Sept. 5, 1950 C. P. MORSE 2,521,180

CIGARETTE LIGHTER

Filed April 23, 1947 3 Sheets-Sheet 1

Fig. 1.

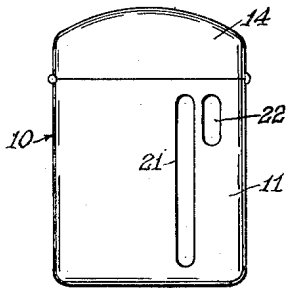


Fig. 3.

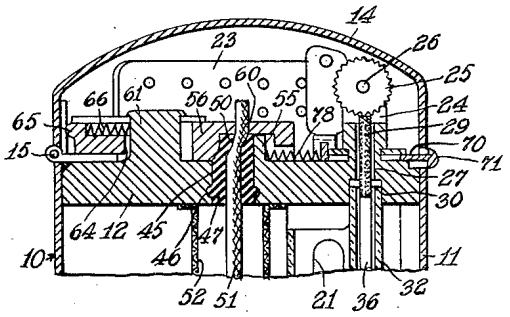


Fig. 4.

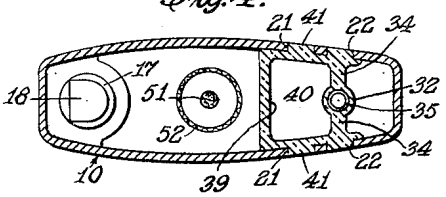


Fig. 2.

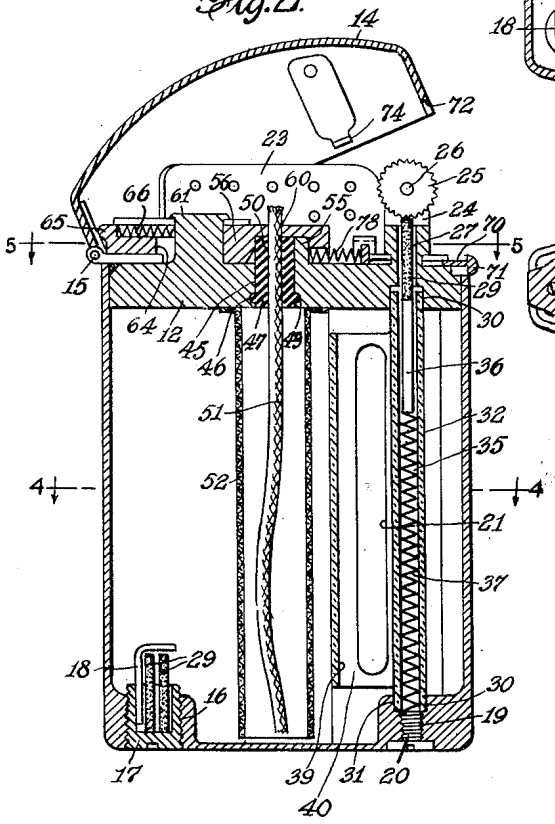


Fig. 5.

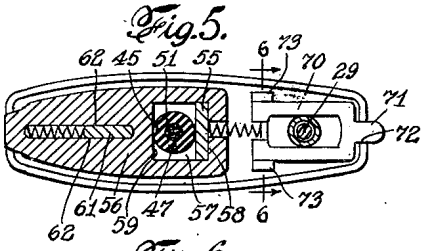
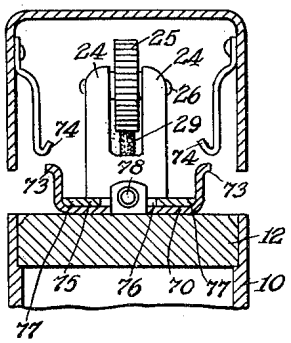


Fig. 6.



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Sept. 5, 1950 C. P. MORSE 2,521,180

CIGARETTE LIGHTER

Filed April 23, 1947 3 Sheets-Sheet 2

Fig. 7.

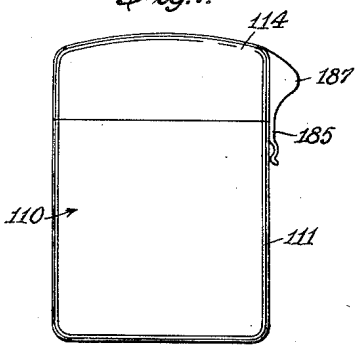


Fig. 9.

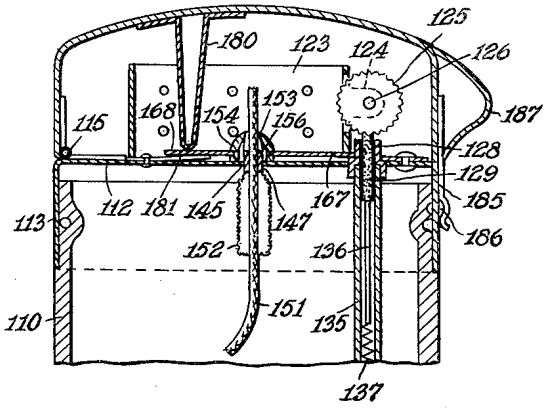


Fig. 8.

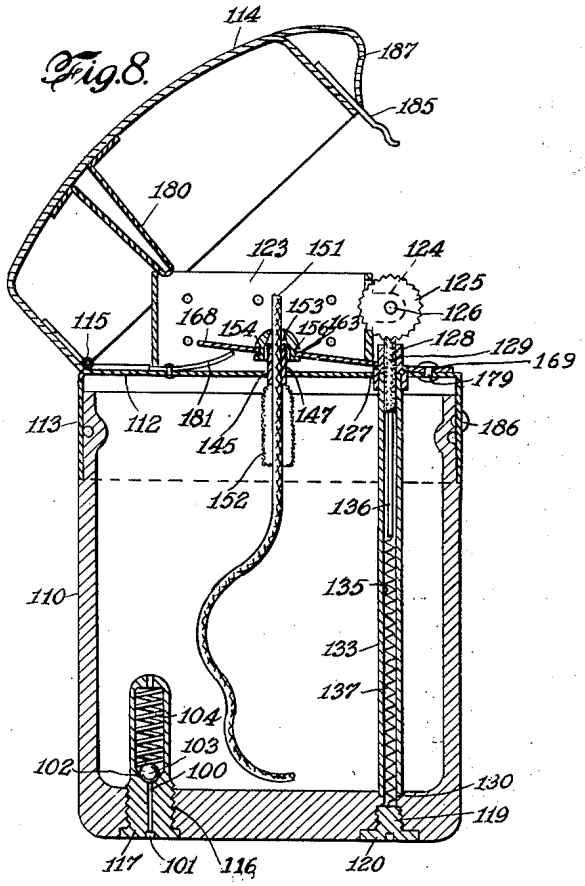
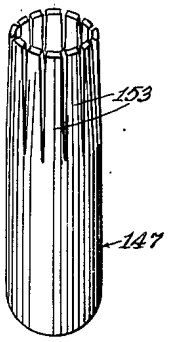


Fig. 10.



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Sept. 5, 1950 C. P. MORSE 2,521,180

CIGARETTE LIGHTER

Filed April 23, 1947 3 Sheets-Sheet 3

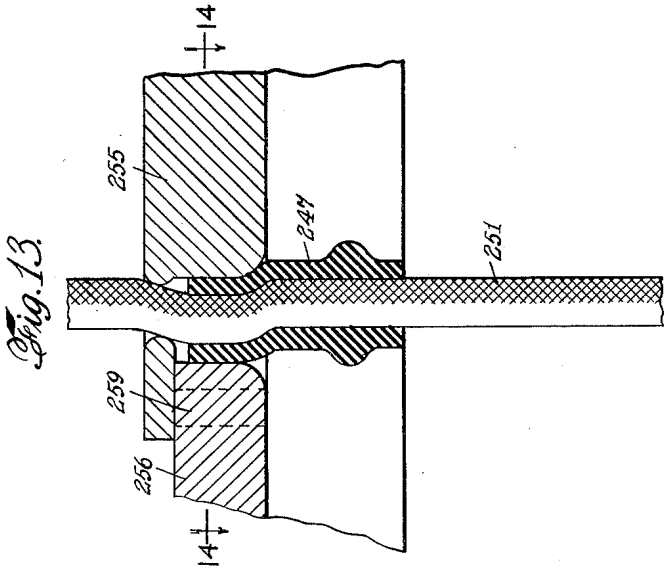

Fig. 13.

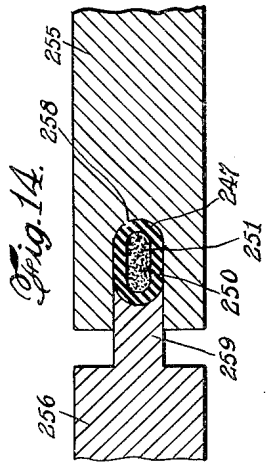

Fig. 14.

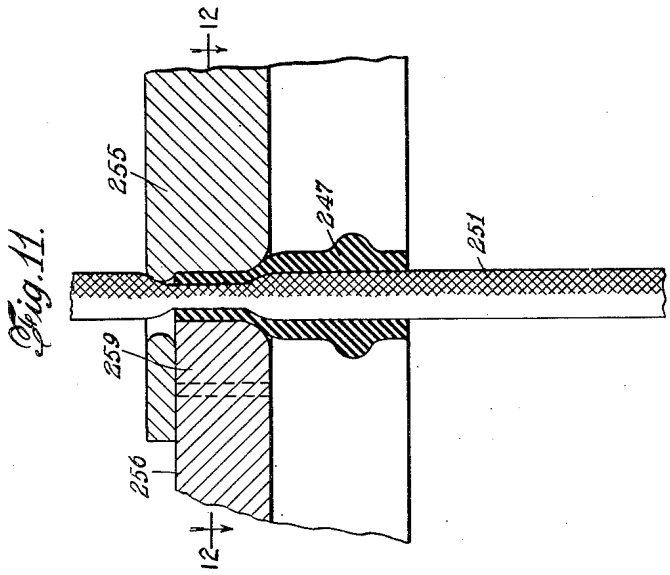

Fig. 11.

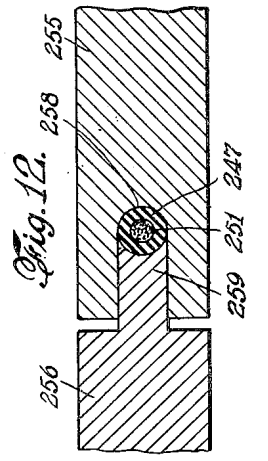

Fig. 12.

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CIGARETTE LIGHTER

Charles P. Morse, Bridgeport, Conn.

Application April 23, 1947, Serial No. 743,389

7 Claims. (Cl. 67—7.1)

1

This invention relates to pyrophoric lighters for igniting cigarettes, cigars, pipes and the like and relates particularly to novel improvements in such lighters utilizing fuel which is stored in liquid form.

Heretofore lighters have been designed which utilized fuel stored in liquid form but they have been unsatisfactory for numerous reasons. One of the difficulties of such prior lighters was that the wick had one end thereof immersed in the liquid fuel and had the other end thereof at least partially exposed to the atmosphere whereby losses due to evaporation of the fuel were considerable. Attempts have been made to prevent evaporation by providing a cap or snuffer cup for enclosing the exposed end of the wick but such devices do not entirely prevent evaporation over a long period because they do not provide a hermetic seal and permit air to leak therein to cause evaporation. Also, there is a tendency that the wick becomes highly saturated with the fuel whereby the mixture provided by the ambient air and the fuel vapors is too rich to be ignited by a spark from the pyrophoric element. Attempts have also been made to isolate the wick from the fuel supply while the lighters were not in use, but this resulted in drying out of the wick causing a fuel loss and was objectionable because time was required before the dried out wick again absorbed sufficient fuel to enable it to be ignited.

Another difficulty of such prior lighters was that they were dangerous because they constituted a fire and explosion hazard. This was because the space in a partially filled liquid fuel chamber contained an explosive mixture of air and fuel vapor which could be ignited in the event the flame of the ignited portion of the wick flashed back into the fuel chamber.

A further difficulty was that no provision was made for permitting breathing of the fuel chamber, that is, to permit air to enter the chamber and replace the space formerly occupied by consumed fuel. Also, no such provision was made for breathing of the fuel chamber which enabled a lighter to be safely carried at high altitudes, for example in airplanes, without having a portion of the fuel expelled from the fuel chamber through the wick due to the pressure in the fuel chamber being greater than the pressure of the atmosphere at high altitudes.

Still further difficulties were that of the supply of the pyrophoric element could not be determined without removing the same from the lighter casing and that no satisfactory means have been devised for determining the liquid level of the fuel.

2

The present invention aims to provide an improved lighter of the foregoing described type which is not subject to the disadvantages enumerated herein.

Accordingly, an object of the present invention is to provide a lighter adapted to carry liquid fuel without leakage, and which makes unnecessary the use of cotton or other absorption agent.

Another object of the invention is to provide a lighter wherein the evaporation of fuel from the wick is eliminated or is so greatly minimized that evaporation losses are inconsequential.

A further object of the invention is to provide a lighter utilizing liquid fuel wherein the fuel chamber has breathing means for admitting and venting air without loss of fuel.

Another object is to provide a lighter of the foregoing described type having means for preventing the flame of the lighter to flash back into the fuel chamber.

Another object is to provide a pyrophoric lighter having means for visually determining the supply of the pyrophoric element.

Another object is to provide a lighter having improved means for visually determining the liquid level of the fuel in the fuel chamber.

A further object is to provide a lighter embodying the foregoing features which is simple and economical to construct and is dependable in operation.

An advantage of the present lighter is that the wick is properly conditioned when the lighter is not in use to provide a combustible mixture adjacent the wick which will readily ignite when a spark of a pyrophoric element is brought into contact therewith.

Another advantage is that the capacity of the lighter is increased as there is no space wasted by cotton or other absorption agent.

Another advantage is that the exposed portion of the pyrophoric element is not subjected to fuel vapors tending to retard the formation of sparks when the element is abraded by a spark wheel or the like.

Another advantage is that the lighter can be safely carried in airplanes or otherwise subjected to greatly varying atmospheric pressure conditions without danger of fuel being extruded therefrom.

Another advantage is that a single spring may be utilized to move the cover into an open position, and, simultaneously, to actuate means to prevent fuel from leaking from the wick.

A further advantage is that the user of the lighter is fully advised of the fuel content and

the amount of pyrophoric element remaining in the lighter so that the same may be replenished at convenient times without the fuel or pyrophoric element being exhausted unexpectedly or at a time when replenishing thereof is impossible.

Other objects and advantages of the invention will be apparent from the following description and from the accompanying drawings which show, by way of examples, two embodiments of the invention.

In the drawings:

Fig. 1 is an elevational view of a pyrophoric lighter embodying the present invention.

Fig. 2 is an enlarged longitudinal sectional view illustrating the interior of the lighter with the cover partly raised to position means for permitting fuel to be absorbed by the exposed end of the wick.

Fig. 3 is a fragmentary sectional view illustrating the upper portion of the lighter shown in Fig. 2 with the cover closed to position means for preventing the evaporation of fuel.

Fig. 4 is a sectional view taken substantially along the line 4—4 on Fig. 2.

Fig. 5 is a sectional view taken substantially along the line 5—5 on Fig. 2.

Fig. 6 is a sectional view taken substantially along the line 6—6 on Fig. 5.

Fig. 7 is an elevational view of a lighter illustrating a modification of the invention.

Fig. 8 is an enlarged longitudinal sectional view illustrating the interior of the lighter shown in Fig. 7 with the cover partly raised to position means for permitting fuel to be absorbed by the exposed end of the wick.

Fig. 9 is a fragmentary sectional view illustrating the upper portion of the lighter shown in Fig. 8 with the cover closed to position means for preventing the evaporation of fuel.

Fig. 10 is a perspective view of a detail embodied in the lighter shown in Figs. 8 and 9.

Fig. 11 is a fragmentary enlarged sectional view illustrating a modified form of squeezing tube in the closed position.

Fig. 12 is a plan view taken along the line 12—12 of Fig. 11.

Fig. 13 is a view corresponding to Fig. 11 showing the tube in the open position.

Fig. 14 is a view taken along the line 14—14 of Fig. 13.

Referring to the drawings, and more particularly to Figs. 1 to 6 thereof, there is shown a pyrophoric lighter 10 generally comprising a casing 11, a top wall member 12 secured in the upper end of the casing and a cover 14 pivotally mounted by a hinge 15 secured to the top wall member 12 adjacent the upper end of the casing at one side thereof. The interior of the casing is adapted to serve as a fuel supply chamber for storing liquid fuel therein.

The bottom wall of the casing has a threaded aperture 16 serving as a fuel refilling opening for the fuel chamber and a threaded plug 17 is removably secured in this aperture to serve as a closure. The inner end of the plug 17 may be recessed to receive a clip 18 for holding spare pyrophoric elements. The bottom wall of the casing has a second threaded aperture 19 serving as an opening for replenishing the pyrophoric element and a threaded plug 20 is removably secured therein. The front and rear walls of the casing each have a pair of vertical openings or slots therein, the slots 21 being longer than the other slots 22 (Fig. 1). The slots 21 serve as sight means for visually observing the liquid fuel level and the slots 22 serve as sight means for visually determining the supply of the pyrophoric element as will be described in detail hereinafter.

The top wall member 12 at one side is formed with a pair of spaced lugs 24 (Figs. 2 and 6) between which a spark wheel 25 is rotatably mounted on a pin 26 supported by the lugs 24. An aperture 27 extends through the top wall member 12 beneath the spark wheel for receiving a pyrophoric element 29 adapted to be engaged by the spark wheel to produce sparks.

The apertures 19 and 27 are in vertical alignment with each other and are in a vertical plane passing through the slots 22, and are each provided with a recess or enlarged bore 39 for receiving cylindrical portions 31 of a member 32, (Figs. 2 and 4) formed of transparent glass, plastic material or the like.

The member 32 has an outwardly projecting portion 34 at each side thereof conforming to the shape of the slots 22 and disposed therein, and has a passage 35 extending through the cylindrical portions 31 for establishing communication between the apertures 19 and 27. The pyrophoric element is adapted to be inserted through the lower aperture 19 and to pass through the passage 35 to the upper aperture 27. A follower 36 is positioned in the passage beneath the pyrophoric element and a spring 37 positioned between the plug 20 and the follower urges the latter upwardly to cause the pyrophoric element frictionally to engage the spark wheel.

In the embodiment shown in Figs. 1 to 6, the follower and slots 22 are of such dimensions and so related that the lower end of the follower is visible through the slots 22 while a portion of the pyrophoric element has not been consumed and disappears when the last portion of the pyrophoric element is about to be consumed, whereby the upper edge of the slots 22 cooperate with the lower end of the follower to serve as index means.

The transparent member 32 is further provided with a tubular or hollow portion 39 adjacent and parallel to the passage 35. This portion is spaced from the top wall member 12 and the bottom wall of the casing and has a passage 40 extending therethrough for receiving liquid fuel stored in the chamber. The portion 39 is in a vertical plane passing through the slots 21 and has an outwardly projecting portion 41 at each side thereof conforming to the shape of the slots 21 and disposed therein, whereby the liquid fuel level in the fuel chamber is indicated in the passage 40 and is visible through the slots 21.

It will be understood that the side portions 34 and 41 of the member 32 are disposed in the slots 22 and 21 respectively in fluid-tight relation, whereby leakage of the fuel through the slots is prevented.

The top wall member 12 has an aperture 45 extending therethrough substantially at the middle thereof (Fig. 2) which is slightly enlarged at its lower end or the underside of the top wall member and is provided with an annular recess 46 just above the lower end. A cylindrical member or tube 47 formed of a resilient material, rubber-like in flexing characteristics and resistant to heat and to lighter fluid is mounted in the aperture 45 and has an annular rib 49 positioned in the recess 46 to secure the same in the aperture. The tube 47 has a central bore 50 for receiving

the upper end of a wick 51 positioned in the fuel chamber.

As illustrated herein, the upper end of the tube extends above the upper side of the top wall member 12 for the purpose about to be described, and the lower end of the tube is substantially flush with the underside of the top wall member. By so positioning the lower end of the tube 47, means are provided for the inlet and exit of air to and from the fuel chamber when differences in pressure occur between the interior and exterior air due to changes in temperature, barometric pressure, altitude and the use of the fluid fuel. Air will enter and exit from the fuel chamber between the wick 51 and the bore 50 of the tube 47 during use of the lighter in upright position, and liquid fuel cannot be forced through the tube.

In order to guard against flash back of the flame at the upper outer end of the wick into the vapor space of the fuel chamber to cause ignition of a mixture of fuel vapor and air, a tubular member 52 formed of a fine screen or gauze surrounds the wick 51 as shown, or at least the upper end of the wick just below the underside of the top wall member 12, and has its upper end secured to the underside of the top wall member by brazing, welding or any other suitable manner.

In accordance with the invention, the lighter is provided with means for compressing the wick to prevent the evaporation of fuel therefrom. Such means includes the tube 47 and means for applying pressure to the tube. As illustrated in Figs. 2, 3 and 5, the last mentioned means comprises an abutment or stop 55 projecting upwardly from the top wall member 12 adjacent one side of the upwardly extending end of the tube 47, and a slidable member 56 having on its under side a rectangular recess 57 (Fig. 5) provided with a surface 59 adjacent the other side of the tube 47 and opposite the stop 55 for urging the tube against the stop 55 to constrict the same and effect compression of the wick just below the free end thereof. The side of the recess 57 opposite the surface 59 has a surface 58 for engaging the opposite side of the abutment 55. The slidable member 56 is further provided with an aperture 60 above the recess 57 normally in vertical alignment with the bore 50 of the tube through which the free upper end of the wick extends.

The slidable member 56 is mounted on the top wall member 12 for slidable movement thereon by means of a projection 61 having flat front and back guide surfaces 62 and extending upwardly through an elongated slot 64 in the slidable member and having its upper end peened over the slidable member to retain the same on the top wall member.

In order to effect sliding movement of the slidable member 56, the latter is formed with a projection 65 at its end adjacent the hinge 15 of the cover 14 the outward side of which is engaged by a portion of the cover or the hinge thereof to move the slidable member into wick compressing position when the cover is closed as shown in Fig. 3. Movement of the slidable member in an opposite direction to release the wick is effected by a spring 66 positioned between the projection 61 and the inward side of the projection 65 (Fig. 2).

A latch is provided (Figs. 2, 3, 5 and 6) for securely locking the cover in closed position to thereby retain the slidable member 56 in wick compressing position, which comprises a slidable spring steel member 70 having a button 71 at one end thereof extending through a slot 72 in the cover to the exterior of the lighter and bent up lips 73 at each side, and spring clips 74 at each interior side of the cover adapted to be engaged by the lips 73. The member 70 is slidably positioned by a member 75 fitting into a groove 76 in the base portion of the spark wheel supporting lugs 24 the member 75 having horizontal portions 77 extending over the member 70 (Fig. 6).

When the button 71 is pushed inwardly the member 70 is moved to cause the lips 73 to disengage the clips 74 allowing the cover to fly open through the action of the spring 66 and release the slidable member having the projection 65 bearing against cover adjacent its hinge. When the button is released, a spring 78 returns the slidable member 70 to its initial position allowing the clips 74 to again be engaged by the lips 73 upon closing the cover.

A wind guard 23 surrounding the wick is secured to the top wall member 12.

Referring to Figs. 7 to 10 of the drawings, there is shown a modified embodiment of the present invention in which corresponding parts are designated by the same reference numerals as in Figs. 1 to 6 with the addition of 100. In these figures a lighter 110 is shown having a casing 111 formed of transparent, liquid fuel resisting thermoplastic or thermosetting material or the like adapted to enable the user of the lighter to visually determine the amount of liquid fuel in the casing. The casing has an open end over which the skirt 113 of a sheet metal top wall member 112 is positioned. A cover 114 is pivotally mounted by a hinge 115 on the top wall member at one side thereof.

The bottom wall of the casing has a threaded aperture 116 serving as a fuel refilling opening for the fuel chamber and a threaded plug 117 is removably secured in this aperture. The plug has a bore 100 extending longitudinally therethrough terminating at its lower end in a vent opening 101 for establishing air flow communication between the interior and exterior of the lighter. A seat 102 is formed adjacent the inner end of the vent opening for a valve member 103 seated by a spring 104 positioned in the bore 100 and retained therein by constricting the upper end of the plug. This vent arrangement is adapted to provide for breathing of the casing without loss of liquid fuel as previously described herein.

The bottom wall has a second threaded aperture 119 serving as an opening for replenishing the pyrophoric element and a threaded plug 120 is removably secured therein.

The top wall member 112 has a wind guard 123 secured thereto which is formed with a pair of spaced lugs 124 (Figs. 8 and 9) between which a spark wheel 125 is rotatably mounted on a pin 126. An aperture 127 is formed in the top wall member beneath the spark wheel in which is mounted a tubular member 128 for receiving a pyrophoric element 129 adapted to be engaged by the spark wheel.

The aperture 127 is in vertical alignment with the aperture 119 in the bottom of the casing, and the latter is formed with a recess or bore 130 for receiving the lower end of a transparent tube 133 which has its upper end positioned into the lower end of the tubular member 128. The tube 133 has a passage 135 extending therethrough for conveying the pyrophoric element from the opening 119 to the spark wheel. A follower 136 is

positioned in the passage beneath the pyrophoric element and a spring 137 positioned between the plug 126 and the follower urges the latter upwardly to cause the pyrophoric element to frictionally engage the spark wheel.

In the embodiment illustrated in Figs. 7 to 10, the length of the skirt 113 of the top wall member and the length of the follower are such that when the pyrophoric element is about to be exhausted, the lower end of the follower is in horizontal alignment with the lower edge of the skirt which serves as index means to give a visual indication of the supply of the pyrophoric element. The position of the follower with respect to the skirt can be readily observed through the transparent tube 123 and the liquid fuel may be observed through the transparent casing 110.

The top wall member has an aperture 145 extending therethrough substantially at the middle thereof and a thin metallic tubular member 147 (Fig. 10) has its lower end mounted in this aperture and is secured to the top wall member for receiving the upper end of a wick 151 positioned in the fuel chamber.

In order to guard against flash back of the flame at the outer end of the wick, a tubular member 152 formed of a fine screen or gauze has its upper end secured to the underside of the top wall member adjacent the aperture 145 and surrounding the upper portion of the wick within the fuel chamber. Preferably the length of the tubular member 152 is such that it does not extend below the skirt 113 and thereby is not readily visible from the exterior of the lighter.

The wick compressing means in this embodiment includes the tubular member (Fig. 10) which is rendered substantially resilient by longitudinally slitting the upper end thereof to form spring fingers 153 and a member 156 having an aperture through which the upper end of the wick extends provided with a downwardly facing frusto-conical surface 154 for engaging and constricting the spring fingers 153. The member 156 is mounted for tilting movement in an aperture 163 of a resilient arm 167 having a free end 168 and an end provided with a slot 169 for receiving a rivet 179 or the like secured by the top wall member. By reason of the slot 169 the arm 167 is slidably mounted to maintain the member 156 in alignment with the wick compressing member 147.

In order to effect compression of the wick for the purposes described herein, the underside of the cover 114 is provided with a depending leg 180, adapted to engage the free end 168 of the arm 167 and move it downwardly when the cover is closed, whereby the surface 154 constricts the fingers 153 (Fig. 9). When the cover is opened (Fig. 8), the arm 167 and the member 154 carried by the arm are rendered ineffective to cause constriction of the fingers 153 by a leaf spring 181 having one end secured to the top wall member and having a free end extending upwardly and engaging the free end of the arm 167 to raise the same upwardly.

The lighter 110 is provided with latch means comprising a resilient latch element 185 on the cover and a locking projection 186 on the skirt 113 of the top wall member adapted to be engaged by the element 185 to lock the cover in closed position. The cover is further provided with an outwardly projecting end portion 187 above the latch element adapted to facilitate manual engagement of the cover to open the same.

Referring to Figs 11 to 13 of the drawings, there is shown a modified embodiment of the invention in which corresponding parts are designated by the same reference numerals as in Figs. 1 to 6 with the addition of 200. In these figures a modified wick compressing member is shown formed of an oblong tube 247 having an oblong wick opening 250 for receiving the upper end of a wick 251 positioned in the fuel chamber. Means for compressing the wick compressing member 247 includes an abutment or stop 255 having a concave surface 258 adjacent one end of the upwardly extending end of the member 247, and a slidable member 256 having an extension with a concave surface 259 for urging the tube against the concave surface 258 of the abutment 255 effecting the compression of the wick. The wick is shown in the compressed position in Figs. 11 and 12. It should be noted that in this position the wick assumes a shape circular in section at the point of compression. In Figs. 13 and 14, the wick is shown in the released position. This embodiment is advantageous in that a somewhat better seal is obtainable in the closed position, while in the released position better provision is made for air to enter and exit from the fuel chamber between the wick 251 and the wick opening 250.

While the present invention has been described in connection with a pocket type lighter, it will be understood that lighters in accordance with the invention may be embodied in or combined with cigarette cases, desk sets or the like.

From the foregoing description it will be seen that the present invention provides an improved lighter of the liquid fuel type which has numerous advantages. The lighter is adapted to carry liquid fuel without leakage, and without the use of cotton or other absorption agents. Evaporation of liquid fuel is practically eliminated and provision is made for liquid level indicating means. Also provision is made for visually indicating the supply of the pyrophoric element. Flash back of the flame is prevented and breathing of the fuel chamber is provided for. These and other features of the invention render the lighter more convenient and serviceable than existing lighters. Furthermore, the lighter is attractive in appearance, economical to manufacture, and can readily withstand any rough usage to which it may be subjected.

While the invention has been described and illustrated with reference to specific embodiments thereof, it will be understood that other embodiments may be resorted to without departing from the invention. Further it is understood that the features of one form of the invention may be incorporated in another form thereof if desired. Accordingly, the forms of the invention set out above should be considered as illustrative and not as limiting the scope of the following claims.

What I claim and desire to secure by Letters Patent is:

1. In a lighter, a casing for fuel having a wall provided with an aperture, a resilient member in said aperture having a bore therethrough, a wick in said casing having one end extending through said bore, an abutment on said wall adjacent the resilient member, a member slidably mounted on said wall having a portion for engaging said resilient member and having an aperture through which said wick extends and being operable in a direction to constrict said resilient member to compress said wick, and spring means for moving said slidably mounted member in an opposite direction.

2. In a lighter, a casing for fuel having a wall

provided with an aperture, a resilient member in said aperture having a bore therethrough, a wick in said casing having one end extending through said bore, abutment means on said wall adjacent the resilient member, a member slidably mounted on said wall having a portion for engaging said resilient member and having an aperture through which said wick extends and being operable in a direction to constrict said resilient member to compress said wick against the abutment means, spring means for moving said slidably mounted member in an opposite direction, and a cover pivotally mounted on said casing for enclosing said end of said wick and having means for moving said slidably mounted member into wick compressing position upon closing thereof.

3. In a pyrophoric lighter, a casing for liquid fuel having a pair of slots therein, and a transparent member in said casing having a portion for closing one of said slots spaced from opposite ends of said casing and provided with a passage therethrough for receiving fuel to determine the liquid level thereof in said casing, and having a portion for closing the other of said slots provided with a passage therethrough for receiving a pyrophoric element.

4. In a pyrophoric lighter a casing for liquid fuel having a pair of vertical slots in the side wall thereof and having opposed apertures in the top and bottom walls thereof, a transparent member in said casing having a portion for closing one of said slots spaced from the top and bottom walls of said casing and provided with a passage therethrough for receiving fuel, said member having a portion for closing the other of said slots and a passage adjacent said last mentioned portion extending between said apertures for receiving a pyrophoric element, a follower for said element, and index means cooperating with said follower for visually determining the consumption of the pyrophoric element.

5. In a lighter, a casing for fuel having an aperture therein, a resilient member normally of oblong section and having a passage therethrough positioned in the aperture, a wick in said casing having one end extending through the passage,

an abutment adjacent the member, and movable means for urging the member against the abutment to compress the wick.

6. In a pyrophoric lighter, a casing for liquid fuel having a slot and an aperture therein, a transparent member in said casing having a portion closing said slot and having a passage for receiving a pyrophoric element, a wick in said casing having a portion extending outwardly through said aperture, resilient means substantially surrounding said outwardly extending portion of the wick and, means for constricting said resilient means to compress the wick.

7. In a lighter, a casing for liquid fuel having a top wall provided with an aperture and a side wall provided with a slot, a transparent member in said casing having a portion closing said slot, a resilient member of rubber-like material extending through said aperture, a wick having a portion disposed in the casing and a portion extending through the resilient member and means for constricting the resilient member to compress the wick.

CHARLES P. MORSE.

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