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2,618,952

PYROPHORIC LIGHTER

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2 SHEETS—SHEET 1

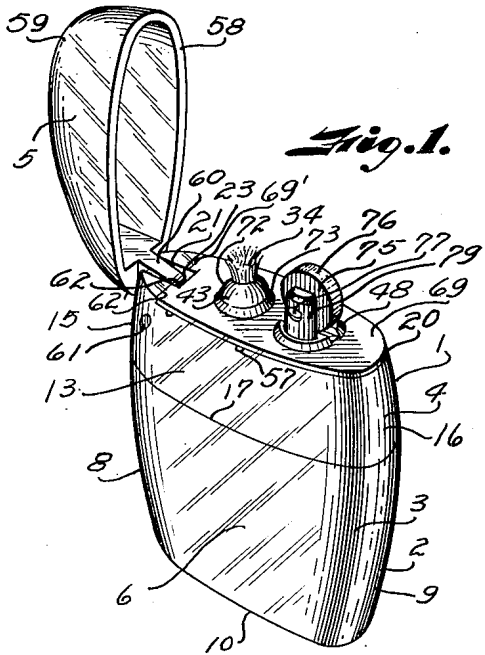


Fig. 1.

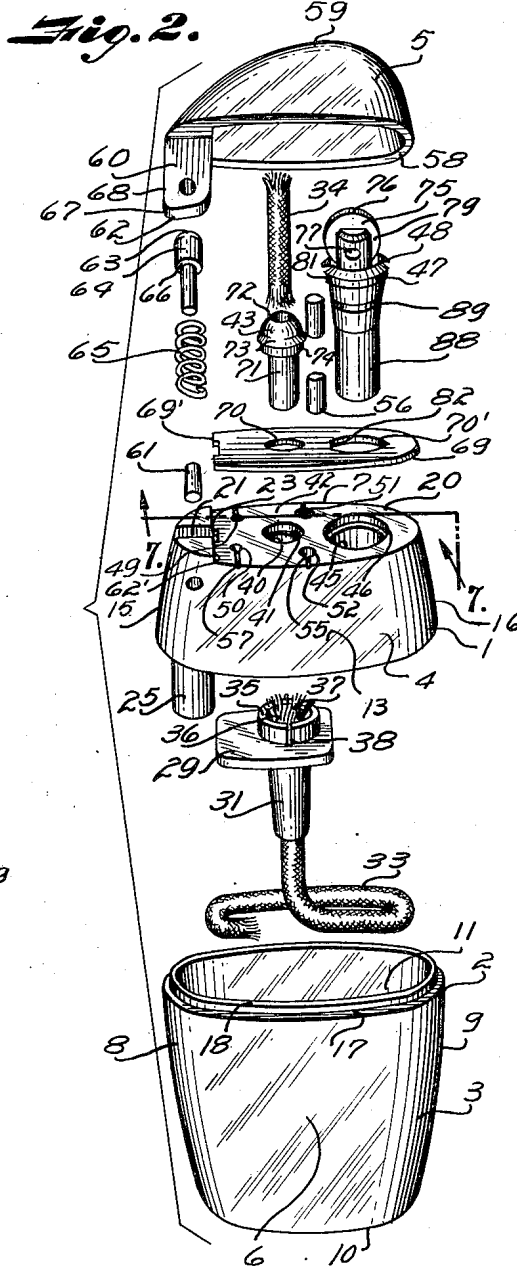


Fig. 2.

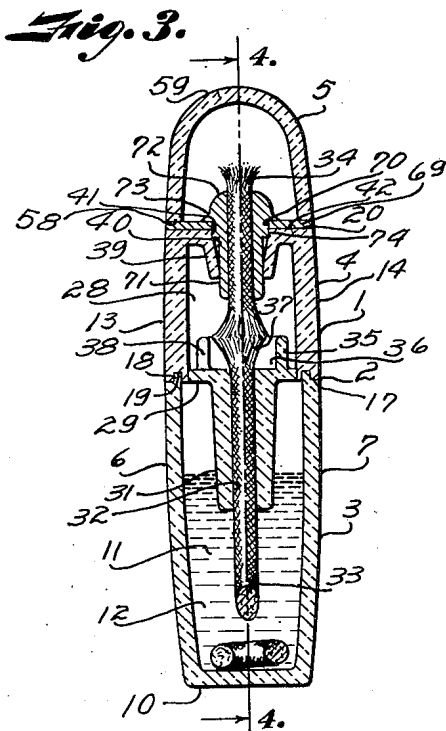


Fig. 3.

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2 SHEETS—SHEET 2

Fig. 4.

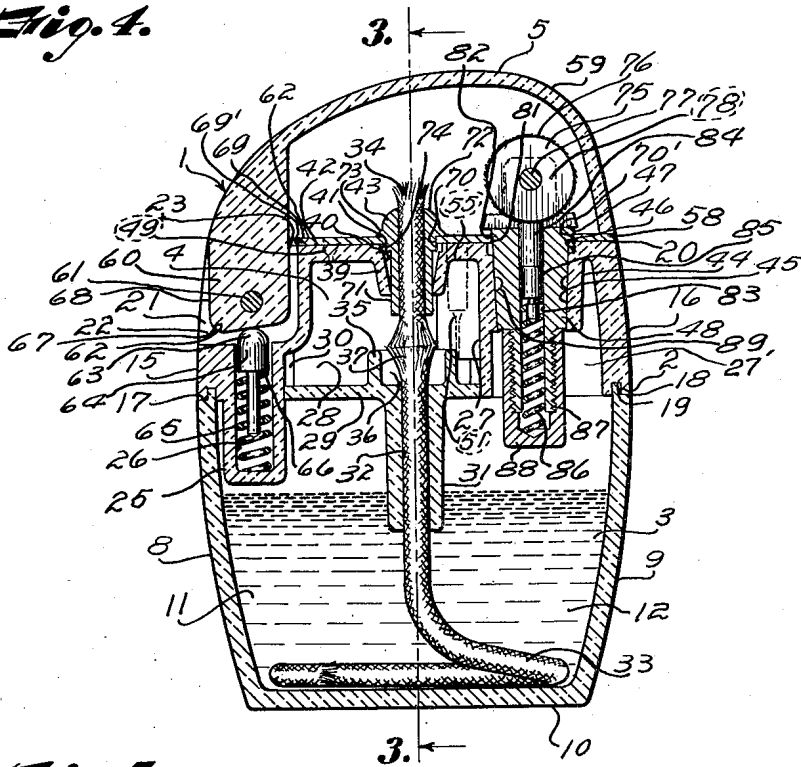


Fig. 5.

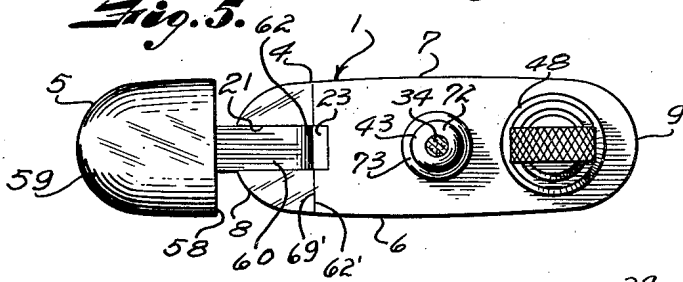


Fig. 6.

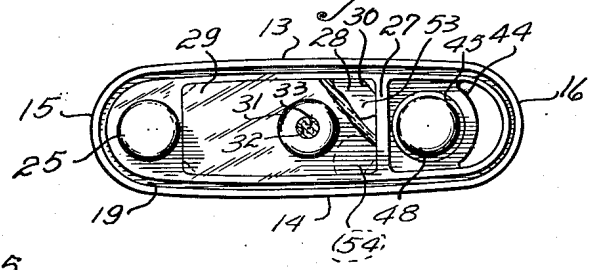
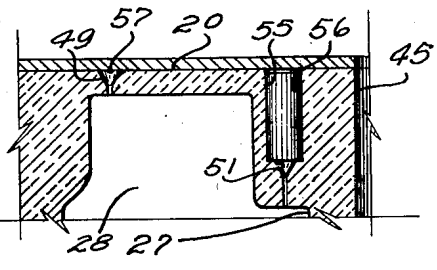


Fig. 7.



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PYROPHORIC LIGHTER

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5 Claims. (Cl. 67-7.1)

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This invention relates to pyrophoric lighters, and particularly those utilizing a body of liquid fuel for supplying a taper which is lighted by pyrophoric mechanism.

Much difficulty has been experienced with lighters of this character by leaking of the fuel when the lighters are turned through different positions or are subjected to external temperature and pressure changes.

It is, therefore, the principal object of the present invention to provide a lighter of this character with means for trapping any fluid that tends to escape from the fuel compartment except when required to supply the taper and to return the fluid to the reservoir, thereby preventing escape of the liquids through the taper when the taper is not lighted or an excessive feed through the taper when the taper is lighted.

Other objects of the invention are to provide a lighter of simple construction and in which the component parts are readily assembled; to provide a lighter construction that is suitable for manufacture from plastic materials; to provide a lighter having a shape for convenient and comfortable retention in the pocket of the owner and which is conveniently grasped by the fingers and palm of the hand while the friction wheel is actuated by the thumb; to provide a lighter having a rugged construction, particularly when formed of plastic material and which is of light weight; to provide a lighter construction wherein the quantity of liquid fuel is readily discernible when the reservoir portion is formed of a translucent plastic; to provide a lighter wherein the plastic elements are protected from the heat of the flame; and to provide the trapping chamber in such manner that it forms an insulation between the heat of the flame and the fuel reservoir.

In accomplishing these and other objects of the invention as hereinafter pointed out, we have provided improved structure, the preferred form of which is illustrated in the accompanying drawings wherein:

Fig. 1 is a perspective view of a lighter constructed in accordance with the present invention and showing the snuffer cap in open position.

Fig. 2 is a perspective view of the parts of the lighter shown in disassembled spaced relation to better illustrate the construction.

Fig. 3 is a vertical section through the lighter on the line 3-3 of Fig. 4.

Fig. 4 is a section taken at right angles on the line 4-4 of Fig. 3.

Fig. 5 is a plane view of the lighter with the cap in open position.

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Fig. 6 is a bottom plan view of the trap section of lighter casing, the feed wick being shown in section and a part of the trap chamber closure plate broken away to better illustrate a stop therefor.

Fig. 7 is an enlarged fragmentary section through the trap section of the lighter casing, the section being taken on the line 7-7, Fig. 2.

Referring more in detail to the drawings:

1 designates a lighter constructed in accordance with the present invention and which includes a casing or shell 2 consisting of a reservoir section 3, a trap section 4 in a snuffer cap 5.

The reservoir section 3 has slightly bulging sides 6 and 7 that are connected by rounded end walls 8 and 9 which diverge upwardly in rounding curves from a substantially flat bottom 10 to provide a transversely elongated reservoir or chamber 11 adapted to contain a body of liquid fuel 12.

The trap section 4 has correspondingly bulged side walls 13 and 14 connected by rounded end walls 15 and 16. The base of the section thus conforms in contour with the rim 17 of the reservoir section. The trap section is secured to the reservoir section by a leak-tight joint. For example, the rim of one of the sections may be provided with an inset tongue 18 to engage in a groove 19 that is formed in the rim of the upper section, with a cement or other suitable adhesive being inserted therebetween. The side and end walls of the trap section curve upwardly and inwardly and are connected by a top 20 extending substantially parallel with the bottom 10. The end wall 15 is formed sufficiently thick to accommodate a slot-like recess 21 that opens outwardly through the end wall as indicated at 22 and through the top 20 as indicated at 23. Depending from the end wall 15 in vertical registry with the recess 21 is a cylindrical boss 25 having a bore 26 extending co-axially thereof and opening into the recess 21 for purpose later described. Extending transversely between the side walls 13 and 14 of the trap section in inwardly spaced relation with the end wall 16 is a partition 27 which cooperates with the end wall 15 and with the side walls 13 and 14 to provide a fluid trapping chamber 28 that is closed at the top and bottom by the top 20 and plate 29 respectively, the plate 29 being inset upwardly and seated at the corners thereof on ribs 30 as best shown in Figs. 4 and 6. The plate 29 has a depending wick tube 31 that extends into the reservoir as shown in Fig. 4 and which has a bore 32 to extend a feed wick 33 by which the liquid fuel is fed from

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the reservoir to a taper unit 34 later described. Formed on the trap chamber side of the plate 29 is an annular flange 35 that provides a cup-like pocket 36 about the splayed terminal 37 of the feeding wick and which has connection with the lower portion of the trap chamber through a drainage slot 38. Fig. 2 whereby any liquid escaping into the trap chamber 28 may drain therefrom into the pocket 36 and be returned by way of the wick to the reservoir 11. The partition 27 also cooperates with the end wall 16 to provide an expansion space 27' therebetween.

Depending from the inner surface of the top 20 is a downwardly tapering annular flange 39 that is positioned in co-axial relation with the wick tube 31 and which provides a conical socket 40 having an annular counterbore 41 within the outer surface 42 of the top 20 to provide clearance for the taper retaining tube or a nipple 43 later described. Formed between the partition 27 and end wall 16 is a depending boss 44 having a downwardly and inwardly tapering bore 45 providing a fuel fill opening through which the liquid fuel is poured into the fuel reservoir 11. The bore 45 has a counterbore for 46 to provide clearance for a collar 47 on a closure plug 48 later described.

Formed in the top of the trap section of the casing near the corners of the trap chamber and inset from the walls thereof are vent openings 49, 50, 51 and 52, the openings 51 and 52 being provided in bosses 53 and 54 formed in the corners of the trap chamber on the side adjacent to fill opening. The vent openings 51 and 52 are counterbored as at 55 to store spare pyrophoric elements 56. The bosses terminate short of the plate 29 to provide adequate venting space when liquid is contained in the trap chamber. The upper surface 42 of the top 20 has grooves 57 therein which extend from the vent ports or openings to the outer sides of the casing as shown in Fig. 2.

The snuffer cap 5 is a rim portion 58 corresponding with the contour of the top of the trap section and has side and end walls rounding into a substantially dome shaped top 59 to cover the taper wick 34 and the igniting mechanism which is carried by the plug 48. Depending from the cap 5 on the end adjacent the recess 21 is a lug 60 that extends thereinto and is hingedly connected with the trap section by a transverse hinge pin 61, the lower edge of the lug is provided with an inclined cam surface 62 that is engaged by the rounded head 63 of a spring pressed bolt 64 which is slideably mounted in the bore 26 previously mentioned. The bolt 64 is under action of a coil spring 65 having one end seated against the bottom of the bore and the other against an annular shoulder 66 extending about the head of the pawl as shown in Fig. 4. The rounded head of the pawl is thus retained in yielding contact with the cam surface 62 of the lug 60 and is adapted to be depressed when cap is moved to an open position with a rounded terminal 67 of the cam surface sliding over the top of the pawl so that the pawl engages a flat side 68 to hold the cap in open position.

In order to protect the top of the trap section and cover the vent ports to retain the extra pyrophoric elements, we provide a plate 69 that is formed of metal or some similar fire resistant material and which is of a shape to extend from the hinge lug 60 to the opposite side of the casing. The plate is provided with openings 70 and

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70' registering with the counterbores 41 and 46 of the tapered openings 40 and 45.

The wick tube 43 includes a sleeve portion 71 that is closely engaged in the socket 40 formed by the flange 39. The tube also includes a rounded head 72 having a flanged periphery 73 engaging the plate to retain the plate in position on the trap section of the casing. The tube may also be provided with a shoulder portion 74 that extends through the opening 70 of the plate 69 and into the recess provided by the counterbore as shown in Fig. 4. The taper wick extends through the tube in both directions and is of a sufficient length to contact the splayed end of the feed wick at one end and to project from the casing and provide sufficient evaporating area for the ignition of the fuel when ignited by the pyrophoric mechanism.

The pyrophoric mechanism is carried by the plug 48 and includes a friction wheel 75 having a roughened or serrated periphery 76 and which is rotatably mounted on a cross pin 77 having its ends carried in upstanding ears 78 and 79 mounted on the upper end of the closure plug. The collar 47 of the closure plug has one side thereof flattened as at 81 to engage a flattened portion 82 of the opening 70' and limit rotation of the plug tending to throw the friction wheel out of alignment with the projecting end of the taper wick.

The closure plug is provided with an axial bore 83 for slideably containing a pyrophoric element 84 or one of the spares 56. The pyrophoric element is retained against the periphery of the friction wheel 75 by a plunger 85 so slideably mounted in the axial bore and having support on a spring 86 that is also housed within the bore 83. To provide a spring of the proper length the bore continues into an externally threaded neck 87 projecting from the lower end of the plug into the supply reservoir. Threaded onto the externally threaded neck is a cap 88 having a seat for the lower end of the spring and which closes outlet from the supply chamber. A tight seal of the closure plug is effected by the taper of the plug engaging the taper of the fuel opening in the trap section, however, the plug may be provided with an annular sealing groove 89 to stop any seepage that may tend to occur. The slight turning movement allowed for the closure plug as limited by the flat side of the shoulder thereof is sufficient to facilitate withdrawal of the plug when it is necessary to fill the fuel reservoir.

The casing sections 3 and 4 and snuffer cap 5 are preferably formed of a plastic material which may be opaque, however, the reservoir section is preferably formed of transparent or translucent plastic so that quantity of liquid fuel is readily discernible therethrough. The member composing the plate 29 and wick tube 31 is also formed of plastic material so that it may be readily sealed in place within the open side of the trap chamber to close the trap chamber from the reservoir chamber. The other parts of the lighter are formed of materials suitable for the function which they perform.

In assembling the parts of the lighter, the feed wick 33 is inserted in the wick tube 31 so that the splayed terminus 37 is contained within the pocket 36 after which a solvent or cement is applied about the periphery of the plate portion 29 and the plate portion is inserted in the trap section with the corners thereof seated against the ribs 30. A similar solvent or cement is applied around the edges of the side and end walls of the

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casing sections 3 and 4 and the parts are pressed together with the tongue 18 entering the groove 19. After setting of the solvent or cement, the casing sections are in effect an integral body with the trap chamber 28 sealed from the reservoir with the exception of the wick passage-way through the wick tube 31.

The spring 65 and plunger or bolt 64 are inserted within the bore 26. The snuffer cap is then applied with the lug 60 thereof extending into the slot-like recess 21 so that the pin 61 may be passed thereto to hingedly connect the cap with the body of the lighter when the cap is closed. The head of the bolt 64 engages the inclined portion of the cam surface of the lug to hold the cap in closed position. On opening the cap, the rounded portion of the cam depresses bolt and compresses the spring. As the rounded portion of the cam passes over the bolt, the action of the spring snaps the cap to open position where it is retained by the spring, the pressed bolt engaging the flat side 68 of the lug.

The spare pyrophoric elements 56 are inserted in the recess 55 and the plate 69 is applied over the top of the trap section with the opening 70 and 70' therein registering with the counterbores 41 and 46. The taper tube 43 carrying the taper wick is then inserted through the opening 70 and the sleeve portion thereof is pressed into the conical socket 40 until the flange 73 thereof seats against the upper surface of the plate 69. When thus assembled, the plate is clamped against the top of the trap section and is retained from turning movement thereon by the end 69' thereof engaging against shoulders 62' of the respective sides of the slot-like recess 21 as best shown in Fig. 1. The pyrophoric unit is then assembled and the plug portion thereof is pressed into the fill opening. The flattened side 81 of the plug engages the portion 82 of the opening 70' so as to maintain registry of the friction wheel 75 with the projecting end of the taper wick. However, there is sufficient movement between the side 81 and portion 82 to facilitate loosening of the plug.

When the lighter is to be used, the pyrophoric unit is removed from the fill opening and the liquid fuel is poured through the opening into the reservoir 3. When the unit is reinserted, the plug seats tightly within the tapered fill opening so that the only outlet is by way of the wick tube. Under ordinary conditions, the feed wick closes the wick tubes so as to prevent leakage of the fluid into the trap chamber, however, there is sufficient capillary movement of the liquid through the wick tube to maintain the taper in condition to be lighted when the friction wheel is rotated to generate sparks that are discharged into the vapor emitted by the taper wick to effect lighting of the taper.

When the taper is lighted, the heat of the flame is reflected by the plate 69 so as to avoid heating of the body portion of the casing. It is obvious that the trap chamber and the relatively thickened walls of the trap section reduce conduction of heat into the liquid fuel reservoir. When the cap is closed, the flame is snuffed thereby and extinguishment of the flame stops the capillary feed of the liquid fuel from the reservoir chamber. When the lighter is turned on any of its sides, the liquid fuel tends to escape through the wick tube into the trap chamber but the liquid fuel is trapped therein since the feed is not in sufficient quantity to bring the level to a point where the trapped fluid can flow through any one of the vents.

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When the exterior of the lighter is subjected to temperature changes or pressures causing discharge of liquid fuel from the reservoir, the discharge fluid flows from the cup 36 into the trap chamber where it collects therein without discharging through the taper wick because the interior of the trap chamber is maintained at the same pressure as the external pressure by means of the vent openings. When the external and reservoir pressures are again equalized, the trapped liquid returns through the passage 38 into the cup 36 and through the wick tube to the reservoir.

When the pyrophoric element 84 becomes worn and a new element is required, the pyrophoric unit is withdrawn together with the taper tube to permit removal of the plate 69 after which the lighter casing may be turned to discharge one of the spare elements, the thumb being placed over the fill opening to prevent the spilling of any liquid fuel that may be contained in the reservoir chamber. The old pyrophoric element is removed by unscrewing the cap 88 to withdraw the spring 86 and plunger 85 after which the new pyrophoric element is inserted in the bore 83, followed by the plunger 85 and spring 86. The cap 88 is then replaced, after which plate 69, taper tube 43, and pyrophoric unit 84 are replaced as previously described.

From the foregoing, it is obvious that we have provided a pyrophoric lighter with means for trapping any fuel that tends to escape from the fuel compartment except as required to supply the taper of the lighter, and that the trapped fuel is returned to the supply reservoir so as to prevent leakage of the liquid fuel. It is also obvious that we have provided a lighter that is of simple and inexpensive design and which is adapted for manufacture from plastic materials. It is also obvious that we have provided a lighter structure which eliminates necessity of the usual packing retaining chamber of a conventional lighter.

It is also obvious that the space 27 provided in the trap section of the casing forms an upward extension of the reservoir chamber to accommodate expansion of the liquid fuel and to receive any of the fuel that is displaced by the depending part of the pyrophoric unit. Thus the reservoir chamber may be filled up to the level of the trap section.

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

1. A lighter of the character described including a casing section forming a reservoir for a liquid fuel, a trap section superimposed on the reservoir section and closing the top thereof, said trap section having a fill opening in connection with the reservoir in offset relation with the trap chamber, a pyrophoric unit including a plug closing the fill opening and having a friction wheel and a pyrophoric element in frictional contact with said wheel, a wick tube connecting the reservoir and the trap chamber, a feed wick extending from the reservoir through said wick tube and terminating within the trap chamber, a taper wick tube carried by the trap section of the casing and extending into the trap chamber for contact with the feed wick and having a portion projecting exteriorly of the trap section to provide a taper in position to be lighted upon operation of the pyrophoric unit, said trap section of the casing having vents connected with the trap chamber, a fire-resistant plate covering said vents, and flanges encircling the pyrophoric unit and taper wick tube for retaining said plate.

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2. A lighter of the character described including a reservoir section having sides, ends and a bottom forming a reservoir for a liquid fuel, a trap section having a top and corresponding sides and ends superimposed on the reservoir section and having a transverse partition extending between the sides thereof, a plate inset between the partition and one of said ends of the trap section to form a fuel trap chamber, said trap section having a fill opening on the other side of the partition and in connection with the reservoir, a wick tube depending from said plate into the reservoir, a pyrophoric unit including a plug closing the fuel opening and having a friction wheel and a pyrophoric element in frictional contact with said wheel, a wick extending from the reservoir through said wick tube and terminating within the trap chamber, a taper wick tube carried by the casing and extending into the trap chamber, a taper wick in said last named tube having contact with the feed wick and having a portion projecting exteriorly of the trap section to provide a taper adapted to be lighted upon operation of the pyrophoric unit, said top of the trap section having vent ports inset inwardly from sides of the trap chamber and having lateral outlets, a fire resistant plate covering said ports and having openings to pass the taper tube and said plug, said fire resistant plate being retained by the taper wick tube.

3. A lighter of the character described including a casing having a reservoir for a liquid fuel and having a fuel trapping chamber in connection with the reservoir through a wick passage, a fire resistant plate covering the top of the casing, said casing having a fill opening in connection with said reservoir, a pyrophoric unit carried above said plate including a plug closing the fill opening and having a friction wheel with a pyrophoric element in frictional contact with said wheel, wick means extending through said passage for conducting fuel from the reservoir through the trap chamber and having a terminus in position to be ignited by sparks generated by the pyrophoric unit, said casing having vent ports in the trap chamber and covered by said plate, and means removably securing said plate to the casing, selected vent ports being counterbored to provide recesses for housing spare pyrophoric elements and retained by said plate.

4. A lighter including a casing consisting of a reservoir section having side and end walls and a bottom forming a reservoir chamber for storing a liquid fuel, a trap section having corresponding side and end walls having sealed engagement with corresponding walls of the reservoir section and having a closed top and a partition extending transversely between the side walls and spaced inwardly from the end walls to cooperate therewith in providing a trap chamber on one side and an upward extension of the reservoir chamber on the other side, an insert closing the bottom of the trap chamber to separate the reservoir and trap chambers except for a fuel passageway between said chambers, a boss depending from said top into the upward extension of the partition and terminating short of the walls of the trap section to provide an expansion space, said boss having a bore extending through

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the top of the trap section for filling the reservoir chamber with a liquid fuel, and a pyrophoric unit having a lower end depending into the reservoir chamber and having a plug portion closing said bore, fuel feeding means carried by the top wall and depending into the trap chamber for feeding the liquid fuel from the trap chamber for ignition by the pyrophoric unit.

5. A lighter including a casing consisting of a reservoir section having side and end walls and a bottom forming a reservoir chamber for storing a liquid fuel, a trap section having corresponding side and end walls having sealed engagement with corresponding walls of the reservoir section and having a closed top, one of said end walls of the trap section being substantially thicker than the other walls and overhanging a portion of the reservoir chamber, a boss integral with the overhanging portion of said end wall and depending into the reservoir chamber, said boss and thicker end wall having a socket opening into a recess in said thicker end wall, said recess opening outwardly through said wall and through the top of the trap section, a partition extending transversely between the side walls and spaced inwardly from the end walls of the trap section to provide a trap chamber on the side of the thicker end wall and an expansion space at the other in connection with the reservoir chamber, an insert closing the bottom of the trap chamber to separate the reservoir and trap chambers except for a fuel passageway between said chambers, a boss integral with the partition and depending from said top into the space between the partition and said thinner end wall and terminating short of the end walls of the trap section, said boss having a bore extending through the top of the trap section into the expansion space for filling the reservoir chamber with a liquid fuel, and a pyrophoric unit having a lower end depending into the reservoir chamber and having a plug portion closing said bore, a fuel feeding means carried by the top wall of the trap section and depending into the trap chamber for feeding the liquid fuel from the trap chamber for ignition by the pyrophoric unit, a cap section seated on the trap section and having a hinge lug depending into said recess, a hinge pin extending transversely of the side walls of the trap section and through the lug to hinge the cap section, and a spring pressed plunger within the socket for engaging the lug to retain the cap section in closed position on the trap section.

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