PATENT SPECIFICATION

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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in or relating to Liquefied Gas Lighters

We, LA NATIONALE S.A., a Company organised under the laws of Switzerland, of 2, Rue des Falaises, Geneva, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

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 parts, of an evaporation body supplied with liquefied gas and placed transversely relatively to the burner passage, one of the 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 into a seating, between the burner and the reservoir containing the liquefied gas, in such a manner that the liquefied gas is caused to pass therethrough and to evaporate. In its seating, said evaporation body is subjected to a compression so as to adjust the supply of gas to the burner. In the above mentioned constructions, the evaporation body 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 liquefied 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 liquefied 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 liquefied 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 ~~evaporating~~ 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 evaporation zone of small surface area, the supply of liquefied gas to said latter being limited by a short compression zone.

According to the present invention a lique-

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fied gas lighter, wherein the gas is supplied to a burner through a device for evaporating and regulating the gas supply by adjustable compression, of an evaporation body, between two parts, said body being supplied with liquefied gas and placed transversely relatively to the burner passage, one of the parts having an orifice for the supply of gas to the burner, is characterised in that the two parts compressing the ~~evaporatin~~ evaporation body are shaped in such a manner as to constitute an evaporation chamber in the interior of which the evaporation body is in a non-compressed state, one of said parts having a projection of general annular shape adapted to compress the evaporation body wholly around its non-compressed portion located in the evaporation chamber.

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 the form of construction shown in Fig. 1.

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 Fig. 1 has an upper wall 1, a lower wall 2 and a side wall 3. Into the upper wall is screwed a support 4 which itself has a threaded bore into which is screwed a part 5 of tubular shape. The fluidtightness between the support 4 and the upper wall 1 is obtained by a joint 6 and that between the support 4 and the part 5 by an annular joint 7 located in an annular groove of the support 4.

The upper end of the part 5 constitutes a wheel 12 with a milled edge, enabling the user to screw said part 5 more or less into the support 4 and thus to apply an adjustable pressure on an evaporation body formed by a lozenge 8 of porous material, clamped between two parts which are formed respectively by the lower wall 2 of the lighter and the base of the part 5. Said latter has a truncated orifice 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 orifice 9 defines on said lozenge.

The orifice 9 is constituted by a passage having a truncated shape, the major base of which is disposed on the side of the evaporated zone.

In the interior of the tubular part 5 is located a rod 10 of which the lower end has a member 11 which bears against the upper edge of the orifice 9.

The liquefied 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 10*a* which bears against the upper end of the rod 10 when the lighter is not being used. As the upper part of the orifice 9 is of very small cross-sectional area, 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 10*a* opens and releases the rod 10. The rod 10 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 of the part 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 parts clamping the lozenge 8 is the minimum along the edges of the orifice 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 body 8*a* of larger dimensions and which is not pressed directly against the base 2 by the part 5, but against a 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 ~~avoporation~~ evaporation body 8*a*.

It is known that liquefied gases, especially butane, produce when evaporating, oily deposits on the evaporating body. These deposits finally completely obturate the pores of the evaporating body, which prevents cor-

rect 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 eleminate any appreciable pressure on the evaporation body 8*a*, 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 evaporating 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 liquefied gas to escape. 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 a part 15 is welded to the upper wall 1 of the lighter. Said part 15 has an orifice 9 for the supply of gas to the burner and contains a rod 10 having a member 11 and serving the same purpose as the parts bearing the same references as shown in Fig. 2. However, the rod 10 is held in the raised position by a spring 16 in such a manner as to withdraw the member 11 from the upper edge of the orifice 9. The evaporating body 8*a* is clamped between two parts formed by the part 15 and by a 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 21. The lower portion of the part 18 has an orifice of square cross-section with which engages a part 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 8*a* 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 support 25 is screwed into the upper wall 1 of the lighter. Said support comprises at its lower end a part 26 subjected to the action of a spring 27 bearing against a screw 28 screwed into the support 25. The latter has a transverse orifice 29 into which passes an evaporation body 8*a* which is clamped between the part 26 and a part 30 having an orifice 9 for the supply of gas to the burner. Packing 31 ensures fluidtightness between the support 25 and the part 30. The latter is fitted into a part 32 of which the upper portion has grooves enabling it to be driven in rotation by a milled wheel 12. The parts 30 and 32 have a longitudinal bore in which is located a rod 10, subjected to the action of a spring 16 and forming a valve for the orifice 9. The edge of the milled wheel 12 has a threaded hole into which is screwed a screw 33 of which the end engages with an annular groove 34 provided in the support 25. The end of the screw 33 forms a stop which determines the extreme adjusting position of the flame by coming into contact with one or other of the faces of a part 35 engaging with the groove 34. Said part 35 forms a movable stop which is held in position by resilient clamping on the support 25. In this manner, when applying an additional force on the milled wheel 12, which forms the operating member of the adjusting device, the movable stop 35 can be moved. The rotation which the milled wheel 12 can carry out, without moving the stop 35 is sufficient to allow of adjusting the height of the flame. On the contrary, when it is desired to scavenge the evaporation zone of the evaporation body 8*a* by a stream of liquefied gas, it is necessary to eliminate the pressure applied to said body and to unscrew the part 32 fairly strongly whereby there is produced a movement of the stop 35 and applies a supplementary force to the operating member.

Fig. 6 illustrates another constructional form of a burner, 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 orifice 29 through which passes an evaporation body 8*a* which is clamped between a part 26 screwed into the lower extremity of the support 25 and a part 30 having an inlet orifice 9 for supplying gas to the burner.

A packing 31 provides for gas tightness between the support 25 and the part 30. 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 or unscrew it in the support 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 body 8*a*. 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 orifice 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 body 8*a* around the evaporation zone which is disposed inside the chamber 36. The height of this latter is substantially equal to the thickness of the evaporation body 8*a* 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 body 8*a*, the part of this body 8*a* 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 8*a* in the non-compressed state, can be filled with gas in the liquid state. When the lighter is opened the quantity of liquefied 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 passage 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 passage 9 is cylindrical, and the upper wall of a chamber 36*a* is flat instead of having the shape of a truncated cone, as chamber 36 in Fig. 6. It may be observed that the height of this chamber 36*a* is smaller than that of the chamber according to Fig. 1. In practice it is not necessary that the part of the evaporating 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 36*a* 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 opening 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 8*a*. 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 parts has a circular relatively sharp edge for effecting the compression of the evaporation body, but good results can also be obtained by clamping the evaporating body by means of a part, the compression edge of which is formed by a plane annular surface, provided that the compressed zone has a surface less than four times the cross-section of the gas supply orifice at the point at which the zone of evaporation is defined.

WHAT WE CLAIM IS:—

1. A liquefied gas lighter, wherein the gas is supplied to a burner through a device for evaporating and regulating the gas supply by adjustable compression, of an evaporation body, between two parts, said body being supplied with liquefied gas and placed transversely relatively to the burner passage, one of the parts having an orifice for the supply of gas to the burner, characterised in that the two parts compressing the evaporation body are shaped in such a manner as to constitute an evaporation chamber in the interior of which the evaporation body is in a non-compressed state, one of said parts having a projection of general annular shape adapted to compress the evaporation body wholly around its non-compressed portion located in the evaporation chamber.

2. A lighter according to claim 1, characterised in that the zone of compression of the evaporation body has a surface less than four times the cross-section of the gas supply orifice at the point at which the zone of evaporation is defined.

3. A lighter according to claims 1 and 2, characterised in that the distance separating the two parts is minimum along the edge of the orifice for the supply of gas to the burner.

4. A lighter according to claims 1 to 3, characterised in that one of the two parts is movable and is subjected to a resilient force

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the evaporation body 8*a* around the evaporation zone which is disposed inside the chamber 36. The height of this latter is substantially equal to the thickness of the evaporation body 8*a* 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 body 8*a*, the part of this body 8*a* 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 8*a* in the non-compressed state, can be filled with gas in the liquid state. When the lighter is opened the quantity of liquefied 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 passage 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.

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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 8*a*. 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 parts has a circular relatively sharp edge for effecting the compression of the evaporation body, but good results can also be obtained by clamping the evaporating body by means of a part, the compression edge of which is formed by a plane annular surface, provided that the compressed zone has a surface less than four times the cross-section of the gas supply orifice at the point at which the zone of evaporation is defined.

WHAT WE CLAIM IS:—

1. A liquefied gas lighter, wherein the gas is supplied to a burner through a device for evaporating and regulating the gas supply by adjustable compression, of an evaporation body, between two parts, said body being supplied with liquefied gas and placed transversely relatively to the burner passage, one of the parts having an orifice for the supply of gas to the burner, characterised in that the two parts compressing the evaporation body are shaped in such a manner as to constitute an evaporation chamber in the interior of which the evaporation body is in a non-compressed state, one of said parts having a projection of general annular shape adapted to compress the evaporation body wholly around its non-compressed portion located in the evaporation chamber.

2. A lighter according to claim 1, characterised in that the zone of compression of the evaporation body has a surface less than four times the cross-section of the gas supply orifice at the point at which the zone of evaporation is defined.

3. A lighter according to claims 1 and 2, characterised in that the distance separating the two parts is minimum along the edge of the orifice for the supply of gas to the burner.

4. A lighter according to claims 1 to 3, characterised in that one of the two parts is movable and is subjected to a resilient force

applying it against the evaporation body resting on the other part.

5. A lighter according to claims 1 to 3, characterised in that one of the parts is formed by a wall of the reservoir of the lighter.

6. A lighter according to claims 1 to 3, ~~characterized~~ in that the device for adjusting the gas supply delivery by adjustable compression has a movement sufficient to eliminate any compression on the evaporation body and this permits the washing of the evaporation zone by a stream of liquefied gas.

7. A lighter according to claims 1 to 5, characterised in that the part having the gas supply orifice is held pressed against the evaporation body by the other part, by means of a resilient element itself bearing against a wall of the reservoir of the lighter.

8. A lighter according to claims 1 to 4, characterised in that the device for regulating the gas supply delivery by the adjustable compression, comprises a member for controlling the resilient force which tends to apply a part against the evaporation body which rests on the other part.

9. A lighter according to claims 1 to 4, characterised in that the device for regulating the gas supply delivery by adjustable compression comprises a member controlling the movement of one of the parts in the direction of that which is subjected to the resilient force.

10. A lighter according to claims 1 to 4 and 9, characterised in that the part having the gas supply orifice is screwed into a support, the other part sliding in said support against the action of a spring, the first part being capable of being entrained in rotation by an operating member enabling it to be screwed more or less into the support and thus adjusting its axial position.

11. A lighter according to claims 1 to 4 and 10, characterised in that the operating member is formed by a milled ring having a projection forming a stop and which determines the extreme positions of adjustment of the flame by coming into contact with one or other of the faces of a part forming a movable stop, said latter being retained in position by resilient pressing against the support, in such a manner as to be capable of moving when a supplementary force is applied to the operating member.

12. A lighter according to claim 1, characterised in that a chamber is formed between the two parts and encloses the evaporation zone of the said body, the height of this chamber being at most equal to twice the thickness of the evaporation body when it is not compressed.

13. A lighter according to claims 1 and 12, characterised in that the chamber is constituted by a cavity provided in one of the parts, the edge of this cavity constituting the part adapted to exert a compression on the evaporation body around the evaporation zone.

14. A lighter according to claims 1, 12 and 13, characterised in that the gas supply orifice which is disposed opposite to the evaporation zone is constituted by a passage having a truncated shape, the major base of which is disposed on the side of the evaporation zone.

15. A lighter according to claims 1, 12 and 13, characterised in that the chamber is provided in the part in which is provided the orifice for the supply of gas to the burner.

16. A lighter according to claims 1 and 12 to 15, characterised in that the height of the chamber is greater than one half of the thickness of the evaporation body in the uncompressed state, but less than this thickness.

17. Liquefied gas lighters substantially as hereinbefore described and as shown in the various figures of the accompanying drawings.

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