July 26, 1949. A. SHATKIN 2,477,398

LIGHTER

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Fig. 1.

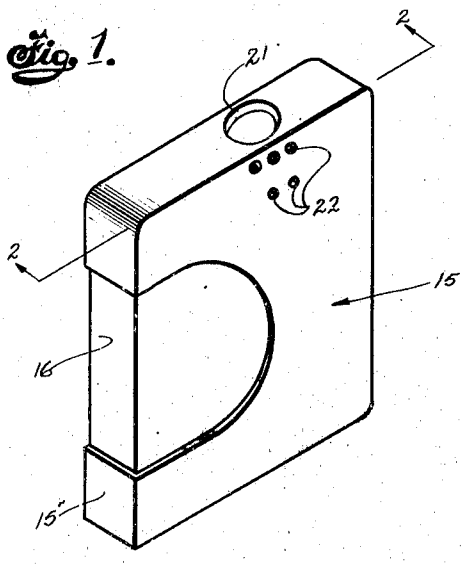


Fig. 2.

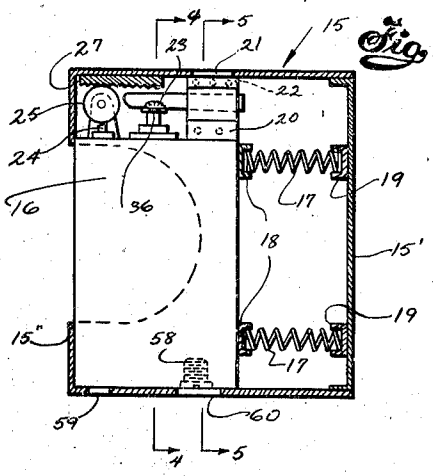


Fig. 3.

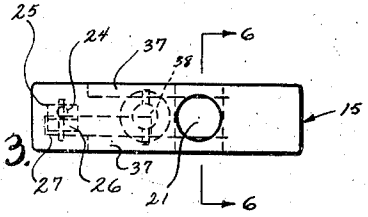


Fig. 6.

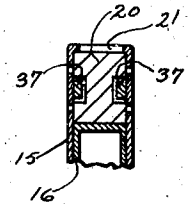


Fig. 8.

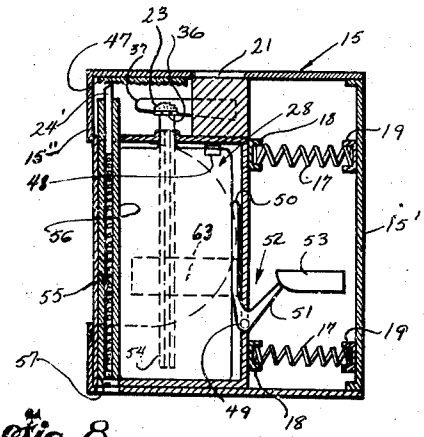
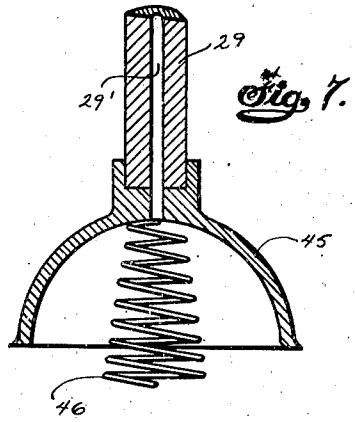


Fig. 7.



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Fig. 4.

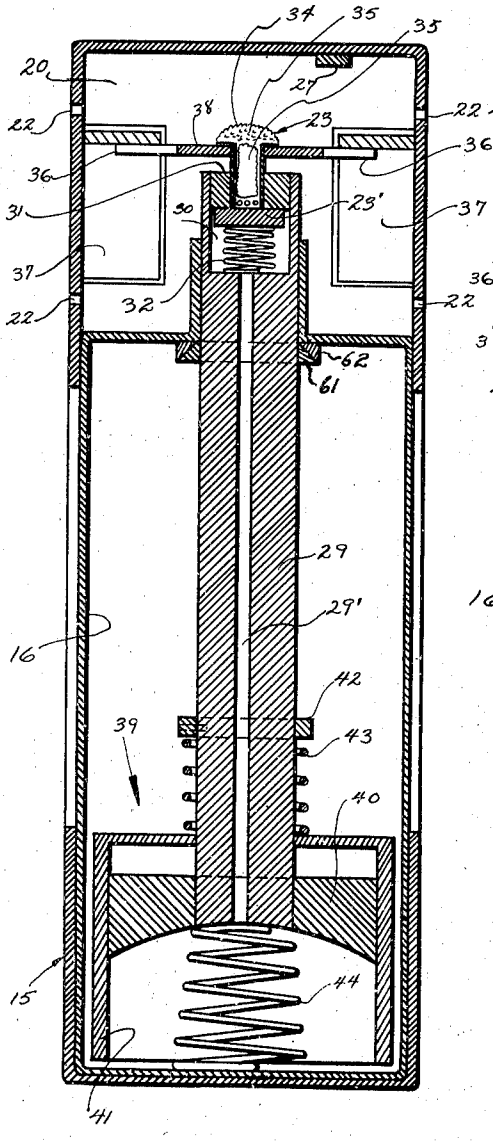
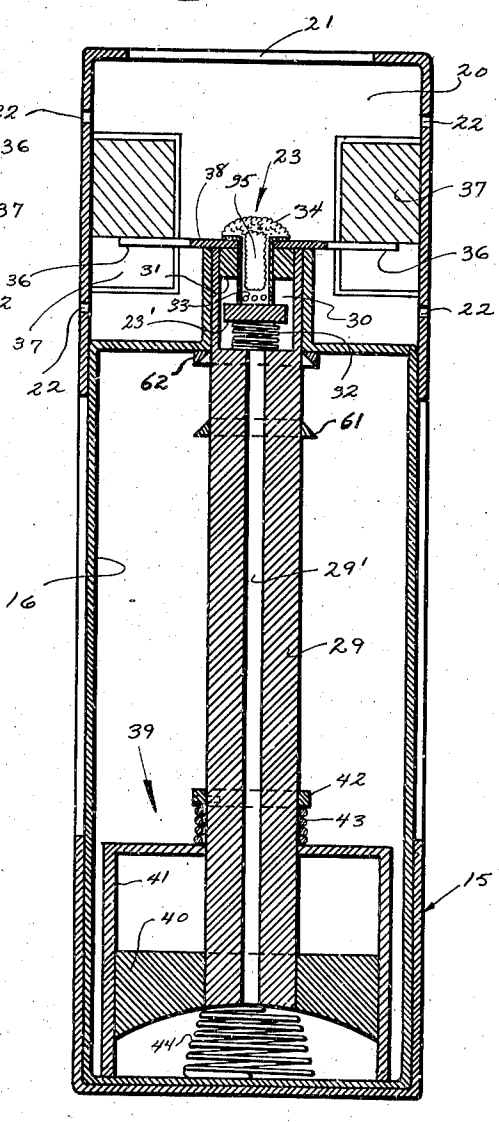


Fig. 5.



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LIGHTER

Aaron Shatkin, Long Branch, N. J.

Application April 18, 1945, Serial No. 588,905

10 Claims. (Cl. 67—7.1)

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The present invention relates to lighters and more particularly to pocket lighters of the type employing a liquid fuel and a friction means for producing sparks to ignite the fuel; operation of said device being automatically accomplished by manual manipulation of a single component.

The principal object of this invention is to provide a pocket lighter of the type described, of novel and improved construction, wherein at each operation thereof, a supply of fuel is automatically transferred to flame position.

Another object thereof is to provide a lighter of the character mentioned, of novel and improved construction which requires no burning wick.

A further object of this invention is to provide a novel and improved lighter of the class set forth, which is simple to use and efficient in accomplishing the purposes for which it is designed.

Other objects and advantages will become manifest as this disclosure proceeds.

In the accompanying drawings forming a part of this application, similar characters of reference indicate corresponding parts in all the views.

Fig. 1 is a perspective view of a lighter embodying the teachings of the present invention.

Fig. 2 is a section taken at lines 2—2 in Fig. 1.

Fig. 3 is a plan view of Fig. 1.

Fig. 4 is an enlarged sectional view taken at lines 4—4 in Fig. 2. This is when the lighter is in "rest" condition.

Fig. 5 is a similar view when the lighter is in operation.

Fig. 6 is a fragmentary sectional view taken at lines 6—6 in Fig. 3.

Fig. 7 is an enlarged fragmentary sectional view of a modified structure to be substituted for various components appearing in Figs. 4 and 5.

Fig. 8 is a view similar to Fig. 2, showing a modified embodiment of this invention.

In the drawings, the numeral 15, indicates genan outer casing, whose end 15' is a separate member to enable the device to be assembled. A single piece of material is cut out from the opposite end 15'' of said outer casing 15, and from the adjacent walls thereof, to permit the inner casing 16, to slide horizontally within the outer casing 15, against the action of the compression springs 17, which normally maintains the inner casing 16 against the interior wall of end 15''. The respective ends of said springs 17 are shown mounted in cup elements 18 and 19, which extend in juxtaposition from end 15' and the inner casing 16, respectively.

The inner casing 16 contacts the floor of the

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outer casing 15, and is of less height than said outer casing. A shutter member 20 secured atop the inner casing, is adapted, when the device is at rest condition, to close the flame hole 21 and the apertures 22, of the outer casing 15. Within the outer casing 15, and extending from the top of the inner casing 16, is a flame cup, indicated generally by the numeral 23, and also a pyrophoric element 24 which is in frictional contact with the rough periphery of a rotatably mounted wheel 25, on whose axis a gear 26 is in operative engagement with the rack 27 fixed to the outer casing 15. Contact of said rack and gear, and the contact of said shutter with the outer casing, afford a good sliding fit between the inner and outer casings 15 and 16.

It is evident from the drawings, that the flame cup 23 is positioned on the inner casing 16, intermediate the pyrophoric element 24, and the shutter member 20, with the latter nearest the end 15'. Movement of the inner casing 16, toward end 15' within the casing 15, should be limited to such position where the flame cup 23 is in alignment with the flame hole 21, when of course, apertures 22 and said flame hole are free of the shutter member 20.

A feature of this invention is the automatic transportation of a supply of liquid fuel up into the flame cup 23, to be burned, at every operation of the lighter. This is accomplished by a pump means or similar mechanism, different types of which are herein set forth, which are automatically set into operation upon relative movement of the casings 15 and 16.

The inning casing 16, either houses a separate fuel tank as 28, in Fig. 8, or it itself serves as the tank for fuel as in Fig. 2. From the bottom region of the tank in each embodiment there extends a tubular member 29 of relatively small inner bore positioned within the tank and extending from the top of the inner casing 16 up into the outer casing 15. The upper end of said tube 29 is counterbored at at 30, and provided with an inner flange at its extremity. This flange may be a separate piece 31, suitably secured. The flame cup 23, is slidably mounted through guide element 31, and is telescopically slidable with respect to the tube 29, within the counterbore 30, against the action of a compression spring 32, which is seated at the bottom of the counterbore and extends in contact with the underside of the plate base 23' of the flame cup. The body of the flame cup 23, and the guide element 31 are in close precision sliding fit. The plate 23' is of smaller size than the counterbore 30. When

the lighter is not in use, the plate 23' will contact flame cup guide element 31, and said element will act valve-like to close the series of apertures 33 at the bottom of the wall of the flame cup 23, and the relative position of these elements will be so maintained due to the action of the spring 32.

The open top of the flame cup is spanned by a metal mesh or gauze member 34. An absorbent element may be housed within the flame cup 23, as at 35, and extends from above the holes 33, to a little below the gauze member 24. Said flame cup at its upper extremity, carries a flange 38 extending from its body, from which flange extend in opposite directions the cam follower arms 36. These arms are respectively in sliding contact with the downwardly sloping edge of the cam members 37, which are fixed on the inner walls of the outer casing 15. It is to be noted that the cross section of the shutter member 20, need be H-shaped in the embodiment illustrated, in order to clear said cam members 37 (see Fig. 6). Also note that the diameter of the flange 38, exceeds that of the tube 29.

In the embodiment illustrated in Fig. 2, the tube 29, is vertically slidably mounted with respect to the inner casing 16, and carries a pump means at its lower end, indicated generally by the numeral 39. Referring to Figs. 4 and 5, the numeral 40 designates a piston having a central hole therethrough communicative with the bore 29' of the tube 29, which piston is carried at the bottom end of said tube. Said piston is within a cylinder element 41, slidably mounted on said tube 39. A collar 42, fixed about said tube serves as a seat for the compression spring 43 which acts against the cylinder member 41. The upper end of an elongated compression spring 44 is secured to the underside of the piston member 40. This spring extends directly below the piston member and serves to raise the piston member above the floor of the inner casing 16.

In the lighter of Fig. 2, which shows same in condition when not in use, the inner casing 16, is positioned in contact with outer casing end 15''. The flame hole and the apertures 22 are closed by the shutter 20. The flame cup 23 is in its uppermost position with respect to the tube 39, so maintained by the spring 32, whereby plate 23' is up against flame cup guide 31, and holes 33 are closed. Due to action of spring 44, tube 29 is in its raised position with respect to the inner casing 16, and the bottom open end of the cylinder 41, is a little off the bottom of the fuel container, which here is the inner casing 16. Due to spring 43, piston 40 is near the top of the cylinder member 41. This condition is set forth in Fig. 4.

In operation, the lighter is taken in hand. With the thumb, the user pushes the inner casing 16 towards end 15' against action of the springs 17 which are thus compressed. During such relative movement of the casing members 15 and 16, gear 26 will be rotated by its engagement with rack 27. Of course, the friction wheel will cause sparking to occur by its rubbing contact with the pyrophoric element 24. Simultaneously the action of cams 37, will cause the flame cup 23 to be pushed downward into the counterbore 30, making the interior of said flame cup communicative with the said counterbore through the apertures 33. Upon further downward movement caused by the action of said cams 37, when flange 38 contacts the tube 29, said tube will be pushed downward into the tank 16, whereby cylinder member 41 will contact the floor of said tank 16. The springs 43 and 44 will be stressed, and the piston 40 will move downward while the cylinder is at rest, whereby fuel (not shown) which is pocketed within the cylinder member 41, will rise up into tube 29, and thence into the counterbore 30. Then, after the impact of the fuel is deadened materially against the bottom 23' of the flame cup 23, such fuel will enter the flame cup through the series of holes 33, seep through and about the loosely arranged absorbent mass 35, and become ignited by the spark from element 24.

The flame of the burning fuel will be only above the gauze member 34, part within the outer casing 15, and part out through the flame hole 21. This hole 21 at the remote end of the manipulation of the casing 16, will be in alignment with the flame cup 23. Part of the flame issuing from the flame cup 23, being within the outer casing 15, and ventilation holes 22 being at flame position, a wind guard is thus provided for protection of the flame. The relative position of the various components of the device when operated are substantially shown in Fig. 5.

When the user has no further use for the flame, the thumb hold on the inner casing 16 is released, whereupon the various components of the device will automatically assume rest position due to the action of the springs included in the device, the flame will become extinguished due to exclusion of air, and any unburnt fuel which was raised, will be sucked back down into the tank, except what may remain absorbed in mass 35, if the latter is included. The actual amount of fuel automatically raised at each operation of the device need be very small, a few drops at most. The dimension of the pump elements should be so designed that only such small quantity be raised. If desired, it is evident that the lighter may be provided with an ordinary wick in place of the absorbent mass 35 and the gauze member 34, in which instance the wick would fill the mouth and extend slightly upward from the fuel cup 23. Such structure is easily understood without any further illustration.

In place of the pump structure 39, it is suggested to use a rubber cup element 45, as in Fig. 7. Such cup is secured to the bottom end of the tube 29, and is communicative with the bore of said tube. The operation thereof is obvious. A spring 46, having the same function as spring 44, is included.

In the modified form of lighter as in Fig. 8, it is to be noted, that the pyrophoric element 24' is in direct frictional contact with a steel element having a rough surface 47. This element is secured to the ceiling of the outer casing 15. The fuel tank is a rubber sac 28, provided with a vent valve indicated diagrammatically at 48. A bell-crank is pivotally mounted to the inner casing at 49, whereby its arm 50 may compress sac 28, when the arm 51 of said bell crank 52, is shifted by action of a cam 53 mounted on the wall of the outer casing 15. Said cam is so designed that the sac 28 will be compressed a definite amount to effect lifting of fuel up through tube 54, which is akin tube 29, but is fixed with respect to the inner casing 16. The operation of this embodiment is obvious in view of explanations already herein set forth.

The manner of mounting the pyrophoric elements 24 and 24' may be as is well known, by use of a tube fixedly extending through the inner casing, and housing a spring 55 to create pressure contact of the pyrophoric element extending

from the top of said tube **56**, with the roughed elements **25** or **47**. Screw **57** is provided for regulation of such pressure. Also in empirical manner, openings having removable plugs may be provided for access to fill the fuel tanks, with registerable holes in the outer casing to gain access to manipulate such plugs. In the embodiment of Fig. 2, such plug is designated by the numeral **58**, and the holes in the outer casing by **59** and **60**.

In Figs. 4 and 5, the numeral **61** is a conical collar carried on the tube **29**, and **62** indicates a seat for said collar, secured to the inner casing **16**, to provide against seepage when the lighter is not in use.

In Fig. 8, the numeral **63** indicates an indentation in the wall of the inner casing **16**, to clear the cam **53**.

This invention is capable of numerous forms and various applications without departing from the essential features herein disclosed. It is therefore intended that the patent shall cover all patentable novelty herein set forth; reference being had to following claims rather than to the specific embodiments herein which are merely illustrative of the teachings of this invention, to indicate the scope of this invention.

I claim:

1. In a lighter of the character described, the combination of a tank adapted to house liquid fuel, a pyrophoric element, means to cause sparks to issue from the pyrophoric element, a relatively small flame lamp cut positioned in the region of said sparks, a tube extending from the bottom region of the tank and communicative with said flame cup; said tube being movably mounted with respect to the tank, a pump means to transport a supply of fuel from the tank up through said tube and into the flame cup, comprising a means carried on the tube affording an open-mouthed collapsible chamber communicative with said tube; the mouth of said chamber facing a wall of the tank and adapted upon downward movement of the tube, to contact the wall of the tank, spring means to maintain the tube in raised position and the mouth of the chamber spaced from the wall of the tank while the lighter is in rest condition; said means carried on the tube, upon further downward movement of said tube after the mouth of said chamber contacts the wall of the tank, being adapted to automatically decrease the capacity of said chamber; said spring means being also adapted to restore the chamber to its initial capacity upon upward movement of the tube, means to automatically operate the pump means at each operation of the spark causing means, whereby fuel transported into the flame cup is ignited by said sparks, and a means movably mounted on said tank, adapted upon manipulation thereof from rest position, to actuate the spark causing means; the pump operating means being adapted to lower the tube upon movement of the manipulatable member from rest position, whereby the mouth of said chamber contacts the wall of the tank and the capacity of said chamber is decreased, thus forcing fuel cached within the chamber up through the said tube and into the flame cup.

2. In a lighter of the character described, the combination with an outer casing having a flame hole, of a relatively smaller inner casing moveably mounted within the outer casing, adapted to house liquid fuel therein, means to afford relative movement of the casings, spring means to maintain the casings in a predetermined relative position, a pyrophoric element carried on the inner casing, a roughened element in frictional contact with the pyrophoric element, adapted upon movement of the casings with respect to each other, to cause the emission of sparks from the pyrophoric element, a tube positioned within the fuel space within the inner casing and extending from near the bottom region of the fuel space and through the wall of the inner casing up into the space between the casings to a plane below the path of said sparks; the upper portion of said tube being counterbored, a flame cup having openings at its upper end, longitudinally slidable within said counterbore; said tube having an inward flange at its remote upper end and said flame cup having an outward flange positioned within the counterbore and adapted to rest against the inward flange of the tube, whereby said tube and flame cup are maintained in telescopically slidable relation, a spring within the counterbore adapted to maintain said flanges in contact to seal the upper end of said tube against seepage of fuel when the lighter is not in use; said cup having an aperture in its wall whereby the interior of the cup is made communicative with the tube when the cup is pressed into the counterbore downwardly; said inward flange of the tube being adapted to close said aperture in the flame cup when the flanges are in contact; said flame cup extending through the opening of the inward flange and its rim extending within the region of said sparks, and means to transport fuel from the fuel space within the inner casing up through the tube and into the flame cup, upon movement of the inner casing with respect to the outer casing in one direction, means to move the flame cup downwardly in the counterbore upon movement of the inner casing in said direction; said means being adapted to return said flanges to contact relation and to cause the sucking of fuel remaining in the flame cup back into the fuel space in the inner casing upon movement of the inner casing in the opposite direction; the flame cup being at flame hole position upon the initial movement of the inner casing.

3. A lighter as defined in claim 2, including a flame hole shutter carried on the inner casing, positioned to close said flame hole when the casings are in initial rest position, and to uncover said flame when the relative position of said casings is altered.

4. A lighter as defined in claim 2, wherein the tube is moveably mounted with respect to the inner casing, and wherein the pumping means comprises a piston carried at the bottom of said tube, having a bore communicative with the interior of said tube and the fuel, an open-mouthed cylinder slidably carried by the tube, having the piston positioned therein, spring means to maintain the mouth of the cylinder spaced from the wall of the inner casing, and to maintain the position of the piston within the cylinder away from said mouth, and to maintain the tube in a raised position, while the lighter is in rest condition, a cam carried on the interior of the outer casing, an arm extending from the flame cup in sliding contact with said cam; whereby upon movement of the inner casing with respect to the outer casing, the flame cup will be pushed into the counterbore and the tube will be slid downward into the inner casing, and whereby the mouth of the cylinder will contact the wall of the tank, and the piston is slid downward towards the mouth of the cylinder, thus forcing fuel cached

within the cylinder up through the tube and into the flame cup.

5. A lighter as defined in claim 1, including a valve means interposed between the tube and the flame cup, adapted to remain in closed condition while the lighter is in rest condition and adapted to automatically open to make the tube and flame cup communicative upon movement of the manipulatable member from rest position.

6. In a lighter of the character described, the combination of a tank adapted to house a liquid fuel, a pyrophoric element, means to cause sparks to issue from the pyrophoric element, a relatively small flame cup positioned in the region of said sparks, a tube extending from the bottom region of the tank and communicative with said flame cup, a pump means to transport a supply of fuel from the tank up through said tube and into the flame cup, means to automatically operate the pump means at each operation of the spark causing means, whereby fuel transported into the flame cup is ignited by said sparks, and a means moveably mounted on said tank, adapted upon manipulation thereof from rest position, to actuate the spark causing means; said tube being moveably mounted with respect to the tank, and the pumping means comprises a piston carried on the bottom of said tube having a bore communicative with the interior of said tube and tank, an open-mouthed cylinder slidably carried by the tube, having the piston positioned therein, spring means to maintain the mouth of the cylinder spaced from the wall of the tank and to maintain the position of the piston within the cylinder away from said mouth, and to maintain the tube in a raised position, while the lighter is in rest condition; the pump operating means being adapted to lower said tube upon movement of the manipulatable member from rest position, whereby the mouth of the cylinder contacts the wall of the tank, and the piston is slid towards the mouth of the cylinder thus forcing fuel cached within the cylinder up through the tube and into the flame cup.

7. A lighter as defined in claim 6, including a valve means interposed between the tube and flame cup, adapted to remain in closed condition while the lighter is in rest condition, and adapted to automatically open to make the tube and flame cup communicative upon movement of the manipulatable member from rest position.

8. A lighter as defined in claim 2, wherein the tube is movably mounted with respect to the inner casing, and wherein the pumping means comprises an open-mouthed cup of resilient material carried at the bottom of said tube; the interior of said resilient cup being communicative with the tube, and spring means to maintain the mouth of said resilient cup spaced from the wall of the inner casing and to maintain the tube in raised position while the lighter is in rest condition, and including a cam carried on the interior of the outer casing, an arm extending from the flame cup in sliding contact with said cam, whereby upon initial movement of the inner casing within the outer casing, the flame cup will be pushed into the counterbore and the tube will be moved downwards into the inner casing, and whereby the mouth of the resilient cup will contact the wall of the inner casing and its volumetric capacity is diminished, thus forcing fuel cached within the resilient cup up through the tube and into the flame cup.

9. A lighter as defined in claim 2, including a tank of resilient material for housing the fuel, an air inlet valve mounted in the wall at the top of said tank, and wherein is included a movably mounted tank-squeezing member, adapted upon movement thereof to squeeze the tank whereby fuel is transported up through the tube and into the flame cup; said squeezing member having an element extending into the outer casing and a cam mounted on the outer casing; said element of the squeezing member being in sliding contact with said cam, adapted upon movement of the inner casing within the outer casing, to shift the squeezing member against the tank a predetermined range.

10. A lighter as defined in claim 1, including a valve means interposed between the tube and the flame cup, adapted to remain in closed condition while the lighter is in rest condition, and adapted to automatically open to make the tube and flame cup communicative upon movement of the manipulatable member from rest position.

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