Dec. 30, 1947. F. L. PHILLIPS 2,433,707

JET LIGHTER

Filed Nov. 21, 1944

Fig. 7.

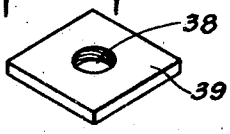


Fig. 1.

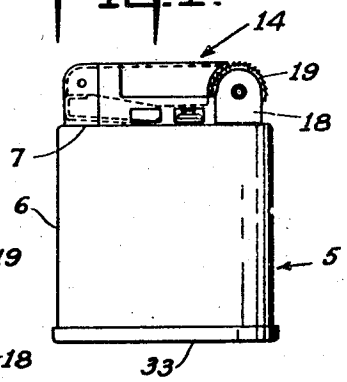
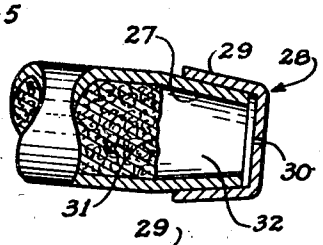


Fig. 2.

Fig. 6.



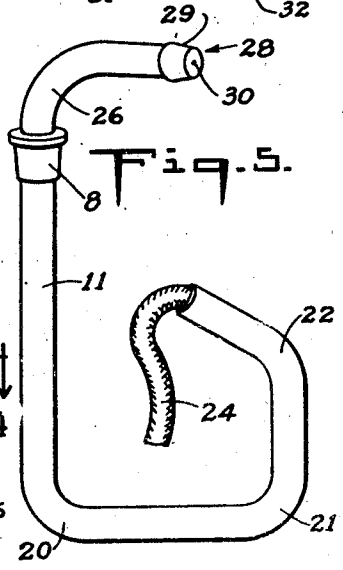


Fig. 5.

Fig. 3.

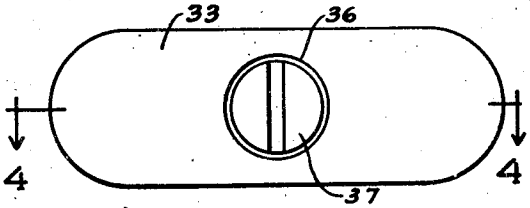
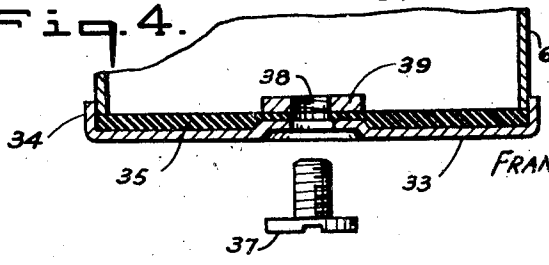


Fig. 4.



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2,433,707

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5 Claims. (Cl. 67—7.1)

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This invention relates to pocket lighters, and is more particularly concerned with improvements in such lighters employing a jet flame.

Heretofore the type of pocket lighter which furnishes a jet flame for the lighting of a pipe as well as an ordinary wick light for cigarettes has operated effectively in most respects. It has, however, been subject to annoying limitations which have tended to affect its salability and its reputation when once sold and put into use.

In particular, one prior type of jet lighter overlooked the fact that the vapor pressure built up to provide the jet, caused a substantial back pressure through the jet wick. This pressure would build up in the fuel compartment and tend to force liquid fuel out through the ordinary wick. Among the methods proposed to overcome this, one called for making the lighter housing of telescoped shells, with the outer longer than the inner, thereby leaving space for fuel expansion. This was cumbersome, uneconomical, and did not preclude leakage out between the shells, should the lighter be upside down in one's pocket or should pressure build up within it. Another proposal called for partially plugging the inner end of the tube carrying the jet wick to introduce resistance to back pressure down the jet tube. This worked well for lighters in substantially continuous use, but it did restrict the capillary action of the wick somewhat, with the result that a new lighter taken from the shelf in a store would require some time after the first filling for its jet wick to carry liquid up to the jet compartment with sufficient flow for a jet flame. The effect of this delay on prospective customers can be readily appreciated.

Another feature of prior lighters which calls for improvement is the maintenance of a proper jet aperture. These apertures are minute and, for proper operation, should remain so. They do, however, clog up occasionally, and if the user of the lighter attempts to open one of them up, he might well overdo it and enlarge the aperture to such an extent that the jet flame will not operate.

I have discovered a way for preventing the back pressure from working down through the wick into the fuel compartment, and to accomplish that end without introducing any undesirable effects. This I do by a proper snug fitting of the jet wick within its tube, and the making of that tube of the proper length so that a resistance can be built up that is just equal to or slightly in excess of the pressure generated in the jet chamber. If the tube were straight it would be too

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long for the shape lighter preferred by the public, so I have it bent around to lie within the main fuel chamber.

This improvement not only eliminates the necessity of having an expansible main fuel compartment, but also eliminates the necessity of partially plugging the inner end of the jet tube. Lighters made according to my invention, when first filled with lighter fluid, will operate wick and jet flames almost instantaneously. In addition, a positive closure can be provided for the bottom of the lighter so as to eliminate the possibility of leakage inherent in the telescoping shell arrangement. Furthermore, my bottom closure can be so constructed and gasketed that instead of removing it once it is properly seated, one merely needs to remove the securing screw to fill through the screw hole without disturbing the bottom closure itself.

To assure the maintenance of a proper jet aperture, I form that aperture in the end of a minute thimble. Such thimble and the end of the jet tube are constructed so as to be readily assembled and disassembled by hand. By furnishing a reasonable supply of replacement thimbles with each lighter sold, the user thereof may simply and properly apply a new jet aperture should the one he is using become clogged.

It is accordingly the principal object of my invention to balance the back pressure in jet tubes of jet lighters by resistance in the tube which does not interfere with the capillary action of the wick.

It is another object of my invention to furnish a leakproof lighter having supplemental filling means therein.

A further object of my invention is the provision of means whereby the proper jet aperture can be readily restored should the existing aperture become clogged or enlarged.

Further and more detailed objects of the invention will appear as the description proceeds, and through reference to the accompanying drawing in which:

Figure 1 is an elevation of the type of lighter with which my invention is concerned.

Figure 2 is a vertical section of the lighter of my invention shown in open or operative position.

Figure 3 is a plan view of the bottom of the lighter showing the improved bottom closure employed.

Figure 4 is a fragmentary section taken on lines 4 of Figure 3, showing the securing screw for the bottom closure for filling through its opening.

CROSS REFERENCE

Figure 5 is a detailed elevation showing my jet tube removed from the lighter.

Figure 6 is an enlarged fragmentary section showing the removable thimble carrying the jet aperture and the mounting therefor.

Figure 7 is a perspective view of the web for receiving the securing screw for the bottom closure.

The lighter of my invention comprises a body portion generally indicated at **5**. This portion has a continuous side wall **6** of desired shape and a closed top **7**. This top is provided with suitable apertures and fittings **8**, **9** and **10** for the extension therethrough of the jet tube **11**, the wick **12**, and the striking flints **13**. In addition, it has affixed to it a guard member generally shown at **14** carrying the cover **15**, pivoted against the action of the spring toggle **16**. This cover also carries a snuffer **17** for the wick of the main burner. In addition, the guard **14** is furnished with a mounting **18** for the pivotal reception of the striking wheel **19**, all of which parts are common to lighters of this type and form no particular part of this invention.

In the embodiment here illustrated, the extent and direction of the jet tube are in accordance with the considerations already discussed. Inside of the main fuel compartment or body of the lighter, this tube **11** extends down close to the bottom thereof and is then turned laterally in a smooth right angle bend or curve **20**. From the bend **20**, it extends well across the compartment to another right angle curve or bend **21**, and thence upward to terminate in the curved portion **22**. Though two bends **20** and **21**, and a curve **22** are shown, it is to be understood that the number and direction of the bends may vary, depending on the space available for the tube **11**. This wick is seated snugly within the tube **11** and extends out freely at **24** from the unrestricted inner end **25** of the tube **11**, so that it may readily pick up fluid from the main fluid compartment. The snug fit, to be described more particularly hereinafter, is a critical feature of this invention.

The tube **11** extends exteriorly of the wall **7** into a smooth bend **26**, and from thence substantially horizontally, to terminate in a slightly tapered outer end **27**. This end **27**, as best shown in Figure 6, is fitted with a thimble **28**, whose side wall **29** is tapered in accordance with the taper of the end **27**, and whose end wall is perforated at **30** to form the minute jet orifice. The tapers **27** and **29** are so related that the thimble **28** may be installed and removed by hand without any great effort, but will hold together unless intentionally separated. This enables the user of the lighter, on the clogging of the orifice **30**, to remove the thimble **28**, and replace it with a new one, several of which I contemplate providing with each lighter.

The provision of this easily removable thimble, as already pointed out, eliminates a cause of annoyance in prior art constructions. In order for the jet flame to operate effectively, the orifice **30** must be very minute and not vary too much from the exact dimension selected for it. The orifice is so minute, however, that should it become obstructed, the user may have difficulty in locating the place where it is supposed to be. If he does locate it, he is not likely to have available any instrument small enough to clean out the orifice without enlarging it. Any enlargement of the orifice will at least reduce the effectiveness of the jet if it does not entirely destroy its operation, so the provision for replaceable thimbles carrying proper orifices is a considerable advantage. Without them the lighter might have to be returned to the factory for repairs.

Returning to the tube **11** and its wick **23**, it is to be noted that said wick, though extending outward of the main fuel compartment, does not extend to the outer end of the tube **11**, but terminates at the position shown at **31**, sufficiently inward of the outer end of the tube **11** to provide for a gas chamber **32** between the end **31** of the wick and the end of the thimble **28**. Assuming for the moment that the main fuel compartment is filled, and the wicks **24** and **12** are properly supplied with fuel, the outer end **33** of the wick **12** may be lighted by spinning the wheel **19** in conventional fashion. Should it then be desired to light a pipe or anything else for which a projected jet flame would be desirable, the lighter is tilted so that the flame from the wick **33** impinges on the thimble **28** and the end **27** of the tube **11** comprehending the gas chamber **32**. The heat from the flame will then vaporize the fluid from the end of the wick **31** and build up sufficient pressure in such vapor to cause it to force a fine stream out through the opening **30**. This vapor stream will, of course, be ignited by the flame from the wick **33**, will extend a substantial distance from the orifice **30**, and will continue to burn for a sufficient length of time to enable a leisurely lighting of a pipe. It is, of course, necessary for proper operation, that a fairly substantial pressure be built up in the gas chamber **32**. On the other hand, however, the pressure is not of such magnitude as to overcome the fit of the taper portions **27** and **29**, so is released quite slowly through the minute orifice **30**. The pressure will thus attempt to escape in any other direction available. The only other possible path is back through the wick **23**, or between it and the interior of the tube **11**, and that is where it attempts to go. If it be permitted, however, to back up into the main fuel compartment, that compartment will shortly be under an internal pressure greater than the external pressure of the atmosphere, and leakage of the liquid fuel will result, particularly through the wick **33**. If on the other hand, the tube **11** be constricted in order to resist the back pressure from the wick **23**, such constriction will act to materially reduce the capillary action of the wick **23**, resulting in the undesirable effects already discussed.

I have found that by selecting a wick of proper texture which will have the proper snug fit within the jet tube, a definite length of tube is required to provide the proper resistance to back pressure. Taking, as an example, a tube whose internal diameter is $\frac{3}{32}''$ and drawing thereinto a wick of a hard finish braid, also having a diameter of $\frac{3}{32}''$, I find that the pressure exerted by the jet is equalized in a tube length of $3\frac{5}{16}''$. It is not too difficult to draw such a diameter wick into such a diameter tube, and it results in what I term a snug fit. By using a slightly larger wick, I find that the tube length can be decreased somewhat, though counterbalancing this is the fact that such a wick is difficult to draw into the tube. Other dimensions capable of giving good performance can, of course, be determined by following the teaching of the invention, so it is to be understood that the example given hereinabove is merely illustrative and is not to be considered in a limiting sense.

The bends **20**, **21** and **22** are placed in the tube merely to accommodate its length in the size cas-

ing employed. So long as they are smooth and do not constrict the course of the snugly fitted wick 23, they make no material difference in the operation of the jet.

The elimination of back pressure in the main fuel compartment enables me to provide a positive fuel-tight closure for the bottom of that compartment rather than one of the prior art type which allowed for expansion as such pressure built up. I accordingly furnish a closure plate 33 having an edge flange 34 therearound to snugly fit the exterior surface 6 of the chamber 5. A gasket 35 of a packing material, impervious to the common forms of liquid fuel employed, is fitted within the confines of the closure 33 and its edge flange 34. In addition, the closure 33 is provided substantially centrally thereof with a depression 36 for the reception of a securing or filling screw 37. The screw 37, as best shown in Figure 2, has as one of its principal functions the securing of the closure 33 in position to assure a leakproof joint between 33 and the body 6 by the intermediation of the gasket 35. If this leakproof seal is maintained for any period of time, however, the closure 33 will quite likely stay in place, even though the screw 37 be removed. I thus contemplate that the refilling of the lighter can be accommodated for merely by the removal of the screw 37. By taking that screw all the way out, then a clear passage will be present from the interior of the container through the closure 33, the gasket 35, and the screw threaded opening 38 in the web 39 which extends across the bottom of the chamber 6 to receive the screw 37. An ample aperture is thus provided for the filling of the main fuel compartment, and if the lighter be held upside down while this is being done, it is not even necessary to employ the type of can which squirts the fuel in, since the depression formed to take the screw head 37 will direct the liquid in the proper path. This latest feature of the invention simplifies the handling of these lighters to a marked degree, and gives the user a choice of either removing the entire bottom of the lighter or merely removing the combined securing and filling screw, if refilling is all that is desired.

It is believed that the foregoing adequately describes the purpose and operation of the various elements of my invention so that no further exposition of it is necessary. Though I have shown what I presently contemplate as the best manner of carrying my invention into effect, it is, of course, to be understood that such showing is merely illustrative and that the true scope of my invention is to be determined by the limits set by the following claims.

I claim:

1. In lighters of the character described, a jet tube of substantial predetermined length, a wick received within said tube and terminating short of the outer end of said tube to provide a pressure chamber, said jet tube being unrestricted at its inner end, the length and fit of said tube and wick being such as to provide substantially unrestricted capillary action of said wick, but so restricting the passage of vapor pressure through said tube that the existence of any such pressure to escape out of the inner end of said tube is substantially eliminated whereby on the filling of a dry lighter, fluid will quickly pass up through said wick, while in the use of the lighter the building up of vapor pressure within the fuel chamber of the same will be substantially eliminated.

2. In lighters of the character described, a jet tube having a restricted orifice at its outer end, but being unrestricted at its inner end, said tube being of substantial extent, a wick within said tube, said wick extending throughout substantially the full length of said tube, and said wick and the tube being in snug fitting interengagement, the length and fit of said tube and wick being such as to provide substantially unrestricted capillary action of said wick, but restricting the passage of vapor pressure through said tube so that the said pressure is neutralized in the extent of the tube, whereby, on filling up a dry lighter, fluid is quickly carried up through said jet tube by capillary action, but on thereafter using the jet flame of the lighter the building up of pressure in the fluid chamber is practically eliminated.

3. In lighters providing both wick and jet burners, a main fuel compartment, a jet tube extending within said compartment and being unrestricted on its inner end, a wick received within said jet tube and extending from the inner end thereof to terminate short of the exterior end of the same to provide a vaporizing chamber, the length and fit of said tube and wick being such as to provide substantially unrestricted capillary action, but still so restricting the passage of vapor pressure, built up in said vaporizing chamber, through said tube in the direction of said main fuel compartment, that the existence of such pressure is substantially eliminated at the inner end of said tube.

4. In lighters providing both wick and jet burners, a main fuel compartment, a jet tube extending for a substantial distance within said compartment and being unrestricted on its inner end, the outer end of said tube being provided with a jet orifice, a wick received in a snug fit within said tube and extending out beyond the inner end of said tube, but terminating short of said jet orifice, to provide a vaporizing chamber at said outer end of said tube, the length and fit of said tube and said wick within the same being such as to provide substantially unrestricted capillary action of the wick, but so restricting the passage of pressure through the wick from said vaporizing chamber that such pressure will be substantially eliminated at the inner end of said tube.

5. In lighters of the character described, a tube for providing a projected flame, a wick received within said tube and terminating short of the outer end of the same, a member providing an orifice engaged with the outer end of said tube, said member having a tapered engaging portion, and said end of said tube being formed with a complementary tapered engaging portion, the engagement of said member with said tube through said tapered portions being sufficient to exceed the removing force exerted by vapor pressure built up in said pressure chamber, but being small enough as to enable the removal of said member by hand, whereby on the clogging of said orifice in said member the latter member may be readily removed and a replacement installed by hand action.

FRANCIS LESLIE PHILLIPS.

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Certificate of Correction

Patent No. 2,433,707. December 30,1947.

FRANCIS LESLIE PHILLIPS

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 2, line 32, for the indistinct word after "does" read *not*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of April, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.