrated. In addition, the member 82 a short distance from its upper end is undercut, as shown at 83.

Pressed into the tubular member 82 is a plug 86, provided with a bore 88, outwardly flared at each end, as shown at 89, this bore being co-axial with the chamber 78 and with the bore 76 in plug 74. The plug 86 is provided about its periphery with a plurality of longitudinally extending grooves 90, which are regularly spaced about the plug, and each groove is in communication with axial bore 88. Six of these grooves are provided, and, as will be seen from Figs. 3 and 4, they are staggered with respect to the grooves 84 in the tubular member 82. The plug 86 is provided also with a circumferential groove 85 intermediate the outer and inner ends of grooves 90 and abreast of the undercut 83 in tubular member 82. This groove communicates with the atmosphere at the exterior of the unit assembly laterally of the assembly and is also in communication with the axial bore 88 through the lower wall of the groove.

The valve-and-burner-unit assembly 12, that is, all of the assembly with the exception of cup 16, plug 18, sleeve 48, and washers 38 and 46, is capable of a slight bodily, unitary, longitudinal movement under the pressure of the gas in the lighter. This is sufficient to unseat the fuel valve to permit gas to flow past the valve to the port 58 in the valve stem 56. The assembly is held in closed-valve position by spring-loaded lever 94, mounted on the casing top 14. This lever, when manually depressed, as in conventional practice, operates the ignition mechanism for the lighter. Inasmuch as this ignition mechanism constitutes no part of the present invention, it has not been illustrated.

When pressure is applied to the end of lever 94 remote from assembly 12 to depress the same, the opposite end of the lever is raised, and the pressure of the gas in the lighter casing will raise the fuel valve, so that gas will rush through the port 58 in the valve stem and enter the mixing chamber 78. As the gas rushes through the mixing chamber 78, it aspirates air into the chamber, the air, as above described, flowing into cup 68 between the cut-back of this cup and the flange 70 of the sleeve 48. The air then flows over the top of 48, where it reverses in direction and flows along the space 92 between sleeve 48 and the exterior of the adjusting member 54 until it reaches the ports 62, where its direction of travel is again changed, and it passes through these ports to the mixing chamber 78 within the adjusting member.

As the gas-and-air mixture flows through the throat provided by the flared end of plug 74 and reduced diameter bore 76 of this plug and along this bore, some of the mixture will be discharged through the outlet ports 80 of the plug 74 and grooves 84 to atmosphere. Some of the remainder of the gas-and-air mixture will flow out of the flared upper end of bore 76 and be discharged to atmosphere between the upper end of 75 and the inner

end of plug **86**, along the lower portion of grooves **90** in plug **86** and into the space provided by circumferential groove **85** in plug **86** and undercut **83** in **82**, the upper portion of grooves **90** to atmosphere; the remainder of the gas-and-air mixture will, of course, flow through bore **88** of plug **86** to atmosphere.

It will be appreciated from all of the foregoing that not only do I obtain an excellent mixing action of the air and gas in the mixing chamber **78** due to the turbulence imparted to the air before it reaches the mixing chamber **78**, because of the torturous path it is compelled to take, but, by reason of the novel structure the mixture must pass through before finally discharging to atmosphere for burning, the mixture is divided into a number of streams, as many as there are grooves **84** and **90**, with another stream issuing from the outlet end of plug **86**. Not only does this make for ease of initial ignition but for complete combustion, the flame of my improved lighter being blue in color and devoid of yellow, definitely showing that combustion is complete.

I find also that with my improved construction the flame may be shortened and lengthened by rotation of the adjusting member **54** without any flash-back tendency.

I find also that the flame persists in drafts where conventional lighter flames would be extinguished.

I believe these characteristics are due to the fact that the fuel mixture, instead of discharging in a single stream, as is customary, is broken up into a plurality of small streams, each of which, of course, is ignited and burned in the operation of the lighter. The base of the flame is at the top of the annular flange **66**, and, as this is some distance below the outer end of the valve-and-burner-unit assembly, it will be apparent that the tip of the assembly will be heated, which probably promotes flame retention and may be the reason that the lighter flame is difficult to extinguish in the wind and apparently is responsible for the absence of flash-backs over the whole range of flame length.

While I have illustrated and described an embodiment of my invention, it is to be understood that changes may be made in the details of construction and arrangement of parts within the purview of my invention.

What I claim is:

1. A portable lighter of the gaseous fuel type comprising, in combination, a lighter casing; a fuel supply within the casing; a fuel-valve-and-burner-unit assembly disposed within the lighter casing and projecting to its exterior; a central axial bore for said assembly the projecting portion of said unit assembly being provided on its periphery with a plurality of elongated fuel passageways in constant communication with said central bore, a portion of each of said passageways opening laterally to the atmosphere at the exterior of the unit assembly; ignition mechanism adjacent the projecting tip of the said unit assembly; and a lever carried on the casing exterior, which, when operated in one direction, will impart longitudinal motion to the unit assembly to close the valve thereof, said valve opening automatically by the pressure of the gaseous fuel when said lever is moved in the opposite direction to actuate the ignition mechanism to ignite the fuel passing to atmosphere through the said passageways.

2. A portable lighter of the type employing a low-boiling point liquid fuel, which is maintained in its liquid form by reason of its own vapor pressure, said lighter comprising, in combination, a lighter casing; a partition within the casing dividing the same into a fuel-storage compartment and a fuel-feeding compartment, said partition near the top of the fuel-storage compartment being

provided with an opening which maintains the two compartments in constant communication with each other so that vapors from the fuel-storage compartment will flow into the fuel-feeding compartment to establish and maintain a pressure balance between the two compartments; and a valve-and-burner unit assembly extending into the fuel-feeding compartment from the casing exterior and receiving its fuel supply from the vapors in the fuel-feeding compartment.

3. A portable lighter of the type employing a low-boiling point liquid fuel, which is maintained in its liquid form by reason of its own vapor pressure, said lighter comprising, in combination, a lighter casing; a partition within the casing dividing the same into a fuel-storage compartment and a fuel-feeding compartment; a conduit opening into the fuel-storage compartment near the top of the same and extending along the fuel-feeding compartment to near the lower end of this compartment for the flow of vapors from the fuel-storage compartment to the fuel-feeding compartment to establish a pressure balance between the two compartments to inhibit the passage of liquid from the storage compartment to the feeding compartment; and a valve-and-burner unit assembly extending into the fuel-feeding compartment from the casing exterior and receiving its fuel supply from the vapors in the fuel-feeding compartment.

4. A portable lighter of the type employing a low-boiling point liquid fuel, which is maintained in liquid form by reason of its own vapor pressure, said lighter comprising, in combination, a lighter casing provided with a fuel-supply storage space; a fuel-valve and burner-unit assembly projecting to the casing exterior from the casing interior and receiving its fuel supply from said storage space, said unit assembly being provided intermediate its ends with a mixing chamber and with an axial bore extending from the mixing chamber to and through the outer end of the assembly, the mixing chamber being provided with air intake ports and adjacent said ports with torturous air passageways leading from the said ports to the unit assembly exterior so that air is aspirated in a torturous path into said mixing chamber as fuel from the fuel supply passes through the chamber; sets of grooves in the unit assembly periphery intermediate the mixing chamber and the outer end of the unit assembly, said grooves extending longitudinally of the unit assembly and communicating with said axial bore and with the atmosphere at the exterior of the unit assembly; and a peripheral groove in the unit assembly extending circumferentially of the assembly and lying intermediate the extremities of said longitudinal grooves, said circumferential groove being in direct communication with the atmosphere laterally of the unit assembly and in constant communication with said axial bore through the lower wall of the groove.

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