Feb. 14, 1956 R. E. PETERSON 2,734,364

PORTABLE LIGHTERS

Filed June 24, 1952 3 Sheets-Sheet 1

Fig. 1.

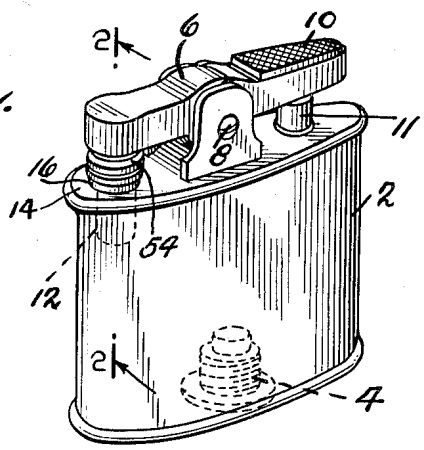


Fig. 2.

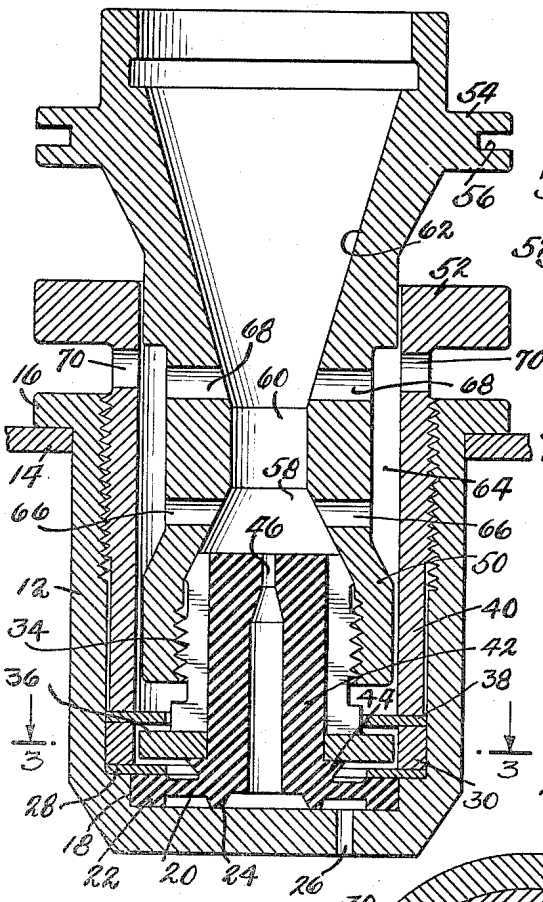


Fig. 4.

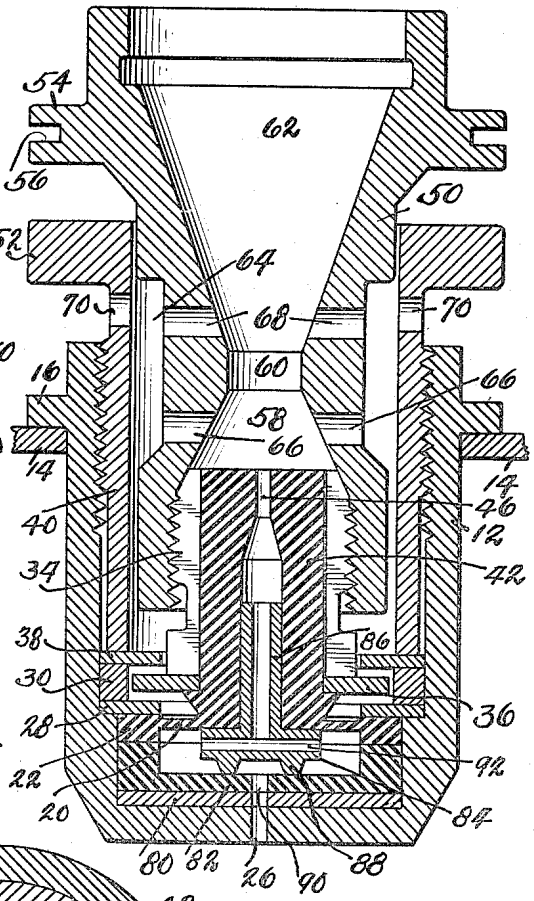
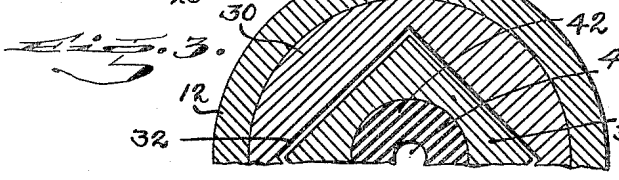


Fig. 3.



INVENTOR
ROBERT E. PETERSON
BY James G. Bethell
ATTORNEY

Feb. 14, 1956 R. E. PETERSON 2,734,364

PORTABLE LIGHTERS

Filed June 24, 1952 3 Sheets-Sheet 2

Fig. 5.

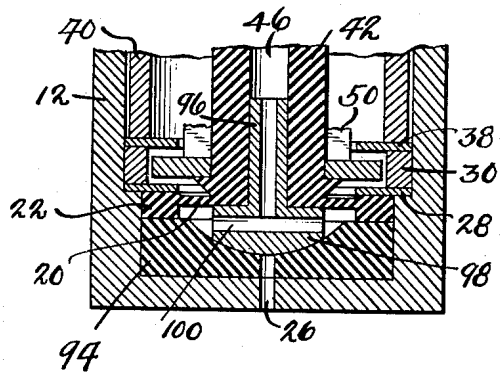


Fig. 6.

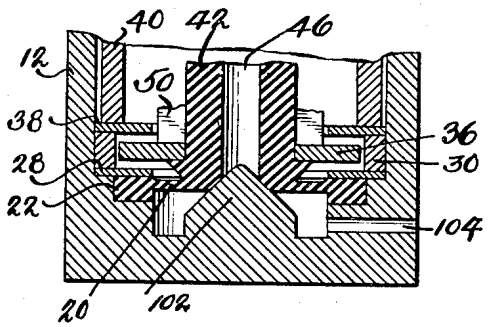


Fig. 7.

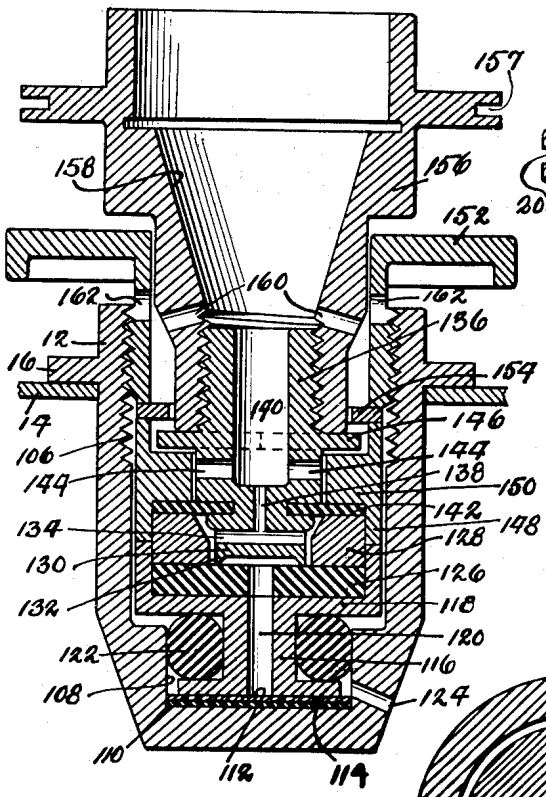


Fig. 8.

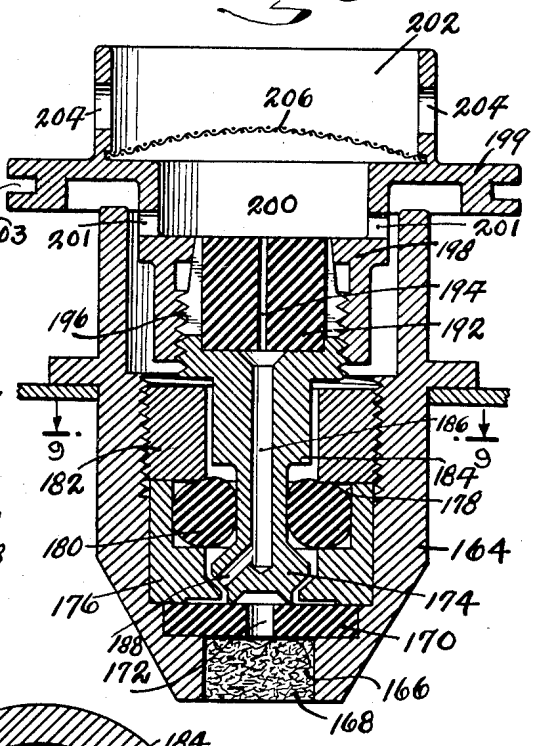
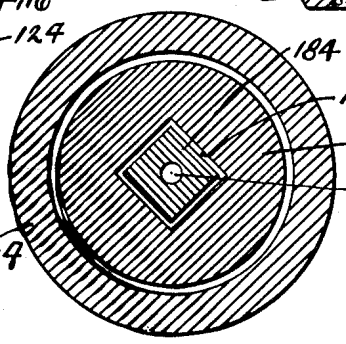


Fig. 9.



INVENTOR
ROBERT E. PETERSON
BY James G. Bechelle
ATTORNEY

Feb. 14, 1956 R. E. PETERSON 2,734,364

PORTABLE LIGHTERS

Filed June 24, 1952 3 Sheets-Sheet 3

Fig. 10.

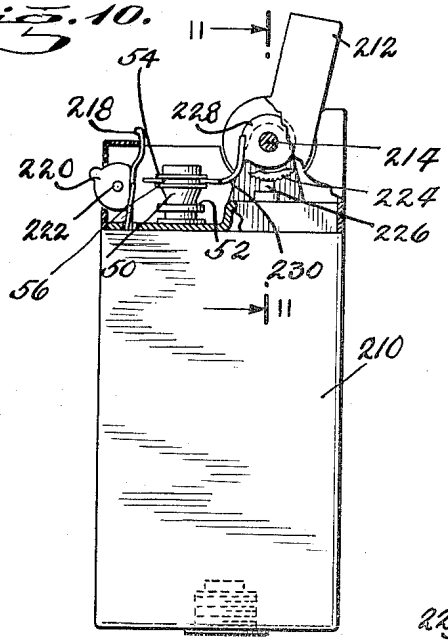


Fig. 11.

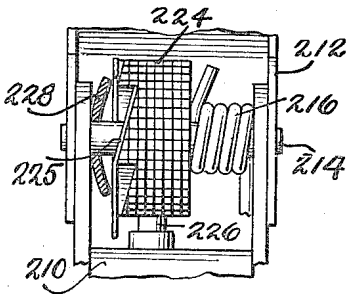
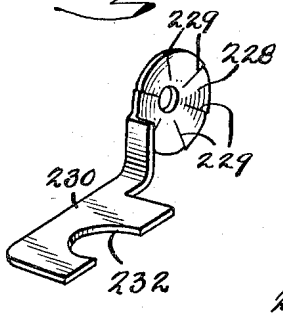


Fig. 12.



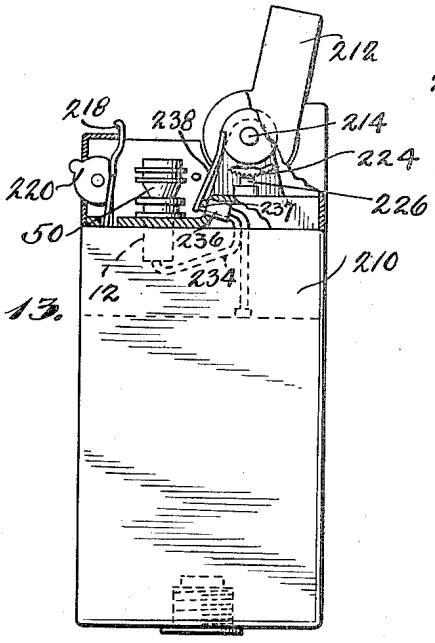


Fig. 13.

INVENTOR
ROBERT E. PETERSON
BY James G. Bethell
ATTORNEY

United States Patent Office

2,734,364

Patented Feb. 14, 1956

2,734,364

PORTABLE LIGHTERS

Robert E. Peterson, New York, N. Y.

Application June 24, 1952, Serial No. 295,154

8 Claims. (Cl. 67—7.1)

My invention relates to portable lighters and the like of the gaseous fuel type, as distinguished from lighters of the wick type employing liquid fuels. Propane and butane are examples of a suitable fuel for my improved lighter, the fuel being stored in the lighter casing, or in a container in the casing, under pressure.

One of the objects of my invention is to provide a portable gaseous-fuel lighter of improved construction and capable of remaining lit in strong draughts.

Another object of my invention is to provide a valve and burner unit assembly for lighters burning gaseous fuels which is not only adapted for use in the construction of new lighters but for installation in existing lighters of the wick type, that is, lighters employing liquids as fuel, whereby the same are readily and economically converted into lighters of the gaseous fuel type.

Another object of my invention is to provide a valve and burner unit assembly which is readily adaptable for use in lighters wherein the lighter casing functions as the reservoir or container for the fuel or in lighters wherein the fuel is stored in a separate container which is inserted into the lighter casing and may be removed when empty, to be replaced with another container.

A still further object of my invention is to provide a valve and burner unit assembly for lighters of the gaseous fuel type wherein means are provided for adjusting the gas flow to adapt the lighter to various conditions, that is to say, to enable the user readily to produce a relatively short flame for cigarettes and cigars and a longer flame for pipes. This adjustable feature also enables the user to adjust the flame to compensate for varying pressure conditions, so far as the fuel supply is concerned, because of temperature variations.

For example, the volume of the gaseous fuel in the lighter increases with temperature rises, and it is of advantage to provide means whereby the gas velocity and flame propagation may be maintained in substantial equilibrium. Obviously, without such adjustment the gas velocity on a hot day might exceed to a detrimental degree the flame propagation rate, and this would produce a blow-off. On the other hand, on a cool day, the volume of the gas supply may be reduced to a point where the gas velocity will be decreased sufficiently below flame propagation rate to cause blow-back. Again, the length of flame as well as other flame characteristics vary with temperature changes, unless means are provided to compensate for these changes in temperature.

My invention provides simple mechanism whereby these inherent difficulties may readily be overcome.

A further object of the invention is to provide a lighter wherein the lighter cover on its opening movement opens the gas valve and operates the ignition mechanism, means being provided whereby the closing movement of the cover effects closure of the gas valve in advance of complete cover closure, so that the lighter flame is extinguished before the cover contacts the flame of the lighter, and hence, although the cover is closed by hand, danger of burning of the fingers is avoided.

Other and further objects of my invention will appear from the detailed description to follow.

In the accompanying drawings,

Fig. 1 is an isometric view of one form of my improved lighter;

Fig. 2 is a section on the line 2—2 of Fig. 1 showing the valve and burner unit or assembly on a very much enlarged scale;

Fig. 3 is a fragmentary sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view, on a greatly enlarged scale, of another embodiment of the valve and burner unit or assembly;

Figs. 5 and 6 are fragmentary sectional views illustrating modified valve mechanisms capable of use in place of the valve mechanism of Fig. 2, for example;

Figs. 7 and 8 are enlarged sectional elevational views similar to Figs. 2 and 4 showing further forms or types of valve and burner units;

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 8;

Fig. 10 is an elevational view of an assembled lighter with parts broken away to show in better detail the valve control mechanism, etc.;

Fig. 11 is a view taken along the line 11—11 of Fig. 10;

Fig. 12 is an isometric view of the valve-operating element illustrated in Fig. 10; and

Fig. 13 is an elevational view illustrating a modified valve-operating mechanism.

Referring to the drawings in detail and, first of all, to the embodiment of my invention as illustrated in Figs. 1, 2, and 3:

2 designates the sealed lighter casing, which constitutes the container for the lighter fuel. This fuel, as above explained, is a gas under pressure, such as propane, butane, etc. The fuel supply may be renewed when necessary through refiller plug 4.

It is to be understood that, when desired, the fuel may be stored in a small container carried within the lighter casing, such container being capable of being replaced with a fuel container when necessary.

6 designates a lever, pivoted as shown at 8, on the top of the lighter casing.

As will be brought out hereinafter, when lever 10, which is pivoted to the rear end of 6, is depressed, the gas valve is free to open under gas pressure, it being understood that at about the same time the ignition mechanism for the lighter will be caused to function.

When the lever 10 is released, a spring-loaded plunger 11 returns it and lever 6 to initial position, as illustrated in Fig. 1, effecting positive closure of the gas valve on this return movement.

As above explained, one of the primary objects of my invention is to provide a valve and burner unit assembly of new and novel construction which may be applied or built into new lighters, as well as applied to existing lighters of the wick type, viz., the type employing liquid fuel, thereby to convert an old-style wick type lighter to a new-style lighter of the gaseous fuel type.

Referring to Figs. 2 and 3 of the drawings, wherein I have illustrated on a greatly enlarged scale a valve and burner unit assembly:

12 designates an elongated cup-shaped metal plug, which is adapted to be inserted through the top 14 of the lighter casing where it may be soldered or welded rigidly in place, the upper end of the plug being provided with an annular flange 16, which overlies the lighter top 14, to facilitate securing and sealing the plug permanently in place.

The interior of the plug 12 is reduced in diameter near the bottom or inner end thereof, as shown at 18, and posi-

tioned in this reduced portion of the plug is the fuel valve 20. This valve is of an elastic material, such as soft cured rubber or other suitable plastic, and its end is shaped to provide two concentrically disposed annuli, designated 22 and 24, the outer ends of which are in the same plane. With the valve seated as shown in Fig. 2, the ends of 22 and 24 are compressed against the bottom of the reduced portion 18 of the member 12, so that gas inlet orifice 26 of the plug 12 is sealed off.

Within the plug 12 and resting upon the annular shoulder provided by the reduced diameter of the cup interior is a metal ring 28, and resting upon this ring is a metal washer 30, which, as illustrated in Fig. 3, is provided with a centrally disposed bore 32, shown as rectangular in plan. It may take other shapes, but as will be brought out presently must not be round.

Passing through the bore 32 of the washer 30 is a split metal sleeve 34, having an enlarged head 36 lying in the washer bore and shaped complementary thereto.

Overlying the washer 30 is a metal clamping ring 38 adapted to be held down by a sleeve 40, threaded into the plug 12 from the upper end thereof. With the sleeve 40 screwed tightly in place, the washer 30 and, hence, the sleeve 34 are held against turning. Inasmuch as the ring 38 overlaps the head 36 of sleeve 34, substantial upward movement of sleeve 34 is prevented.

The valve 20 is provided with stem 42 of elastic material, such as soft cured rubber or other plastic, passing through the bore of the sleeve 34 to the upper or outer end of the sleeve. The valve stem is preferably integral with the valve and is preferably provided with an annular shoulder 44, bearing against the underside of the head 36 of the sleeve 34.

46 designates a gas port extending the entire length of the valve stem.

The sleeve 34 is split longitudinally, as above noted, so that it may be contracted by a gas-port-adjusting member 50, which is threaded upon the sleeve the upper end of this member and the corresponding end of sleeve 34 being tapered, so that, by screwing the member 50 either in or out, the valve stem 42 will be compressed to reduce the outlet end of gas port 46 or allow it to expand, due to its inherent elasticity.

The gas-port-adjusting member 50 projects beyond the head 52 of sleeve 40 and near its outer end is provided with an annular flange 54, which may be knurled, for example, so that it readily may be rotated by hand and, in some cases, may be grooved for a purpose later to be referred to.

The bore of the adjusting member 50, beginning at the top of the valve stem 42, tapers inwardly to provide an air-aspirating, frusto-conical chamber 58 and then is straight-sided for a short distance to provide a mixing chamber 60. The bore then slopes outwardly to provide an inverted frusto-conical, air-aspirating and mixing chamber 62, extending almost to the outer end of 50, the extreme outer end of the bore being straight-sided.

The outside diameter of the adjusting member 50, from abreast of the chamber 58 to above the chamber 60, is materially less than the inside diameter of the sleeve 40, to provide a substantial space 64 at this area between 50 and 40, and the member 50 is provided with air-aspirating ports 66 from space 64 to the frusto-conical chamber 58 and with air-aspirating ports 68 from space 64 to the inverted frusto-conical chamber 62. The sleeve 40 is provided with air inlet ports 70, just below flange 52.

The bores 70 in the member 40 are above the top 14 of the lighter casing 2, so that primary air may be aspirated through ports 70 along space 64 and through ports 66 to the aspirating chamber 58, and secondary air may be aspirated through ports 68 to aspirating and mixing chamber 62.

As above pointed out, the ignition mechanism for my improved lighter may be of the conventional striker type and, it will be understood, is operated as the lever 10 is depressed.

As will be seen by an inspection of Figs. 1 and 2, one end of the lever 6 rests upon the upper end of the outlet-adjusting member 50 when the lighter is not in use, and, consequently, the valve 20 will be seated firmly on the bottom of the plug 12 to prevent the passage of any gas from the lighter casing to the bore 46 of the valve stem 42.

When the lever 10 is depressed to move the end of 6 out of contact with the outer end of adjusting member 50, then the pressure of the gas in the casing 2 will deflect the material of the valve sufficiently to permit gas to flow through inlet 26 in the bottom of plug 12 past the flange 24 and to air-aspirating chamber 58, mixing chamber 60, and aspirating and mixing chamber 62, and to the exit or outer end of adjusting member 50.

Because of the fact that the gas in the casing 2 is under pressure, and because of the fact that aspirating chamber 58 is tapered, the gas rushing through chamber 58 will draw or aspirate primary air into the chamber 58 through ports 70, open to the atmosphere, space 64 and ports 66. The gas and primary air become somewhat mixed as they pass through chamber 60, and as this mixture flows past the ports 70 into the air-aspirating and mixing chamber 62, additional or secondary air will be drawn into the stream, so that, by the time the exit end of the member 50 is reached, the gas and air are thoroughly mixed to provide a highly combustible mixture.

It will be appreciated that the operation just described is substantially instantaneous, the valve 20 deflecting the moment the end of the lever 6 begins to lift, so that, by the time the lever 6 has pivoted sufficiently to effect operation of the igniter mechanism, an air-gas, highly combustible mixture is being discharged from the exit end of the valve and burner unit.

As above pointed out, the gas pressure in the casing 2 varies with temperature changes, with a corresponding change in gas velocity when the lighter is operated. It is of advantage, therefore, to compensate for these pressure and velocity changes, so as to ensure that the rate of gas flow and flame propagation will be in substantial equilibrium to avoid blow-back and blow-off. By varying the setting of the gas-port-adjusting member 50, it is quite apparent that the desired results can be produced. I find also that by varying the gas volume and velocity, I am able to produce an intensely hot blue flame, apparently substantially free of carbon—complete combustion. This adjustable feature of my invention is of advantage in another connection in that, by simply slightly varying the setting of element 50, I am able to produce a stiff short or long flame, as desired, thereby to adapt the lighter for use with both cigarettes and pipes.

I have explained that the valve stem 42 is of a suitable elastic material, such as a plastic. I have explained also that the valve stem is provided with a central bore, through which the gas must flow in its passage to the burner. It will be appreciated, therefore, that the desired adjustability of gas flow is readily obtained simply by rotating the adjusting member 50 from the casing exterior in one direction to contract the valve stem port or in the opposite direction to allow the valve stem port to expand.

It will be seen from all of the foregoing that not only have I made provision for varying the flame characteristics of the lighter flame by varying the size of the bore through which the gas flows to the several aspirating and mixing chambers, but that these chambers are provided in the adjusting element or member 50 by which bore size is varied, and that the adjusting member is accessible from the lighter exterior. This makes for a very simple, compact, and relatively inexpensive unit assembly, which is usable not only for installation in new gaseous-fuel lighters but may be installed in existing lighters of the wick or liquid fuel type simply by removing the wick mechanism, thereby to convert such lighters to the more modern types of gaseous-fuel lighters.

I wish it to be understood that changes may be made in the details of construction and arrangement of parts above described within the purview of my invention.

The embodiment of my invention illustrated in Fig. 4 is very similar to that just described, the primary difference between the two forms being that in Fig. 4 the active part of the valve seats against a plastic, whereas in Fig. 2 the valve is plastic and seats against metal. Because of the similarity between Figs. 2 and 4, a full detailed description of Fig. 4 of the drawings is deemed unnecessary, and those parts of Fig. 4 which are simply duplicates of parts shown in Fig. 2 have been given the same reference characters as in Fig. 2 for clarity of description.

In the embodiment illustrated in Fig. 4, a metal disc **80** is placed in the bottom of the plug **12**, and bonded to it is a resilient, plastic, cup-shaped valve seat **82**, which, it will be seen, is a sealed fit in the plug bottom. The peripheral flange **22** of the gas valve **20** is held in sealing contact against the rim of the valve seat **82** by the metal ring **28**, the washer **30**, clamping ring **38**, and sleeve **40**. The active part of the valve in this embodiment is of metal instead of plastic and is in the form of an inverted T, the head **84** of which is disposed across the lower end of the valve stem **42**, while the stem **86** of the T, which is hollow, extends upwardly into the bore **46** of the plastic valve stem **42** with a tight fit.

The head **84** of the T is provided with an annular flange **88** on its lower face, and, inasmuch as the inlet orifice **26** in the bottom of the plug **12** and the port **90** through metal disc **30** and through the valve seat **82** are within the area bounded by the annular flange **88**, it will be apparent that, when this flange **88** is seated against the plastic seat **82**, gas flow is effectively sealed off. When the valve **20** is deflected to unseat **84**, then gas is free to flow past the flange **88** and through the bore **92**, extending lengthwise of the T head **84**, and from thence through the hollow metal stem **86** to the port **46** of the valve stem **42**.

In this embodiment of my invention, it will be seen that the active part or head of the gas valve **20** is of metal and seats against plastic seat **82**, as distinguished from Fig. 2, wherein the active part of the valve is plastic and seats against metal.

So far as operation is concerned, the two embodiments are alike, deflection of **20** from gas pressure or manually opening the valve to permit gas to flow. So far as the ability to vary the size of the port **46** is concerned, thereby to vary the flame characteristics of the lighter flame, the operation in Fig. 4 is precisely the same as already described in connection with Figs. 1 and 2.

In the embodiment of the invention shown in Fig. 5 I have inserted a plastic member **94** directly in the bottom of the plug **12**, this member **94** functioning as the valve seat. As in Fig. 4, the active part of the valve is metal and in the form of an inverted T. The stem **96** of the T, which is hollow, extends along the bore **46** in the plastic valve stem **42** with a tight fit, while the head **98** of the T extends across the end of the valve stem **42**. The head **98** is bored longitudinally, as shown at **100**, and the lower face of the head **98** is convex and complementary to the concaved face of the valve seat **94**.

In both Figs. 4 and 5 the gas pressure is applied directly to the metal heads of the T, and the seats for these heads are plastic.

In the embodiment shown in Fig. 6 I have illustrated still another form of valve mechanism in that the interior of the metal plug **12** at the bottom thereof is provided with an upstanding conical formation **102**, which extends into the port **46** of valve stem **42**. The gas inlet **104** is through the side of the plug **12** instead of through the bottom thereof as in the other embodiments already described. When the lighter is operated by pressing the lever **10** of Fig. 1, gas pressure will deflect the valve **20** sufficiently to permit gas to flow past seat **102** to valve stem port **46**.

Referring to the embodiment of my invention illustrated in Fig. 7:

In this construction, **12**, as before, designates a plug adapted to be inserted through the top of the casing **2** and to be soldered or otherwise permanently sealed in place.

The plug **12** is internally threaded at its upper or outer end, as shown at **106**, while near its bottom, as shown at **108**, the internal diameter of the plug is substantially reduced. At the bottom of this reduced interior of the plug, I provide an elastic material, such as rubber for instance, and designated **110**. Overlying this cushion is a filter sheet **112**, which may be glasswool or other suitable material.

Engaging the upper face of the filter sheet **112** is a metal member composed of a base **114**, stem **116**, and head **118**. This metal member is provided with a central, longitudinally extending bore **120**.

Surrounding the stem **116** is a sealing ring **122** of elastic material. The gas inlet for the passage of gas to the interior of the plug **12** is designated **124**, and it will be apparent from an inspection of the drawings that the sealing ring **122** effectively prevents the passage of gas to port **120** in any path other than through filter sheet **112**.

The head **118** already referred to is cup-shaped and disposed within it with a tight fit is a disc **126** of elastic material, such as a plastic, the disc being provided with a central bore which is always aligned with the bore **120**. Also disposed within the head **118** and resting upon the elastic disc **126** is a metal ring **128**. The top of this ring lies above the rim of the head **118**.

One function of the elastic disc **126** is to provide a seat for the gas valve **130**, which is of metal, and which is provided on its lower or inner face with an annular flange **132** surrounding the bore in the seat **126**. The valve **130** is provided with a longitudinal bore **134**.

136 designates the stem of valve **130**. This stem is provided with a longitudinally extending bore **138**, constantly communicating with the bore **134** of the valve **130**, the bore **138** being considerably enlarged, as shown at **140**, throughout its upper end.

Just above the valve **130**, the valve stem **136** is provided with an elastic plastic washer **142**, projecting beyond the sides of the stem so as to overlie and engage the metal member or ring **128**.

A short distance above washer **142** I provide the valve stem with transverse air inlet ports **144**, while above these ports the stem is provided with annular peripheral flange **146**. Beyond the flange **146**, the valve stem is externally threaded.

Surrounding the valve stem, but not attached to it, is a tubular member **148**, the lower end of which rests upon the member **118**. Intermediate its two ends, the member **148** is flanged internally, as seen at **150**, the lower face of this flange engaging the upper face of plastic ring **142**. The upper face of the flange **150** underlies the flange **146**, above referred to and which is integral with the valve stem **136**.

Screwed into the top of the plug **12** is an adjusting sleeve **152**, accessible from the exterior of the lighter, this sleeve engaging a ring **154**, resting upon the top of the member **148**.

Threaded upon the valve stem **136** is a sleeve **156**, provided with a diverging bore **158**. This diverging bore extends nearly to the outer end of the sleeve and from thence is straight-sided.

Just above the end of the valve stem **136**, the sleeve **156** is provided with air intakes **160**, and the member **152** just above the end of the plug **12** is provided with air intakes **162**.

From all of the foregoing, it will be appreciated that, by adjustment of the threaded sleeve **152**, the rate of gas feed from inlet **124** to the port **120** and, hence, to the outlet

of the valve and burner unit assembly may readily be varied to suit varying gas pressure conditions and to vary the characteristics of the lighter flame in that, when the sleeve is rotated to move the same inwardly of the plug 12, the density of the disc 112 will be increased, thereby to reduce the gas feed to 120, movement of the sleeve in the opposite direction having the opposite effect, of course.

It will be apparent also that, with this embodiment installed in the casing 2, when the lever 10 is depressed, the pressure of the gas in the casing 2 will deflect plastic washer 142 enough to open the valve 130 automatically, and when the lever 10 is released to permit it to be restored by spring pressure to initial position, the end of 6 will engage the top or outer end of 156 to restore washer 142 to initial position and close the valve 130.

If desired, the burner sleeve 156 near its outer end may be flanged and grooved, as shown at 157, for positively opening and closing the gas valve, as will be brought out later.

It will be appreciated furthermore from all of the foregoing that this embodiment of my invention differs from those previously described in that, while means are provided for compensating for gas pressure variations and for obtaining variations in flame characteristics, these means being accessible from the exterior of the lighter casing, the adjustments are made at the inlet of the valve and burner unit instead of at the outlet orifice.

It will be appreciated still further that, because of the resilient or floating mounting for the valve 130, valve stem 136, and sleeve 156, the amount of gas flow can be regulated to a nicety to produce a carbon-free short or long flame and to compensate for varying pressure conditions within the casing 2 simply by adjustment of the adjusting sleeve 152.

It is probably unnecessary further to describe the operation of this embodiment of my invention, as the same is self-evident. However, I should like to add that, as the valve 130 is unseated, the rush of gas through valve port 134 and through restricted stem bore 138 and enlarged bore 140 past ports 144 will aspirate air into the gas stream, more air being aspirated into the stream as the same flows past the ports 160 and 162, so that, as the air and gas expand into the diverging mixing chamber provided by the bore 158 of sleeve 156, the two will become thoroughly and intimately mixed, so that I am assured of the desired combustible mixture at the outlet of 156.

In the embodiment of my invention illustrated in Figs. 8 and 9, I again provide a construction comparable to that of Fig. 2, for example, in that I make provision for varying the gas volume and flame characteristics by varying the size of the outlet of the valve stem port.

Referring to this embodiment, 164 designates a plug adapted to be inserted into the top of the casing 2 and to be soldered, welded, or otherwise permanently sealed in place, this plug corresponding to 12 of Fig. 2. As in the case of the plug 12, the plug 164 is bored internally so as in effect to be cup-shaped. The plug is provided in its lower or inner end with a large intake port 166, filled with a filter 168, which may be glasswool or any other suitable material.

Seal-seated in the plug bore across the top of port 166 is a resilient plastic washer 170, provided with central bore 172. This washer is not only a sealing washer but functions as a valve seat for a metal gas valve 174.

Within the plug bore and bearing upon the valve seat washer 170 is a metal ring 176. This ring is cut back internally, as shown at 178, so as to receive a resilient plastic sealing ring 180.

Screwed into a threaded portion of the plug 164 is a metal clamping ring 182, which engages sealing ring 180 as well as the top of metal ring 176.

The stem of the valve 174 is designated 184, and, as illustrated, it is provided with a longitudinal port 186, in constant communication with a port 188 in the valve 174, so that, when the valve is unseated, gas can flow along the port 188 and stem port 186.

The plastic sealing ring 180 surrounds the valve stem 184 just above the valve, as is clearly shown in Fig. 8.

The metal ring 182 is provided with a rectangular or other non-circular bore 190, and the valve stem 184, where it passes through the ring, is similarly shaped, as seen in Fig. 8.

Set into the top or outer end of the valve stem 184 is a resilient plastic plug 192, which is provided with a central bore or gas outlet 194. This end of the valve stem is split longitudinally, as seen at 196, and externally threaded to receive outlet adjusting sleeve 198.

This adjusting sleeve, which is substantially smaller in diameter than the internal diameter of the plug 164, extends to the exterior thereof, where it is provided with annular flange 199, whereby it may be adjusted from the lighter exterior for varying the size of the gas outlet 194, as will be brought out presently.

The bore of the adjusting sleeve is enlarged beyond the outer face of the plastic plug 192, to provide an enlarged air-aspirating and mixing chamber 200, air intake ports 201 being provided therein for aspirating air into the gas stream flowing from outlet 194.

Beyond the chamber 200, the internal diameter of the adjusting sleeve bore is enlarged still further to provide another air-aspirating and mixing chamber 202, which is provided with air intake ports 204 for aspirating additional air into the air and gas mixture flowing therethrough from the chamber 200.

Across the bottom of the chamber 202, I provide a metal mesh screen 206. I find that this screen promotes mixture and combustion of the gas and air and renders the lighter flame more difficult to extinguish accidentally.

With this assembly installed in the lighter casing 2, it will be apparent that, when the lever 10 is depressed, gas pressure from the casing will lift the valve 174, so that gas will flow by way of valve ports 188, 186, and 194 to air-aspirating and mixing chamber 200, the mixture flowing from thence to the second air-aspirating and mixing chamber 202.

To vary the size of the gas port 194, thereby to compensate for changes in gas pressure in the casing 2 and to vary the flame characteristics of the lighter, it is simply necessary to give the adjusting sleeve 198 a partial turn in the desired direction to increase or decrease the size of port 194.

While the valve 174 may be opened by gas pressure and closed by pressure of the lever 6, additional means may be provided for these two functions, and for this reason the flange 199 of the adjusting sleeve 198 may be provided with a peripheral groove 203, which will be later referred to.

In Figs. 10, 11 and 12 I have illustrated a lighter construction in which any of the valve and burner unit assemblies above described may be incorporated, and wherein total reliance is not placed upon gas pressure for opening the gas valve. In addition to this feature, I provide means for closing the valve other than the lighter cover, so that the gas valve is closed before the cover is closed sufficiently to contact the lighter flame, and, hence, burning of the fingers or hand in closing the cover is avoided.

Referring in detail to Figs. 10, 11, and 12, the lighter casing has been designated 210. For purposes of illustration, it may be assumed that the valve and burner unit of Fig. 2 is installed in the top of this casing, it being understood, however, that the novel feature of my invention about to be described is applicable as well to any of the valve and burner unit assemblies illustrated in Figs. 3 to 9, both inclusive.

As will be seen from Figs. 10 and 11, the lighter casing 210 is provided with spring-opened cover 212, the pivot pin for the cover being designated 214, and the cover-opening spring being designated 216.

218 designates a spring catch for holding the cover closed. The spring catch is released by finger piece 220, operable from the casing exterior and illustrated as a cam oscillatable on pin 222.

On the pivot pin **214** for the lighter cover the abradant wheel **224** of the ignition mechanism is mounted, this member, as will be appreciated, cooperating with flint **226**. As in conventional practice, when the cover is released and opens under the action of its spring **216**, the wheel **224** will be given a quick rotative impulse by the spring pawl **225**, which engages the ratchet formed in the face of the wheel to produce the desired spark.

Mounted on the cover pin **214** and frictionally engaging the spring pawl **225** is a valve-actuating member, that is a valve-opening and valve-closing member, which is shown in detail in Fig. 12.

This valve-actuating member comprises a head **228** and shank **230**. As will be seen from Figs. 11 and 12, the head **228** is cupped and for greater resiliency may be slitted radially, as shown as **229**. When the lighter parts are assembled, friction between head **228** and spring pawl **225** is high enough so that, when the lighter cover opens and closes, the shank **230** of the valve-actuating member will be raised and depressed.

The shank **230** is cut out as shown at **232**, so that the shank may operatively engage the groove **56**, which, as illustrated in Fig. 2, I provide in the adjusting member **50** of the valve and burner unit assembly.

It will be appreciated, therefore, that, as the cover **212** snaps toward open position, the shank **230** of the valve-actuating member will be raised slightly, thereby to open the gas valve. This opening movement of the gas valve takes place slightly in advance of the rotation of the abradant wheel **224** of the igniter mechanism to ensure that fuel is available at the outlet of the valve and burner unit assembly when the igniter operates.

In closing the cover **212**, which is done manually, the shank **230** is depressed the moment the cover-closing movement is initiated, so that the gas valve is closed to shut off the gas supply prior to contact of the cover with the lighter flame, and, hence, burning of the fingers or hand in closing the cover is avoided.

In Fig. 13 I have illustrated a modification of the invention illustrated in Fig. 10.

In this embodiment, a conduit **234** is attached at one end to the bottom of plug **12** of the valve and burner unit assembly, its other end being open to the gas supply in the lighter casing. The conduit is provided with a valve **236**, the stem **237** of which is engaged by the shank of a valve-closing member **238**, which is very similar to the member illustrated in Fig. 12. This member is mounted on the cover pivot pin **214** and is adapted to be raised when the lighter cover **212** snaps open and is depressed as the cover is closing, in the same manner as the valve-actuating member of Figs. 10, 11, and 12. It will be appreciated that in this embodiment, as distinguished from Fig. 10, the valve **236** opens by gas pressure as the cover opens, so that gas may flow through conduit **234** to the valve and burner unit, to open the valve of this unit by gas pressure, as explained in connection with Figs. 1 and 2.

On the closing movement of the cover, however, the member **238** will close the valve **236**, to shut off the gas supply to the valve and burner unit and extinguish the lighter flame prior to contact of the cover with the lighter flame, and in this way, as in Fig. 10, guard against burning of the fingers or hand.

It will be seen from all of the foregoing that in the several embodiments of my invention hereinabove described means have been provided whereby the lighter is readily adjustable from its exterior, that is, from the outer end of the valve and burner unit assembly, to vary the gas velocity and gas volume not only to compensate for variations in the pressure of the fuel supply due to temperature variations, but to vary the flame characteristics of the lighter flame, thereby adapting a lighter so equipped for use as a cigarette as well as a pipe lighter.

It will be appreciated also that my invention comprises a unit assembly providing for conversion of existing lighters of the wick type to gaseous-fuel burners, this unit assembly being adapted also for installation in new lighters wherein the gas reservoir may be the lighter casing itself or a small tank replaceably installed in the lighter casing.

It will be appreciated furthermore that the present invention provides for adjustment of the gas volume and velocity either by varying the size of the gas outlet to the burner after the gas has passed the gas valve, or the variation or regulation may be effected in the passage of the gas to the gas valve. Figs. 2, 4 to 6, and Fig. 8 illustrate variable outlets, while Fig. 7 illustrates a construction wherein regulation is obtained before the gas reaches the gas valve.

It will be appreciated still further that the construction illustrated in Figs. 10 to 12, inclusive, is adapted for use with the valve and burner unit assemblies of Figs. 1 to 9, inclusive, for manually opening and closing the gas valve when this type of operation is desired. This construction also avoids burning of the fingers when closing the lighter cover in that the gas valve will be closed and the lighter flame extinguished before the cover has closed sufficiently to contact the lighter flame.

It is to be understood that changes may be made in the details of construction and arrangement of parts above described and illustrated in the accompanying drawings 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; and a fuel valve and burner unit assembly, said fuel valve and burner unit assembly comprising a tubular member split longitudinally and externally threaded, disposed within the lighter casing; another tubular member threaded upon the first-mentioned member and projecting to the casing exterior, one member being exteriorly tapered and the other being tapered interiorly complementary to the first taper, the second member being rotatable relatively to the first member to vary the internal diameter of the first member; and a valve stem of resilient material within the first member, said valve stem being ported from end to end, the cross-sectional area of said port being varied with contraction and expansion of the internal diameter of the first-mentioned member when the second-mentioned member is rotated relatively to the first member.

2. A portable lighter of the gaseous fuel type comprising, in combination, a lighter casing, and a valve and burner unit assembly within said casing and extending to the casing exterior; said unit assembly being provided with an inlet port and an outlet port, a valve for the inlet port, a cover member pivoted on the casing exterior, its free end normally overlying the outer end of the said unit assembly, and a valve-actuating member pivotally mounted on the pivot of the said cover member, a spring pawl on the pivot of said cover member co-acting with said valve-actuating member, so that the latter will pivot with the cover member, and means connecting the outer end of the valve-actuating member to the outer end of the unit assembly whereby, on opening movement of the said cover member, said valve-actuating member will open said valve and at the beginning of the closing movement of the said cover member will effect closure of said valve.

3. A portable lighter of the gaseous fuel type comprising, in combination, a lighter casing, and a valve and burner unit assembly within said casing and extending to the casing exterior; said unit assembly being provided with an inlet port and an outlet port, a valve for the inlet port, a pivoted member on the casing exterior having its free end normally overlying the outer end of the unit assembly, a valve-actuating member pivotally mounted on the pivot of the first-mentioned pivoted member, the outer end of said unit assembly being adjustable from the casing exterior to vary the velocity and volume of the gas passing through the unit assembly, and a connection between the adjustable end of the unit assembly and the valve-actuating member for opening the said valve on

opening movement of the first-mentioned pivoted member and for closing the valve at the beginning of the closing movement of the first-mentioned pivoted member, the connection between the valve-actuating member and the adjustable end of the unit assembly being such that the said adjustment of the unit assembly can be effected while said connection remains intact.

4. A portable lighter of the gaseous fuel type comprising, in combination, a lighter casing, and a valve and burner unit assembly within said casing and extending to the casing exterior; said unit assembly being provided with an inlet port and an outlet port, a valve for the inlet port, the projecting end of the unit assembly being attached to said valve, this end of the unit assembly being rotatably adjustable from the casing exterior to vary the velocity and volume of the gas passing through the unit assembly, a member pivoted on the casing exterior, the free end of said member overlying the projecting adjustable end of the unit assembly, a valve-actuating member frictionally connected to the said pivoted member and to the adjustable end of the unit assembly and operative to open said valve upon the beginning of the opening movement of the pivoted member and to close the valve at the start of the closing movement of the pivoted member, said frictional connection of the valve-actuating member to the unit assembly remaining intact during the the said adjustment of the end of the unit assembly.

5. A valve and burner unit assembly for portable lighters of the gaseous fuel type, said assembly comprising, in combination, a cup-shaped plug adapted to be inserted into the lighter casing and to be sealed in place; a gas inlet port in the inner end of the said plug; a valve for controlling said port; a stem for said valve composed, at least in part, of a resilient non-metallic material, said stem being provided with a port which extends through the said non-metallic material, so that, when said valve is unseated, gas can flow into the plug and along said valve stem port; a split sleeve fitting over the valve stem; and an adjusting sleeve upon said split sleeve, adjustable lengthwise thereof to vary the internal diameter of the split sleeve, thereby to vary the cross-sectional area of that portion of the valve stem port which passes through the non-metallic material.

6. A valve and burner unit assembly for portable lighters of the gaseous fuel type, said assembly comprising a cup-shaped plug or fitting adapted to be inserted into a lighter casing and to be sealed in place, a gas inlet port through the inner end of said plug, a disc-like valve for controlling said port, a stem for said valve having a longitudinal bore, means for clamping the valve at its edges to the plug, said valve being composed of a resilient, non-metallic material, so that the material of the valve may be deflected to open the valve to permit gas entering the gas inlet port to flow into the plug to and through the longitudinal bore of the valve stem, an expansible and contractible sleeve into which the valve stem is fitted, and means for effecting expansion and contraction of said sleeve to vary the diameter of the valve stem bore.

7. A valve and burner unit assembly for portable lighters of the gaseous fuel type, said assembly comprising a cup-shaped plug or fitting adapted to be inserted through the wall of a lighter casing, a gas inlet port through the inner end of said plug, a valve controlling said port, a stem for said valve provided with a longitudinal bore for its entire length whereby, when said valve is unseated, gas may flow through said inlet port and along said valve stem bore, at least a portion of said valve stem being composed of resilient, non-metallic material capable of being compressed to vary the diameter of the stem bore, a split sleeve into which the valve stem extends, an adjusting sleeve threaded upon the split sleeve to provide for expansion and contraction of the same to effect a corresponding change in the size of the valve stem bore, the adjusting sleeve being shaped internally to provide air-aspirating and mixing chambers aligned with the valve stem bore.

8. A valve and burner unit assembly for portable lighters of the gaseous fuel type, said assembly comprising a cup-shaped plug or fitting adapted to be inserted through the wall of a lighter casing; a gas inlet port through the inner end of said plug; a valve comprising a head and a stem of resilient, non-metallic material at said port; a clamping sleeve for clamping the head of said valve to the said plug about its periphery; said valve being provided on its inner face with an annular flange concentric with the valve stem and offset with respect to said gas inlet port; said valve stem being provided centrally with a longitudinal bore; said flange normally seating on the bottom of the plug, thereby to prevent the passage of gas through said inlet port to the valve stem bore; a nonrotatable, split sleeve within the clamping sleeve into which the valve stem is fitted; an adjusting sleeve adjustably mounted on the split sleeve to effect contraction and expansion of the same and a corresponding variation in the diameter of the valve stem bore; said adjusting sleeve extending a substantial distance beyond the outer ends of the said plug and said clamping sleeve so as to be accessible for adjustment from the exterior of a lighter casing; said adjusting sleeve being spaced from the inner wall of the clamping sleeve and provided through its walls with air inlet ports; the said clamping sleeve being provided with air inlet ports; the interior of said adjusting sleeve being shaped to provide air-aspirating and mixing chambers abreast of the air inlet ports of the adjusting sleeve, whereby, when the said valve at the inlet port is deflected, gas will be admitted to the valve stem bore and, in flowing from thence to the outlet end of the unit assembly, will aspirate air through the said air inlet ports.

References Cited in the file of this patent

UNITED STATES PATENTS

351,968	Derrick	Nov. 2, 1886
1,185,970	Bower	June 6, 1916
1,610,889	Schmidt	Dec. 14, 1926
1,657,663	Devereux	Jan. 31, 1928
2,424,331	Rose	July 22, 1947
2,459,042	Nave et al.	Jan. 11, 1949
2,489,620	Cartwright	Nov. 29, 1949
2,582,028	Goldman et al.	Jan. 8, 1952
2,608,081	Morgan et al.	Aug. 26, 1952
2,620,643	Nissen	Dec. 9, 1952

FOREIGN PATENTS

157,429	Austria	Nov. 25, 1939