May 11, 1954 C. S. GEHRIE 2,677,948

GAS FUELED PYROPHORIC POCKET LIGHTER

Filed June 13, 1951

2 Sheets-Sheet 1

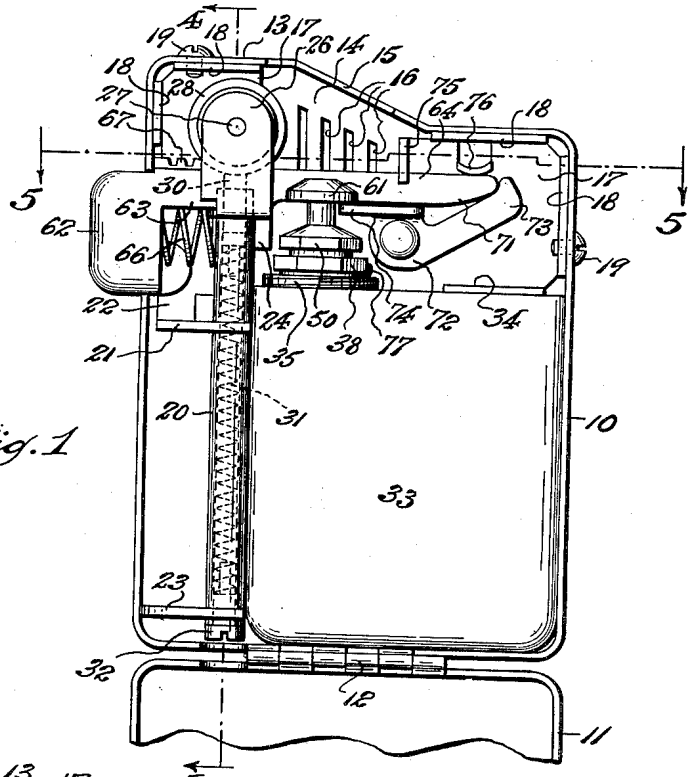

Fig. 1

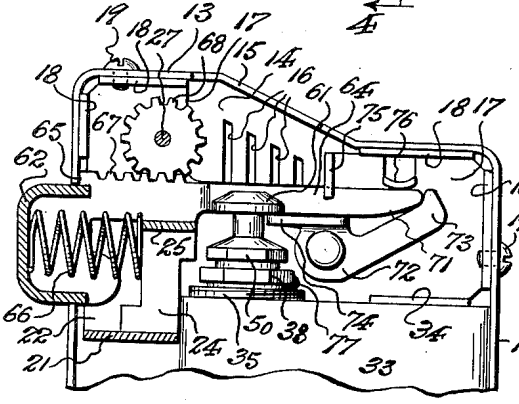

Fig. 2

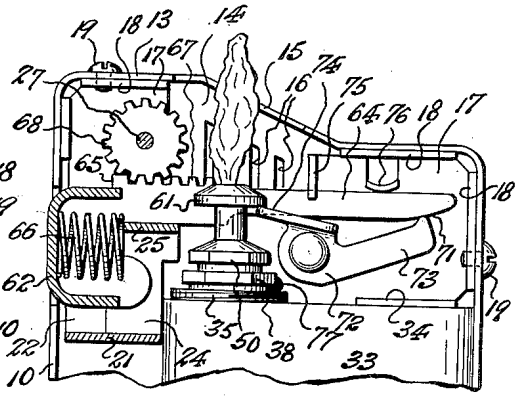

Fig. 3

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2 Sheets-Sheet 2

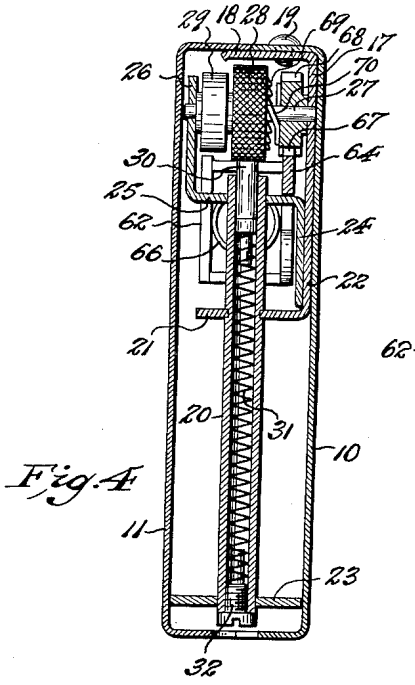

Fig. 4

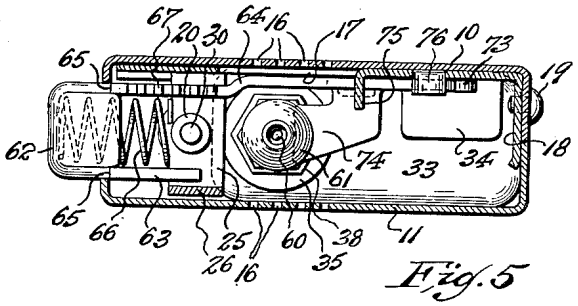

Fig. 5

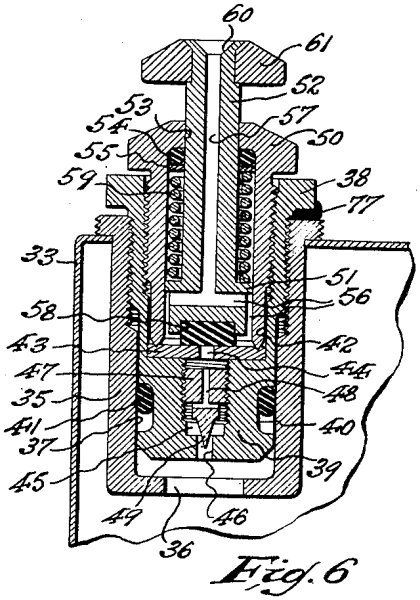

Fig. 6

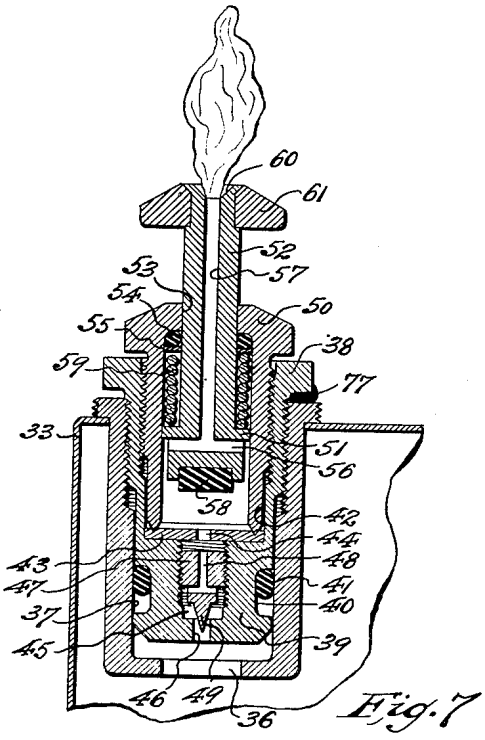

Fig. 7

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GAS FUELED PYROPHORIC POCKET LIGHTER

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3 Claims. (Cl. 67—7.1)

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This invention relates to improvements in pyrophoric pocket lighters of the type which is supplied with a compressed liquified gas as its combustible fuel; said fuel being contained in a supply tank adapted to be detachably mounted within the casing of the lighter subject to replacement by a full tank when its charge of gaseous fuel is exhausted.

It is an object of this invention to provide the fuel supply tank with a burner valve which is normally closed by down-thrusting spring means, together with a spring retracted push-button actuated means mounted within the lighter casing, said latter means operating through a rack and pinion transmission mechanism to actuate the striker wheel of a pyrophoric flint type ignition means, and at the same time lift and open the burner valve of the fuel supply tank through a cooperative cam and pivoted bell-crank mechanism, whereby to permit outflow of gaseous fuel from the tank subject to ignition by said ignition means.

The invention has for another object to provide the fuel supply tank with a regulatable burner valve and means to adjustably mount the same in sealed connection with the tank, whereby the movable element of said burner valve can be adjustably positioned for proper cooperation with the means for lifting said movable element to open the burner valve when the supply tank is operatively disposed within the lighter casing.

The invention has for a further object to provide a lighter, characterized as above stated, having a casing formed by two sections hinged together to close one upon the other, and said sections being so shaped as to provide, at the top of the casing, a ventilated chamber within which the burner valve of the fuel supply tank is disposed, so that the burner end of the burner valve is shielded from wind, whereby a flame issuing therefrom is substantially protected against extinction by wind.

The invention has for a still further object to provide a lighter casing, as above characterized, comprising a base section and a cover section, with inlay means fixed within the base section for positioning and supporting the push-button actuatable ignition and burner valve operating means within the base section, and for detachably holding the fuel supply tank in the place therein.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the invention.

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An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a front elevation of the lighter with the cover section of its casing open to disclose the lighter mechanism supported within the base section of said casing, the cover section of the casing being partially broken away.

Fig. 2 is a fragmentary view similar to that of Fig. 1, with parts shown in section, and with the ignition and burner valve actuating means shown in normal initial position, the burner valve being closed; and Fig. 3 is a view simlar to that of Fig. 2, but showing the operation of the ignition and burner valve actuating means, the burner valve being open.

Fig. 4 is a longitudinal cross-section, taken on line 4—4 in Fig. 1; and Fig. 5 is a horizontal cross-section, taken on line 5—5 in Fig. 1; the casing being closed in both said views.

Fig. 6 is a vertical longitudinal sectional view of the burner valve means with which the fuel supply tank is provided, the valve being closed; and Fig. 7 is a similar view showing the valve open.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

Referring to the drawings, the lighter comprises a casing formed by a base section 10 and a cover section 11. Said sections 10 and 11 are hinged together to close one upon the other, subject to relative opening movement whereby to expose the interior of the base section 10. Said sections are preferably hinged together at their bottom ends by the hinge means 12. The casing sections are elongated at corresponding sides thereof to provide the casing with an extension 13 projecting from its top end. The interior of said extension forms a combustion chamber 14 which communicates with an opening 15 provided in the top end walls thereof, and beneath which opening the burner valve of the fuel supply tank is aligned when said tank is operatively positioned within the casing. The face walls of the casing sections, contiguous to the combustion chamber 14, are provided with a plurality of spaced ventilating openings or slots 16. The ventilated combustion chamber 14 serves to substantially windproof a flame when ignited at the gas discharge end of the burner valve of the fuel supply tank, which flame, however, is adapted to extend through the opening 15 of the casing.

Arranged within the upper end portion of the base section 10 of the casing, contiguous to the inner surface of the face wall thereof, is a suit-

ably shaped inlay or frame plate 17. Said inlay or frame plate is provided with suitably disposed, right angularly projecting, tongues 18 which extend outwardly beyond the free edges of the contiguous lateral bounding walls of the base section 10, thus providing ledges over which the cover section 11 of the casing telescopes when said cover section is closed upon the base section 10, so that said cover section is held in register with the latter. The inlay or frame plate 17 is suitably secured in place within the base section 10, preferably by fastening screws 19 which pass through said bounding walls of the base section 10 to screw into selected tongues 18 of the inlay or frame plate.

Extending perpendicularly upward from the bottom end of the casing through the interior thereof, so as to be disposed adjacent to that side of the casing from which the extension 13 thereof extends, is a pyrophoric flint guide tube 20. The upper portion of said flint guide tube is supported by a horizontal carrier tongue 21 which projects from a dependent extension 22 of the inlay or frame plate 17. To the lower portion of the flint guide tube is affixed a horizontal spacer plate 23 which extends between the face walls of the respective base and cover sections of the casing, thus holding the lower end portion of the guide tube against displacement.

A bearing bracket is affixed by its base 24 to the inlay or frame plate 17, and is provided with an offsetting arm 25 from which extends an upstanding bearing member 26, the latter being thus outwardly spaced from and parallel to the inlay or frame plate 17. Supported between the inlay or frame plate and said bearing member 26 is a transverse shaft 27. The upper extremity of the flint guide tube 20 extends through the offsetting arm 25 of the bearing bracket, so as to be suitably spaced below said shaft 27. Rotatably mounted on said shaft 27, in opposition to the upper extremity of the flint guide tube 20, is a flint striker wheel 28 which is provided with a suitably roughened periphery adapted to abrade and spark a flint against which it is moved. The striker wheel is held in alignment with the flint guide tube 20 by a spacer roller 29, or equivalent spacing means, which is mounted on the shaft 27 between the striker wheel 28 and the bearing member 26 of said bearing bracket. Inserted in the flint guide tube 20, to project from the upper extremity thereof so as to be contacted by the striker wheel 28, is a pyrophoric flint 30. Said flint 30 is backed by a spring 31, so as to be thrust thereby against the striker wheel. The bottom end of the flint guide tube 20 is closed by a removable screw-threaded plug 32, said plug serving to purchase the spring 31 for thrust.

The space within the lower portion of the lighter casing, which extends between the flint guide tube 20 and the right hand side wall of said casing, provides a receiving compartment within which the fuel supply tank 33 for the lighter is removably mounted. To hold the entered fuel supply tank against upward shift or displacement, the inlay or frame plate 17 is provided with an outwardly projecting keeper tongue 34, beneath which the upper end of said tank is engaged.

The fuel supply tank 33 is adapted to be charged with a compressed or liquified gas, such for example as butane, which is suitably stored in the tank under such conditions that, under control of a burner valve structure, it can be expanded and emitted under limited or reduced pressure subject to ignition and combustion whereby to produce a desired lighter flame.

Provided in connection with the upper end of the fuel supply tank 33, to project outwardly therefrom, is a burner valve structure. This burner valve structure comprises an outwardly open, stationary housing 35 which is affixed to and dependent from the top wall of the tank 33 within the interior of said tank. The bottom end of said housing is provided with an opening 36 which communicates with the interior of the tank. The upper end portion of the housing 35 is interiorly screw-threaded and the lower end portion thereof is formed to provide a smooth surfaced bore 37. Threaded into the outer end portion of the housing is a valve casing 38, which terminates in a smooth surfaced lower end portion 39 to telescope into the bore 37 of the housing 35. Said lower end portion 39 of the valve casing is provided with an external annular channel or groove 40 in which is seated a resilient O seal ring 41 adapted to sealingly contact the surface of the bore 37 of housing 35, thus preventing gas leakage from the tank interior through the joint between the valve casing 38 and the housing 35. The valve casing 38 is provided in its upper end portion with an outwardly open, internally screw-threaded shut-off valve chamber 42, seated upon the bottom of which is a fixed valve disc 43 having a central gas outlet port 44. Provided in the lower end portion of the valve casing 38, below the valve disc 43, is an axially disposed, internally screw-threaded regulating valve chamber 45 of reduced diameter, and provided in its bottom with a regulating valve port 46 which communicates with the interior of the tank 33 through the bottom opening 36 of the housing 35. Threaded into the regulating valve chamber 45 is a regulating valve member 47 having gas passages 48 in communication with and between the interior of the regulating valve chamber 45 and the gas outlet port 44. The regulating valve member 47 is provided at its lower end with a conical or needle valve member 49 which cooperates with the regulating valve port 46. It will be obvious that by shifting the regulating valve member up or down in the regulating valve chamber 45, the conical or needle valve member 49 can be adjusted relative to the regulating valve port 46, whereby to regulate the volume of gas emitted from the tank interior through the gas outlet port 44. Threaded into the shut-off valve chamber 42 of the valve casing 38 is a shut-off valve bushing 50, the lower end of which engages and holds the outlet valve disc 43 in place. Slidably supported within the bore of said bushing 50 is a vertically movable shut-off valve 51, the same having an upwardly extending stem 52 of reduced diameter. Said stem 52 extends slidably through an opening 53 in the outer end or head of the bushing 50, so as to project exteriorly upward therefrom. Mounted within the upper interior of the bushing 50, around the shut-off valve stem 52, is a sealing gasket 54 supported by a washer 55. The shut-off valve 51 is provided with gas passages 56 leading from the interior of bushing 50 to a gas discharge passage 57 which extends axially outward through the shut-off valve stem 52. Mounted on the under side of the shut-off valve 51 is a resilient valve piece 58 of reduced diameter, which normally engages the valve disc 43 so as to close the gas outlet port 44. A compression spring 59 is mounted within the bushing 50 around the shut-off valve stem 52, said spring being operative to thrust down-

wardly upon the shut-off valve 51, whereby to normally move and yieldably hold the latter in closing relation to the gas outlet port 44 (see Fig. 6). The outer open end portion of the shut-off valve stem forms a burner tip 60, to which is secured a diametrically enlarged tip head 61.

The burner valve structure is so mounted in connection with the tank 33 as to be disposed adjacent to that side of the latter which abuts the flint guide tube 20, whereby, when the tank is deposited within the lighter casing, the burner tip portion of the burner valve will be positioned somewhat below and adjacent to the flint striker wheel 28, and in the path of sparks cast off from the flint 30 by operation of said striker wheel.

The means for actuating the flint striker wheel 28 and simultaneously opening the burner valve for emission of gaseous fuel from the tank 33 is operable by a push-button member 62, which normally projects outwardly through that lighter casing side wall adjacent to which the flint guide tube 20 is disposed. Extending inwardly from one side of the push-button member 62, preferably as an integral part thereof, is a guide arm 63, which is slidably supported upon the offsetting arm 25 of the bearing bracket which carries the bearing member 26. Similarly, extending inwardly from the opposite side of the push-button member 62, preferably also as an integral part thereof, is a combined rack and cam bar 64, which is also slidably supported upon the offsetting arm 25 of the bearing bracket which carries the bearing member 26. Said guide arm 63 and rack and cam bar 64 are respectively provided, adjacent the junctures thereof with the push-button member, with stop shoulders 65 which by abutment upon the lighter casing side wall through which the push-buton member projects, determines the normal retracted positions of said push-button member and said rack and cam bar. A compression spring 66 is interposed between the offsetting arm 25 of the bearing bracket which carries the bearing member 26 and the push-button member 62, whereby to yieldably hold the latter and the rack and cam bar in normal initial retracted positions. Formed on the upper edge of the rearward portion of the rack and cam bar 64 are rack teeth 67. These rack teeth mesh with the teeth of a flint striker wheel actuating gear wheel 68 which is rotatably mounted on the shaft 27. The face of the flint striker wheel which is opposed to said gear wheel 68 is provided with ratchet teeth 69. Mounted in connection with the gear wheel 68, to rotate therewith, is a yieldable ratchet pawl 70 adapted to engage the ratchet teeth 69 of the striker wheel 28, whereby to transmit the motion of said gear wheel to the striker wheel in one direction. At its forward or free portion, the under edge of the rack and cam bar 64 is formed to provide a cam section 71. Pivotally mounted on the inlay or frame plate 17, beneath the rack and cam bar and adjacent to the burner tip of the tank burner valve structure, is a bell-crank lever 72. The interior operating arm 73 of the bell-crank lever is engageable by the cam section 71 of the rack and cam bar 64, when the latter is forwardly or inwardly moved. The outer arm 74 of the bell-crank lever is formed to project at a right angle to the plane of said bell-crank lever. The outer extremity of said arm 74 is disposed to engage beneath the tip head 61 of the tank burner valve structure. The inlay or frame plate 17 is provided with a suitably disposed guide lug 75 to embrace the rack and cam bar 64, and also with a backing lug 76 to engage the upper edge of the latter so as to hold the same against displacement from its path of operative longitudinal movement.

A novel feature of the burner valve structure with which the fuel supply tank 33 is provided is that it can be vertically adjusted relative to the housing 35 by which it is supported, whereby to predetermine the extent or height of projection of the burner tip portion so as to position the tip head 61 at the proper point or elevation for engagement by the bell-crank lever 72, operation of which lifts the shut-off valve 51 to open condition so as to permit emission of the gaseous fuel from the tank to the burner tip. Such adjustment can be accomplished by screwing the valve casing 38 inward or outward, as may be required, relative to the housing 35. Such adjusting movement of the valve casing 38 does not disturb the sealed relation of said valve casing relative to the housing 35, since the O seal ring 41 readily moves over the smooth surfaced bore 37 of the housing 35 without breaking the seal. Once the proper adjustment of the valve casing for the above stated purposes has been made, said valve casing can be immovably fixed against accidental shifting out of its adjusted position by locking the same to the housing 35. By way of illustration, such locking can be effected by application of a spot of solder 77 to and between adjacent external surfaces of the housing and valve casing (see Figs. 6 and 7).

In the use of the lighter, to ignite the same, the user presses inwardly upon the push-button member 62, thus sliding forward the rack and cam bar 64. As the rack and cam bar moves forward, its rack teeth 67 rotate the gear wheel 68 in counterclockwise direction. The rotary movement of gear wheel 68 is transmitted to the striker wheel 28 by operation of the ratchet pawl 70 upon the ratchet teeth 69 of the latter, thus rotating the striker wheel in counterclockwise direction so that its abrading surface moves across the pyrophoric flint 30, whereby sparks are struck and cast off therefrom into the combustion chamber 14 above the burner tip 60 of the tank burner valve structure. Simultaneously, the forward movement of the rack and cam bar 64 moves its cam section 71 against the operating arm 73 of the bell-crank lever 72, thereby rotating said bell-crank lever in clockwise direction so as to upswing its outer arm 74 against the tip head 61 of the tank burner valve structure, and thus to lift the shut-off valve 51 against the tension of its closing spring 59, whereby to withdraw the valve piece 58 from the gas outlet port 44. The gaseous fuel thereupon flows outwardly through the passages 56 and through the gas discharge passage 57 of the shut-off valve stem 52 for emission from the burner tip 61. The emitted gas will be ignited by the sparks cast from the flint 30, and a lighter flame will be produced within the combustion chamber 14 from which it emerges through the opening 15 in the lighter casing top wall (see Fig. 3). The lighter flame thus produced will continue to burn so long as the push-button member is held inpressed to hold the rack and cam bar 64 in bell-crank lever burner valve opening position.

When the push-button member 62 is released, the spring 66 will return the same to normal initial position, outwardly projected from the lighter casing, thus retracting the rack and cam bar 64 to like normal initial position, so as to

release the bell-crank lever 72 and thereby permit the spring 59 of the burner valve structure to return the shut-off valve 51 to down-thrust closed relation to the gas outlet port 44.

By reason of the pawl and ratchet transmission effective between the gear wheel 68 and flint striker wheel 28, the latter will not be reversely rotated against the flint 30, but will remain stationary during return of the rack and cam bar 64 to normal initial position.

From the above it will be understood that a very simple and highly efficient means is provided for operating the lighter by a one-hand manipulation, whereby to both strike the pyrophoric flint 30 and simultaneously open the burner valve of the fuel supply tank.

Having now described my invention, I claim:

1. A pyrophoric lighter comprising a casing divided in a plane intermediate its face walls to form a base section and a cover section hinged together to close one upon the other, a gaseous fuel tank removably mounted in said base section and having a fuel discharge valve, a flint holding means and cooperative flint striker wheel having an actuating gear supported within said base section at one side of the tank fuel discharge valve, a lever member pivotally mounted within said base section adjacent to the opposite side of the tank fuel discharge valve and cooperative with the latter to open the same, a horizontally slidable spring backed push-button mounted in said base section to normally project exteriorly from an edge thereof adjacent to the flint holding means and a flint striker wheel and its actuating gear, and a single horizontal one-piece rack and cam bar unitary with said push-button and adapted to be moved thereby transverse to the axis of said flint striker wheel and above said lever member, said rack and cam bar having rack teeth at one end to engage and operate the striker wheel actuating gear and a cam section at its free end to engage and operate said lever member.

2. A pyrophoric lighter comprising a casing divided in a plane intermediate its face walls to form a base section and a cover section hinged together to close one upon the other, an inlay frame structure affixed to and within the upper end portion of the casing base section, a striker wheel rotatably supported by the frame structure adjacent to one side of the casing base section, means for rotating the striker wheel including a gear having a ratchet and pawl drive means connected therewith, means supported

within the casing base section to oppose a sparking flint to said striker wheel, a gaseous fuel supply tank removably supported within the casing base section beneath said frame structure intermediate said sparking flint supporting means and the opposite side of the casing base section, fuel gas discharge means at the top end of said tank and provided with an externally projecting vertically reciprocable burner valve disposed adjacent to the striker wheel, said burner valve having a diametrically enlarged annular tip, a spring backed push button slidably supported by said frame structure to normally project outwardly from the striker wheel containing side of the casing base section, a single rack bar extending from said push-button for longitudinal reciprocation thereby in mesh with the striker wheel gear, means carried by the frame structure to guide longitudinal reciprocable movement of said rack bar, a burner valve lifting lever member pivotally mounted on the frame structure beneath the rack bar, one arm of said lever member being adapted to engage beneath the annular tip of the burner valve, and the free end of said rack bar having a cam formation cooperative with the other arm of said lever member upon push-button induced inward movement of the rack bar operative to rotate the striker wheel, whereby to simultaneously rotate the lever member to lift the burner valve to open gas discharging position.

3. A pyrophoric lighter as characterized in claim 2 wherein the fuel supply tank is provided with an upwardly open internally screw-threaded housing affixed to the top end wall thereof to depend within said tank, the fuel gas discharge means being threaded into said housing subject to vertical adjustment relative thereto, whereby to predetermine the position of the burner valve and its tip relative to the lifting lever member so as to assure proper cooperation of the latter therewith.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,831,014	Leitheuser	Nov. 10, 1931
1,937,080	Bilde et al.	Nov. 28, 1933
2,410,808	Christensen	Nov. 12, 1946
2,424,331	Rose	July 22, 1947
2,482,794	Peterson	Sept. 27, 1949
2,571,435	Flamm	Oct. 16, 1951
2,612,033	Flamm	Sept. 30, 1952