

May 27, 1958

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LIQUEFIED GAS LIGHTERS

2,836,044

Filed July 26, 1956

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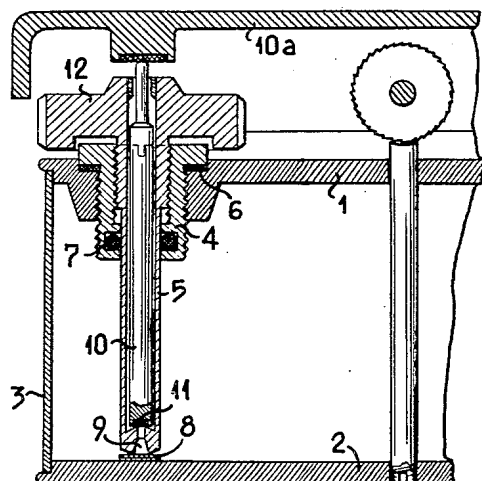


Fig. 1

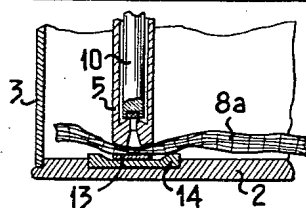


Fig. 2

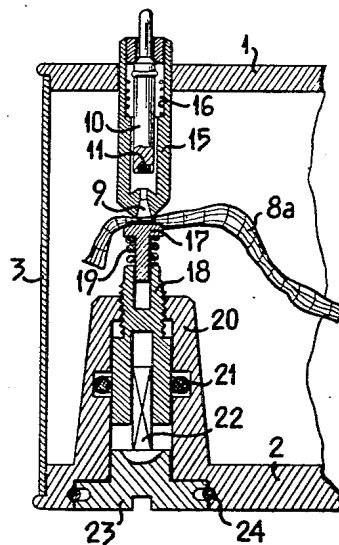


Fig. 3

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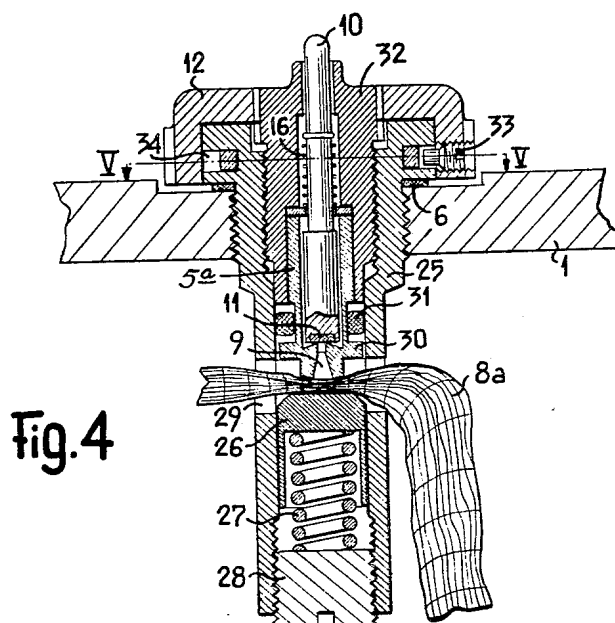


Fig.4

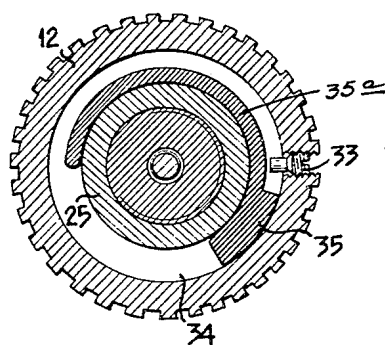


Fig. 5

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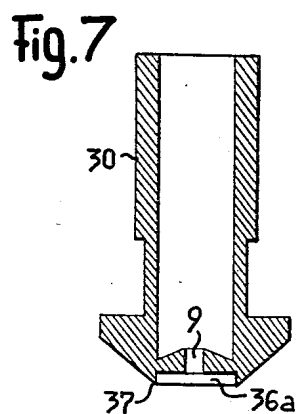
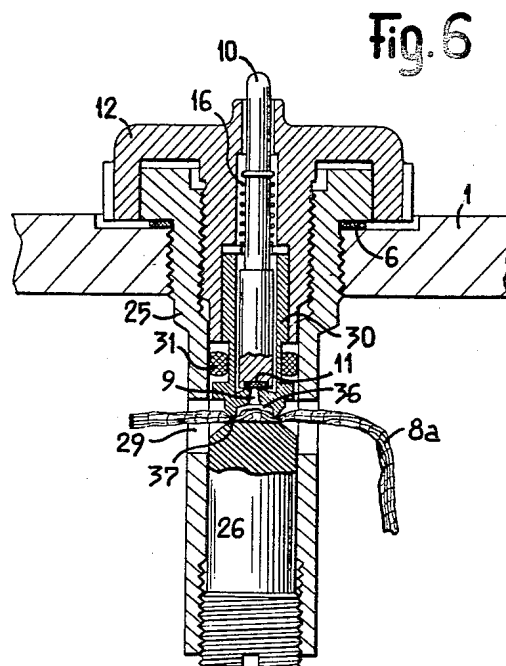
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3 Sheets-Sheet 3



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LIQUEFIED GAS LIGHTERS

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Claims priority, application Switzerland August 4, 1955

4 Claims. (Cl. 67—87)

The present invention has for its subject a liquefied gas lighter, wherein the gas is supplied to the burner through a device for evaporating and regulating the gas supply by adjustable compression, between rigid parts, of an evaporation body supplied with liquid gas and placed transversely relatively to the burner passage, one of the rigid parts having an orifice for the supply of gas to the burner, this orifice being disposed opposite to an evaporation zone on said body.

In known constructions of lighters of this type, the evaporation body is formed by a porous body placed in a cup like seat, between the burner and the reservoir containing the liquid gas, in such a manner that the latter is caused to pass therethrough and to evaporate. In this type of seating, said evaporation body is subjected to a compression so as to adjust the supply of gas to the burner, and is generally in the form of a lozenge or diaphragm placed perpendicularly to the passage channel for the gas and of very large surface area relatively to the cross-sectional area of said passage. As a result the evaporation body is compressed over a large area and the larger portion of its mass, through which the liquefied gas is to pass, is compressed. The liquid gas passes through this compressed zone whilst being gasified and expanding progressively until the moment at which it reaches the end of the passage connected to the burner and which is at atmospheric pressure.

Practice has shown that it is not possible to obtain a stable adjustment of the delivery of gas to the burner and consequently to the flame, as the evaporation of the liquid gas takes place in the compressed portion of the porous body and only takes place slowly, so that the porous body has a zone in which the gas is present partly in the liquid state and partly in the gaseous state. The positioning of the said zone in the porous body varies, on the one hand, in proportion to the time which has elapsed since the lighter has been opened and, on the other hand, in proportion to the temperature, which is the cause of the instability of the flame. Under some conditions, said zone is very close to the mouth of the passage of the burner and it is therefore possible that drops of liquid gas may be entrained as far as this mouth, the sudden evaporation of said drops producing momentary increases of the flame. On the other hand, the gas, when evaporating, deposits waxy residues which clog the pores of the evaporation body and close, at least partially, the gas passage, whereby the instability of adjustment is still further increased.

Further, in view of the large surface of these diaphragms, relatively large forces are necessary for obtaining a regulation of the delivery by compression, which in general necessitates the use of special instruments, such as, for example, a spanner or screwdriver.

On the other hand it has been found that, when a uniform adjustment of the supply of gas to the burner is to be obtained by compression of an evaporation body, it is necessary to define on said latter a non-compressed

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evaporation zone of small surface area, the supply of liquid gas to said latter being limited by a short compression zone.

According to the present invention this result is obtained by the fact that one of the parts compressing the evaporation body is shaped in such a manner as to create a zone of compression of the evaporation body only in proximity to the edge of the evaporation zone, the flow of liquid gas being directed transversely with regard to the compressive forces applied to said compression zone.

The accompanying drawing illustrates diagrammatically and by way of example various constructional embodiments of the invention.

Fig. 1 shows a portion of a lighter according to the first form of construction.

Fig. 2 shows a detail of a modification of this form of construction.

Figs. 3 and 4 relate to two other forms of construction.

Fig. 5 is a section on the line V—V of Fig. 4.

Fig. 6 illustrates a variant of the burner according to Fig. 4.

Fig. 7 illustrates, on a larger scale, a part of this burner, the shape of which has been slightly modified.

The reservoir of the lighter shown in Figure 1 has an upper wall 1, a lower wall 2 and a side wall 3. Into the upper wall is screwed a burner assembly including, among other elements later to be described, a gland nut 4 which is provided with an internal bore for receiving the externally threaded portion of a tubular gas escape regulator tube 5 through which the flow of gas is controlled. The fluidtight seal between the shell 4 and the upper wall 1 is maintained by a washer 6, and the seal between the shell 4 and the tube 5 is maintained by an annular washer 7 located in a mating groove of the shell 4.

The upper end of the tube 5 is formed as a wheel 12 with a milled edge, enabling the user to screw the tubular gas escape tube 5 more or less into the shell 4 and thus to apply an adjustable pressure on an evaporation body formed by a gas feeding element or medium in the form of a lozenge 8 of porous material, clamped between two rigid parts which are formed respectively by the lower wall 2 of the lighter which serves as a relatively fixed anvil and the base of the part 5. Said latter has a gasifying chamber 9 for the supply of gas to the burner and is shaped in such a manner as to create a compression zone of the lozenge 8 only in proximity to the edge of the evaporation zone which this chamber 9 defines on said lozenge. The gas flows through the compression zone transversely with respect to the compressive forces, before reaching the evaporation zone located opposite of the chamber 9, where it evaporates.

In the interior of the gas escape regulating tube 5 is located a rod or valve stem 10 of which the lower end has a seal 11 which bears against the upper edge of the outlet of chamber 9.

The liquid gas soaks the lozenge 8 and evaporates in the zone thereof which is located opposite the orifice 9. The lighter is provided with a cover 10a which bears against the upper end of the rod or stem 10 when the lighter is not being used. As the upper or outer end of the chamber 9 is an outlet orifice of very small cross-sectional area as compared with the diameter of the mouth of the chamber, it is not necessary to apply any considerable force to the rod 10 for preventing leakages of gas, in spite of the relatively high pressure thereof in the reservoir of the lighter. When the lighter is operated, the cover 10a opens and releases the rod 10. The latter is raised by the pressure of gas and the latter can escape to the outside through the passage formed by the space comprised between the part 5 and the rod 10. The gas can be ignited directly as it passes out through the outer exposed end

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of the gas regulator tube 5. The height of the flame can be adjusted by turning the milled wheel 12 for modifying the compression of the porous lozenge between the parts 2 and 5.

As will be seen, the lower end of the part 5 is conical, so that the distance separating the two rigid parts clamping the lozenge 8 is the minimum along the edges or mouth of the chamber 9. In this manner is obtained the maximum compression of the porous lozenge immediately at the edge of the evaporation zone created thereby and the gas expands suddenly, which provides for a satisfactory functioning of the lighter and great stability of the flame, even at low temperatures. Further, as the area of the compression zone is small the force to be applied to the milled wheel 12 is relatively light, even though a sufficiently high specific pressure should be applied to the zone of compression for ensuring the regulation of the delivery of gas. In the examples illustrated, the surface of said compression zone is less than four times the cross-sectional area of the supply orifice 9 at the point at which it defines the evaporation zone.

Fig. 2 shows a modification in which the lozenge 8 is replaced by an evaporation element or body 8a of larger dimensions in the form of an elongated strip or tape having the capillary feeding function of a wick. This element is not pressed directly against the base 2 by the part 5, but against a rigid part formed by a plate 13 resting on a resilient element 14 of rubber, for example, fitted into a recess of the lower wall 2 of the lighter. In this manner there is obtained a greater smoothness of adjustment of the height of the flame by the milled wheel 12 because the plate 13 tends to move at the same time as the part 5, so that the movement of the latter is greater than in the case of Fig. 1 for obtaining the same variation in pressure on the evaporation element 8a.

It is known that liquefied gases, especially butane, produce, when evaporating, oily deposits on the evaporation element or medium. These deposits finally completely obturate the pores of the evaporation body, which prevents correct functioning of the lighter. In the form of construction shown in Fig. 1, the part 5 may be moved upwardly, by rotation of the milled wheel 12, through a distance sufficient to eliminate any appreciable pressure on the evaporation body 8a, so that the gas can pass out of the burner in the liquid state, whilst producing a cleansing of the evaporation zone. Thus, as after a time of functioning, the evaporation body has a tendency to become clogged, the user can clean it easily by unscrewing the milled wheel 12 so as to allow a small quantity of liquid gas to escape to flush out the accumulated residues. Then he should tighten up the wheel 12 and effect adjustment of the height of the flame.

Fig. 3 shows another form of construction in which the gas escape tube 15 is welded to the upper wall 1 of the lighter. Said tube 15 has a chamber 9 with an outlet orifice of reduced diameter for the supply of gas to the burner and contains a rod 10 having a seal 11 and serving the same purpose as the parts bearing the same references as shown in Fig. 2. However, the rod 10 is urged to its raised position by a spring 16 in such a manner as to withdraw the seal 11 from the upper edge of the orifice 9. When the lighter cover is closed the valve stem or rod is pushed inwardly to seat the seal over the outlet orifice of the gas chamber. The shoulder at the junction of the body of the stem and the shank of the exposed tip permits passage of gas because the facing or contacting parts are not machined so that there is no complete blocking of the gas escape channel. The evaporation element 8a is clamped between two rigid parts formed by the part 15 and by a yieldable anvil member 17 sliding in a threaded part 18 and subjected to the action of a spring 19. Said part 18 is screwed into corresponding part 20 formed integral with the lower wall 2 of the reservoir of the lighter. The fluidtightness between the part 18 and the part 20 is ensured by a fluidtight joint

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21. The lower portion of the part 18 has an orifice of square cross-section with which engages a key 22 of corresponding shape, secured to a part 23 in the form of a screw head; said part 23 is held in the wall 2 of the lighter by an elastic ring 24. When turning the part 23, the part 18 is screwed into the part 20, which enables the pressure applied to the evaporation body 8a by the parts 15 and 17, to be modified. The operation of this form of construction is in all respects similar to that of the form of construction described with reference to Fig. 1, except that the adjustment of the height of the flame is effected by means of the part 23 instead of by means of the milled wheel 12.

Fig. 4 shows another form of construction in which a tubular shell or support 25 is screwed into the upper wall 1 of the lighter casing. This support comprises at its lower end a rigid yieldably supported anvil portion 26 subjected to the pressure of a spring 27 bearing against a screw 28 threaded into the support 25. The shell has a transverse medial opening 29 through which the evaporation strip 8a passes and in which it is also clamped between the anvil portion 26 and the mouth of the gas chamber of the gas regulator tube 5a. In the zone of the flange 30 there is provided a chamber 9 communicating with an outlet orifice for the supply of gas to the burner. The packing 31 insures fluidtightness between the shell 25 and the flanged part 30. In this form of the invention the burner assembly includes the flanged gas regulator tube 5a and a gas escape sleeve 32 assembled coaxially. The outer portion of sleeve 32 is partially threaded to mate with similar threads on the interior of the shell 25. The sleeve 32 has its upper portion provided with alternate grooves and ribs enabling it to be coupled to and driven in rotation by a manually manipulated wheel 12. The gas regulator tube 5a and sleeve 32 have a longitudinal bore which houses the valve stem or rod 10 which is subject to the action of a spring 16 and forms a valve for the outlet orifice of the chamber 9.

The edge of the milled wheel 12 has a radially disposed threaded hole which receives a screw 33 whose inner end rides in an annular groove 34 (Fig. 5) provided in the shell 25. The inner end of screw 33 also forms one part of a stop which determines the maximum adjusted position of the flame by coming into contact with one or the other faces of an abutment 35. This abutment forms a movable stop held in position on the shell 25 by a resilient clamping ring 35a frictionally embracing the bottom of the groove in the flange of the shell 25. In this manner, when applying an additional force on the wheel 12, the abutment stop 35 can be set or reset. Once the abutment is set the turning of the wheel 12 through an arc defined by opposite sides of abutment 35, the distance the tube 5a moves is sufficient to permit a normal adjustment of the height of the flame. On the contrary, when it is desired to scavenge the evaporation zone of the liquid gas feeding element or strip 8a by a surge of liquid gas, it is necessary to remove pressure from the strip by unscrewing the sleeve 32 through the manipulation of wheel 12 with a fairly strong effort to produce a movement of the abutment 35 and let liquid fuel escape through the burner nozzle. Thereafter, the wheel 12 may be turned in the opposite direction to press the mouth of the tubular gas regulator against the strip and reset the stop 35 to a position where the normal flame regulating range of movement of the wheel 12 will be restored.

Fig. 6 illustrates another constructional form of a burner assembly, providing for still greater stability of the flame than those above described. This burner is constituted by a support 25 screwed into the upper wall 1 of the lighter and having a transverse opening 29 through which passes an evaporation strip 8a which is clamped between the inner end of a plug 26 screwed into the lower extremity of the shell 25 and a tubular gas regulator 5 having flange 30 and inlet chamber 9 pro-

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vided with an outlet orifice of reduced diameter for supplying gas to the burner.

A packing 31 insures for gas tightness between the shell 25 and the gas regulator 5a having a flange. This latter is fitted in a part 12, the upper part of which forms a wheel having a milled edge to enable it to be easily rotated to screw it into or unscrew it in the shell 25 and thus to permit of adjusting the distance between the part 30 and the part 26, in order to regulate the compression exerted on the evaporation strip 8a. The parts 30 and 12 are bored longitudinally to receive a rod 10 subject to the action of a spring 16. The lower end of this rod 10 has a fluidtight packing 11 adapted to be applied to the orifice 9 to close it when the cover, not illustrated, of the lighter, bears on the upper extremity of the rod 10. When this cover is lifted, the spring 16 acts to move the rod 10 away from the orifice 9 in order to permit of the flow and escape of gas.

The gas inlet chamber 9 to the burner communicates with a chamber 36 constituted by a cavity in the part 30. The edge of this cavity is adapted to exert a compression on the evaporation strip 8a around the evaporation zone which is disposed inside the augmented chamber 36. The height of this latter is substantially equal to the thickness of the evaporation strip 8a when it is not compressed. In this way, when the parts 26 and 30 are moved together to the maximum extent in order that the annular edge 37 of the chamber 36 exerts a very strong compression on the evaporation strip 8a, the part of this body 8a which is disposed in the chamber 36 undergoes practically no compression.

When the lighter is closed, the chamber 36, the volume of which is almost completely occupied by the evaporation body 8a in the non-compressed state, can be filled with gas in the liquid state. When the lighter is opened the quantity of liquid gas does not evaporate instantaneously, but slowly, because the gas is retained by the fibres of the evaporation body, so that on ignition a stable flame is obtained at temperatures lower than 15° C. It will be noticed in addition, that the evaporation or gasifying chamber 9 is in the form of a truncated cone which is of advantage because if a little gas in the liquid state is disposed in the passage the liquid drop has a tendency to occupy a minimum surface by reason of capillary action and moves towards the part of minimum section of the cone whence it is expelled by the gaseous flow.

It may be observed that butane gas which is currently used for lighters operating with liquefied gas, contains sometimes very small fractions of a hydrocarbon having a higher boiling point than that of butane and these fractions have a tendency to accumulate in the evaporation zone in the form of a liquid droplet.

Fig. 7 illustrates a variant of the part 30 in which the chamber 9 is cylindrical, whereas the upper wall of the entrance chamber 36a is flat instead of having the shape of a truncated cone, as illustrated in Fig. 1. It may be observed that the height of this entrance chamber 36a is smaller than that of the chamber according to Fig. 1. In practice it is not necessary that the part of the evaporation body, which is located in this chamber, be completely uncompressed. It is sufficient in practice that the compression of the evaporation body in the chamber 36 or 36a be much less than that exerted on this body by the annular edge 37. In practice it is of advantage to make the height of the chamber greater than one half the thickness of the evaporation body in the uncompressed state, but less than this thickness. However, acceptable results can still be obtained when the height of this chamber is greater than the thickness of the evaporation body in the uncompressed state. Notwithstanding, this height should not exceed twice the thickness of the evaporation body, because without this a substantial part of the volume of the chamber 36 is not occupied by the evaporation body and since the gas can accumulate there in the liquid state, there is produced again, at the time of open-

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ing the lighter, a sudden evaporation of this gas which produces a considerable lowering of the temperature of the part 30, which involves the danger of again producing the irregularities in the flame which it is sought to avoid.

In the embodiment described in Fig. 6, the chamber 36 is formed in the part 30 in which is provided the orifice 9 for the supply of the gas to the burner, but it is to be understood that this chamber could also be provided in the part 26, the part 30 then having only the orifice 9, which would come directly into contact with the evaporation body 8a. As a variant, a cavity could also be provided in each of the parts 30 and 26, these cavities being disposed opposite to each other in such a way as together to form the chamber 36.

In all the constructional forms described, one of the rigid parts has a circular edge for effecting the compression of the evaporation body, but good results can also be obtained by clamping the evaporation body between plane surfaces of the rigid parts, on condition that the compression zone is produced only in proximity to the edge of the evaporation zone.

I claim:

1. A liquefied gas fueled lighter of the character described, comprising a casing having a reservoir therein constructed to receive liquefied gas fuel, a burner structure carried by said casing and having therewith a fuel conducting passage leading outwardly to the mouth of the burner, a porous fuel conducting body having one portion thereof which lies across the inner end of such passage to provide a fuel evaporation zone at the surface of such portion which faces said passage, clamping means including opposed members compressing between them portions of said body which surround said evaporation zone to provide a compression zone surrounding said evaporation zone, said porous body also having portions which are disposed on the peripherally outward side of said compression zone and which are exposed to said reservoir to provide a liquid fuel conducting zone surrounding said compression zone, whereby liquid fuel passing from said reservoir to said evaporation zone enters said body through said portions which are exposed to said reservoir on the peripherally outward side of said compression zone, and then passes through said compression zone to said evaporation zone in paths of flow which are transverse to the compressive forces applied by said clamping members, said clamping means being adjustable to regulate said compressive forces and thereby alter the rate of flow of fuel through said compression zone to said evaporation zone.

2. A liquefied gas fueled lighter of the character described, comprising a casing having a reservoir therein constructed to receive liquefied gas fuel, a burner structure including a hollow housing mounted in a wall of said casing and extending into said reservoir, said housing having therewithin a fuel conducting passage leading to the mouth of the burner, the portion of said housing within said reservoir having a side wall provided with an opening which affords communication between said reservoir and the interior of said housing, a strip of porous fuel conducting material having one portion thereof which lies across the inner end of such passage to provide a fuel evaporation zone at the surface portion of such strip which faces said passage, said strip also having portions which extend from the interior of said housing and outwardly through said opening into the space within said fuel reservoir, a clamping member within said housing which engages the portions of said strip which surround said evaporation zone, to provide a compression zone surrounding said evaporation zone, a second clamping member also disposed interiorly of said housing and which engages the surface of said fuel conducting strip which is juxtaposed to said evaporation zone and said compression zone, and means affording relative adjustment of said clamping members one toward and from the other, to alter the compressive forces ap-

plied by said clamping members to the portions of the fuel conducting strip which surround such evaporation zone, the aforesaid portions of said strip affording a fuel conducting zone through said strip which surrounds said compression zone, whereby, liquid fuel passing from said reservoir to said evaporation zone enters said strip from the portions thereof which are disposed on the peripherally outward side of said compression zone and then passes through said compression zone to said evaporation zone in paths of flow which are transverse to the compressive forces applied by said clamping members.

3. A liquefied gas fueled lighter of the character described according to claim 2, wherein, the housing is fixed in the casing and the means affording relative adjustment of said clamping members one from and toward the other includes, an abutment on the housing and manually rotatable means on the exterior of the casing having a flange telescoping over the abutment and said flange has a stop thereon cooperating with the abutment normally to limit the angular turning movement of the clamping member.

4. A liquefied gas fueled lighter of the character described according to claim 3, wherein the abutment is frictionally clamped to the housing, whereby, an angular force on the abutment in excess of the normal force to regulate the movement of said inner tubular element to produce the selected gas discharge pressure will cause the element to relieve the strip of compression sufficiently to permit a cleansing surge of liquid gas to pass through the said inner tubular element and out past the tip of the valve stem.

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