April 7, 1953 A. P. ANDERSON 2,633,724

CONTROL-MECHANISM FOR PYROPHORIC LIGHTERS OF THE GASEOUS FUEL TYPE

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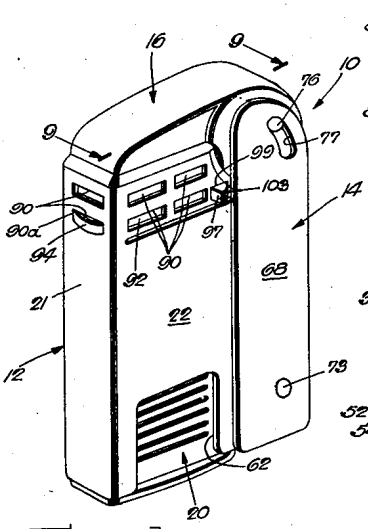

Fig. 1

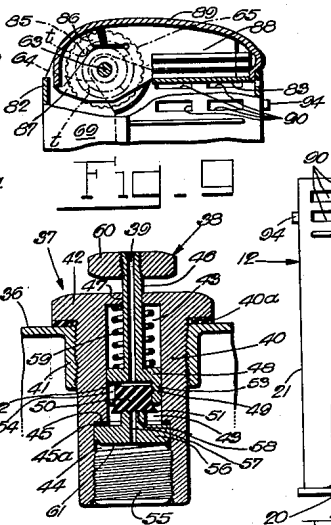

Fig. 8

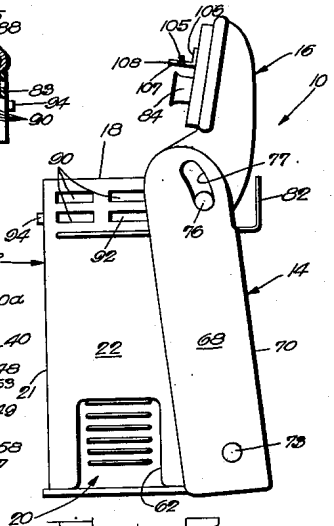

Fig. 3

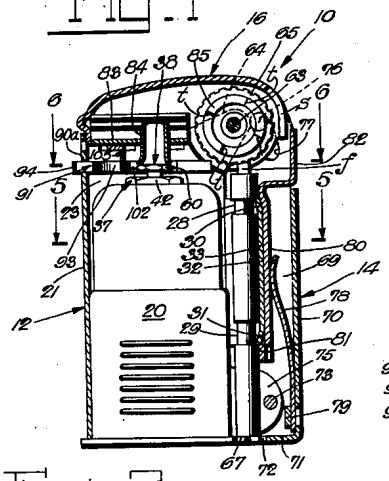

Fig. 2

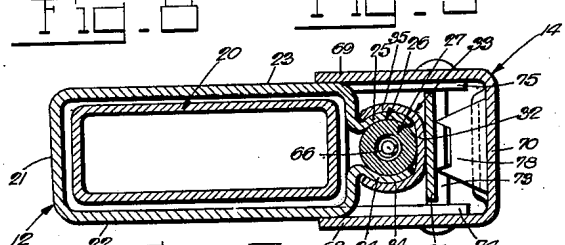

Fig. 5

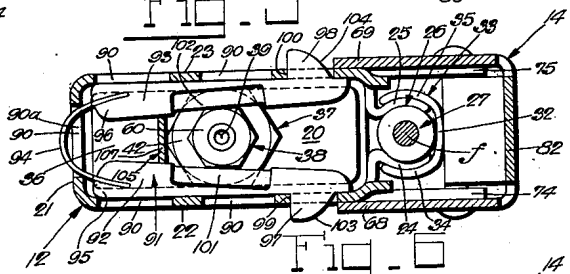

Fig. 6

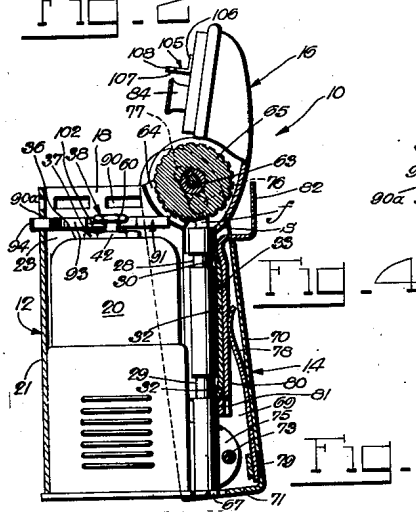

Fig. 4

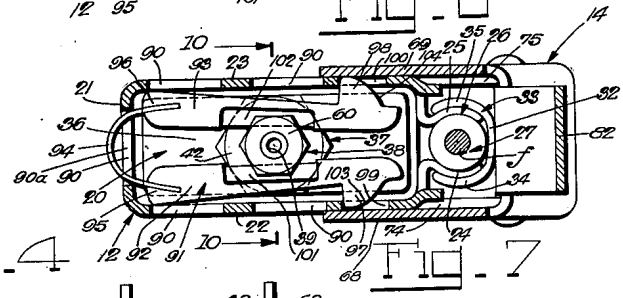

Fig. 7

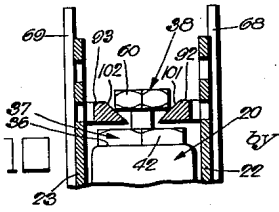

Fig. 10

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CONTROL-MECHANISM FOR PYROPHORIC LIGHTERS OF THE GASEOUS FUEL TYPE

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8 Claims. (Cl. 67—7.1)

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This invention relates to pyrophoric cigar or cigarette lighters in general, and to lighters of the gaseous-fuel type in particular.

Lighters of this type usually contain a replaceable cartridge holding a long-lasting supply of compressed inflammable gas and having a normally-closed valve through which to release a small quantity of the gas to be burned on each application of the lighter. For the release from the cartridge of a gaseous-fuel charge and for its ignition, these lighters are usually equipped with a valve-actuator and with more or less conventional sparking-mechanism, which require separate manipulation by the users of these lighters. Since the spark emission from the mechanism is only momentary, it is imperative that the user of any of these lighters manipulates the valve-actuator preferably slightly before, and not after, manipulating the sparking-mechanism, in order to obtain a flame. Thus, for efficient and safe use of these lighters, their manipulation and the correct timing of the separate manipulations of their valve-actuators and sparking-mechanisms require considerable dexterity which many users do not possess.

It is one of the main objects of the present invention to provide a gaseous-fuel type lighter which for its safe, efficient and reliable operation requires no dexterity whatever on the part of the user of the lighter.

Another object of the present invention is to eliminate in a lighter of this type the heretofore imperative separate manipulation of the valve-actuator and, instead, provide for its automatic performance in time with the manipulation of the sparking-mechanism by the user of the lighter, thereby eliminating all waste of gaseous fuel and obviating any danger of igniting an excessive accumulation of released fuel-gas, assuredly producing a flame on each manipulation of the sparking-mechanism, and rendering the manipulation of the lighter a task which requires no skill whatever.

It is a further object of the present invention to provide for the sparking-mechanism and for the valve-actuator of a lighter of this type a common manipulator which, when operated by the user of the lighter, will momentarily operate the sparking-mechanism and also render the valve-actuator operative to open the cartridge-valve, and, when released by the user, will render the valve-actuator inoperative and cause closure of the cartridge-valve, thereby affording the user of the lighter a simple and most convenient control over the duration of the flame produced by the lighter.

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Another object of the present invention is to provide in a lighter of this type a valve-actuator in the form of a structurally-simple, part-resilient element which is readily assembled with the lighter by simply snapping it in place therein, and which is correctly and reliably operated by a simple camming action of the aforementioned common manipulator.

It is still a further object of the present invention to have safety provisions in a lighter of this type which will effectively prevent operation of the valve-actuator, except when the aforementioned common manipulator is operated.

It is also among the objects of the present invention to provide a lighter of this type which, while exceedingly simple in construction, is nevertheless highly efficient and reliable in performance, and readily lends itself to efficient mass production at low cost.

Other objects and advantages will appear to those skilled in the art from the following, considered in conjunction with the accompanying drawings.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

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

Fig. 2 is a longitudinal section through the same lighter;

Fig. 3 is a side elevation of the lighter when in use;

Fig. 4 is a section similar to Fig. 2, showing the lighter when in use;

Figs. 5 and 6 are enlarged cross sections through the lighter, as taken on the lines 5—5 and 6—6, respectively, of Fig. 2;

Fig. 7 is a section similar to Fig. 6, showing certain parts of the lighter in a different position;

Fig. 8 is an enlarged fragmentary section through the valve-equipped top of a replaceable fuel-cartridge in the instant lighter;

Fig. 9 is a fragmentary partial-section and partial-elevation of the lighter, the section being taken substantially on the line 9—9 of Fig. 1; and

Fig. 10 is a fragmentary section through the lighter as taken on the line 10—10 of Fig. 7.

Referring to the drawings, and more particularly to Figs. 1 to 4 thereof, the reference numeral 10 designates a pyrophoric lighter which, in the present instance, comprises a casing 12, a manipulator 14, and a normally-closed cover 16 for the open top 18 of the casing 12. The casing 12, which is also open at the bottom for the insertion thereat of a fuel-container or -cartridge 20 (Fig. 2), comprises a front wall 21 and opposite

side walls 22 and 23 which, as best shown in Fig. 5, are rearwardly extended at 24 and 25, respectively, to form a socket 26 for the reception of a flint-receptacle or -tube 27. The flint-tube 27 is, for its secure mounting in the socket 26, provided in the present instance with spaced peripheral grooves 28 and 29 (Fig. 2) into which are crimped the top and bottom ends 30 and 31, respectively, of the connecting-web 32 of a generally U-shaped reinforcement-member 33, the opposite legs 34 and 35 of which are forced into firm engagement with the socket-forming wall extensions 24 and 25, respectively (Fig. 5).

The fuel-cartridge 20, which is preferably of the replaceable kind, is charged with a long-lasting supply of compressed inflammable gaseous fuel. Such a gaseous fuel may be any of the inflammable hydrocarbons, of which butane has proved highly satisfactory. The cartridge 20 is at its top 36 provided with a pressure-reduction valve 37, having a valve-element 38 which is normally closed (Fig. 2) to prevent the escape of gaseous fuel from the cartridge, and which may be lifted into the position shown in Fig. 4 for the release of a limited quantity of gaseous fuel from the cartridge through an outlet 39 in the valve-element 38 (Fig. 6).

The pressure-reduction valve 37 may be of any suitable construction. Fig. 8 shows an example of a pressure-reduction valve with which the fuel-cartridge 20 may be equipped. This valve comprises a casing 40 which is threaded into an internal boss 41 on the top wall 36 of the cartridge 20, and is provided with a hexagonal head 42 by means of which it may conveniently be tightened in the boss 41. To prevent leakage of the compressed gaseous fuel from the cartridge 20 through the threaded connection between the boss 41 and the valve-casing 40, there is preferably interposed between the latter and the head 42 of the valve-casing 40, a gasket 40*a*. The valve-casing 40 is provided with a cylindrical chamber 43 and a diametrically-enlarged end-bore 44 which leaves an annular shoulder 45 in the casing 40. Slidable in the valve-chamber 43 is the valve-element 38, having a stem 46 which extends through an aperture 47 in the head 42 of the valve-casing 40. The plunger-end 48 of the valve-element 38 is provided with an annular recess 49 for the reception of a valve-plug 50 of rubber or a similar resilient material. The plug 50 is at one end diametrically enlarged as at 51, so that the same will, when fully seated in the recess 49 in the plunger-end 48 of the valve-element (Fig. 8), leave a gap 52 between its other end and the bottom of the recess 49. The cylindrical wall 53 of the plunger-end 48 of the valve-element 38 is also provided with one or more axial slots 54 which provide communication between the valve-chamber 43 and the outlet-passage 39 in the valve-element 38. Firmly held against a gasket 45*a* on the annular shoulder 45 in the valve-casing 40 by a threaded plug 55 in the tapped end-bore 44 is an insert 56 which is provided with a central duct 57 and a valve-seat 58. The valve-element 38 is with its resilient plug 50 normally urged by a compression spring 59 against the valve-seat 58 of the insert 56 to intercept communication between the duct 57 in the latter and the valve-chamber 43. For lifting the valve-element 38 from the seat 58, the stem 46 of the former is at its free end provided with a shoulder 60 which may conveniently be formed by a hexagonal nut.

In operation, gas from the compressed gaseous-fuel supply in the cartridge 20 will seep through the threaded connection between the plug 55 and the end-bore 44 in the valve-casing 40, and will accumulate at considerably reduced pressure in the space 61 between the plug 55 and insert 56. The fuel-gas in the space 61 is trapped therein by the valve-element 38 as long as the latter is normally seated on the valve-seat 58. However, gas in the space 61 will be permitted to escape through the valve-element 38 when the latter is lifted from the seat 58 in a manner to be described hereinafter. In that event, fuel-gas from the space 61 will pass through the duct 57 in the insert 56, through the slot or slots 54 and the gap 52 in the plunger-end 48 of the valve-element 38, and through the outlet-passage 39 in the valve-stem 46. Since the slot or slots 54 and the gap 52 in the plunger-end 48 of the valve-element are greatly restricted in width, and since the outlet-passage 39 in the valve-stem 46 is similarly restricted in diameter, it is obvious that the pressure of the fuel-gas flowing therethrough will be further reduced to the extent where the pressure is just sufficient to sustain the flame of the lighter at normal size.

The fuel-cartridge 20 is received rather snugly in the casing 12 so as to preclude its accidental escape therefrom, yet permit its withdrawal for replacement purposes without requiring an undue effort on the part of the user of the lighter. For facile removal of the fuel-cartridge 20 from the casing 12, the opposite side walls 22 and 23 of the latter are preferably recessed at 62, respectively, to afford a good grip on the cartridge.

The cover 16 carries, in the present instance, a cross-pin 63 which is journaled in rearwardly-extending lugs 64 on the side walls 22 and 23, respectively, of the casing 12 (Figs. 2 and 9). Freely rotatable on the pin 63 is a conventional, preferably bushed sparking-wheel 65 which is adapted to be turned in a clockwise direction, as viewed in Figs. 2 and 4, in order to draw sparks from the adjacent end of a flint *f* in the flint-tube 27 for the ignition of fuel-gas released by the lifted valve-element 38. The flint *f* may in a conventional manner be urged against the usually knurled or otherwise roughened periphery of the sparking-wheel 65 by a compression-type spring 66 (Fig. 5) which is held in the flint-tube 27 by the usual threaded plug 67 at the lower end of the flint-tube.

The manipulator 14 is, in the present instance, a U-shaped channel having opposite legs or flanges 68 and 69 which straddle the casing 12, and a connecting-web 70 which conceals the flint-tube 27 and its socket 26 (Figs. 2 and 5). The manipulator 14 is further provided with an inwardly-turned bottom flange 71 which is slotted at 72 to provide for access to the plug 67 at the lower end of the flint-tube 27. The manipulator 14 carries near its lower end a cross-pin 73 which is journaled in rearwardly-extending lugs 74 and 75 on the side walls 22 and 23, respectively, of the casing 12. Thus, the manipulator 14 is turnable from the normal inoperative position shown in Figs. 1 and 2 into the operative position shown in Figs. 3 and 4, and vice versa.

The swing of the manipulator 14 into its operative and inoperative positions is, in the present instance, utilized for opening and closing the cover 16, respectively. To this end, the cover 16 is provided with opposite aligned pins 76 (Figs. 1 and 2) which are disposed eccentrically of the pivot-pin 63 and cooperate with identical cam-slots 77 in the opposite flanges 68 and 69, respec-

tively, of the manipulator 14. The cover 16 is at its rear slotted as at *s* in order that the cover may, in its open position, clear the flint-tube 27 (Fig. 4).

The manipulator 14 is normally urged into the inoperative position shown in Figs. 1 and 2 by a leaf-type spring 78 (Figs. 2 and 5) which is conveniently anchored at one end in a punched-out strap 79 on the web 70 of the manipulator, and bears with its other end against a backing-plate 80 which, in turn, bears against the flint-tube socket 26. The backing-plate 80, which is provided at its lower end with a preferably punched-out projection 81 that engages the adjacent end of the socket-reinforcement member 33 (Figs. 2 and 4), is also provided with a rearwardly-offset top-shield 82 which conceals the sparking-wheel 65 and is substantially flush and continuous with the web 70 of the manipulator 14 when the latter is in its normal inoperative position (Fig. 2).

The cover 16 is, in the present instance, provided with a web 83 (Fig. 2) in which is mounted in any suitable manner a conventional cup-shaped flame-extinguisher 84 that bears with its open end against the nut 60 on the valve-element 38 and covers the fuel-outlet 39 thereat when the cover 16 is closed (Fig. 2).

The instant lighter 10 is also provided with a ratchet-mechanism which will turn the sparking-wheel 65 in a clockwise direction, as viewed in Figs. 2 and 4, when the cover 16 is opened on depressing the manipulator 14 into its operative position, and which will have no turning effect on the sparking-wheel 65 when the cover 16 closes on the spring-return of the manipulator 14 into its inoperative position. This ratchet-mechanism comprises a ratchet-disk 85 on one side of, and preferably integral with, the sparking-wheel 65 (Fig. 2), and a pawl 86 (Fig. 9) which is, in the present instance, formed by an inwardly-bent tongue of a plate 87 which is elongated at 88 to fit approximately between the top wall 89 and the web 83 of the cover 16 (Fig. 9), while the pivot-pin 63, which extends through the plate 87, holds the latter firmly in the cover 16. Thus, the pawl 86 turns with the cover 16 and will, on rotation of the latter from its closed position into its open position, engage the nearest tooth *t* of the ratchet-disk 85 and turn the sparking-wheel 65 for the emission of sparks from the flint *f*. On closure of the cover 16, the somewhat resilient pawl 86 will merely override the following tooth *t* of the ratchet-disk 85, and will fail to turn the sparking-wheel 65, especially since the spring-urged flint *f* will act as a brake against the periphery of the sparking-wheel.

As shown in Fig. 4, the casing 12 extends some distance above the valve-element 38 on the inserted fuel-cartridge 20, so as to serve as an effective windbreaker. However, to support proper combustion of the ignited gaseous fuel as it is discharged from the valve-element 38, the upper end of the casing 12 is preferably provided with restricted air-passages or slots 90 (Figs. 1, 4 and 6).

In accordance with a primary aspect of the present invention, provisions are made whereby the valve-element 38 is, for the discharge of a limited quantity of gaseous fuel from the cartridge 20, lifted from its closed position (Fig. 2) into its fuel-discharge position (Fig. 4) on depressing the manipulator 14 into its operative position. To this end, there is provided a valve-actuator 91 (Figs. 2, 4, 6 and 7) which, in the present instance, comprises two spaced fingers 92 and 93 which are joined at their adjacent ends 95 and 96, respectively, by a leaf-type spring 94 that normally urges these fingers apart. The fingers 92 and 93 of the valve-actuator 91 are provided near their opposite ends with outwardly-projecting followers 97 and 98, respectively, which are adapted to cooperate with the adjacent flanges 68 and 69 of the manipulator 14 in operating the valve-actuator, in a manner described hereinafter. The valve-actuator 91 may conveniently be inserted in the instant lighter 10 by projecting the leaf-spring 94 into the slot 90*a* in the front wall 21 of the casing 12, and snapping the followers 97 and 98 into aligned slots 99 and 100 in the opposite end walls 22 and 23, respectively, of the casing 12, in the manner best shown in Fig. 6. The valve-actuator 91 is thus readily mountable in, and demountable from, the casing 12 of the instant lighter. Instead of projecting the leaf-spring 94 through the air-passage or slot 90*a* in the front wall 21 of the casing 12, this slot may be omitted in the casing and the leaf-spring 94 mounted in a slotted member (not shown) on the inside of the casing-wall 21, so as to conceal the spring 94 from view.

The opposite fingers 92 and 93 of the valve-actuator 91 are intermediate their lengths provided with cam-faces 101 and 102, respectively, which are in cooperative relation with the nut 60 on the valve-element 38 of the inserted cartridge 20 (Figs. 2 and 6). The cam-faces 101 and 102 on the fingers 92 and 93 preferably clear the nut 60 on the valve-element 38 when the manipulator 14 is in its inoperative position (Figs. 2 and 6), so that the fuel-cartridge 20 may be removed from the casing 12 of the instant lighter, and a new fuel-cartridge be inserted therein without any interference from the valve-actuator 91.

The followers 97 and 98 on the fingers 92 and 93 of the valve-actuator 91 are, in the present instance, provided with cam-edges 103 and 104, respectively, for cooperation with the adjacent flanges 68 and 69 of the manipulator 14 in forcing the fingers 92 and 93 into the valve-lifting position shown in Figs. 7 and 10 on depressing the manipulator 14 from the inoperative position shown in Fig. 6 into the operative position shown in Fig. 7. In thus forcing the fingers 92 and 93 of the valve-actuator 91 into the valve-lifting position (Figs. 7 and 10), their respective cam-faces 101 and 102 will engage the nut 60 on the valve-element 38 and lift the latter into its fuel-discharge position in which to release a limited quantity of gaseous fuel. The valve-element 38 will be retained in its fuel-discharge position and will release fuel from the cartridge 20 while the manipulator 14 is held in its operative or depressed position (Figs. 4 and 7), and the valve-element 38 will be permitted to return to its normally-closed position (Figs. 2 and 8) on the spring-return of the fingers 92 and 93 of the valve-actuator 91 into the inactive or retracted position shown in Fig. 6, following the release of the depressed manipulator 14 by the user of the lighter.

To prevent lifting of the valve-element 38 into its fuel-discharge position and release of gaseous fuel from the cartridge 20, in consequence of accidental or unauthorized depression of the followers 97 and 98 into the respective slots 99 and 100 in the casing 12 when the manipulator 14 is in its inoperative position (Figs. 1 and 6), there is provided a lock-member 105 (Figs. 2, 3 and 4) which may be in the form of an angle having the legs 106 and 107. The lock-member 105, which may with its leg 106 be suitably mounted on the web 83 of the cover 16, will, in the closed

position of the latter, extend with its other leg 107 between the fingers 92 and 93 of the valve-actuator 91 (Fig. 6) and effectively lock them against movement into their valve-lifting position while the cover 16 is closed. Preferably, the tip-end 108 of the leg 107 of the lock-member 105 is wedge-shaped for its ready entry between the fingers 92 and 93 of the valve-actuator 91. On depressing the manipulator 14 into its operative position (Figs. 3 and 4), the lock-member 105 on the cover 16 will be immediately retracted from the fingers 92 and 93 of the valve-actuator 91 so that the latter may be forced into its valve-lifting position (Fig. 7) by the manipulator 14, as it is being depressed.

The provision of the valve-actuator 91 in the present lighter construction secures many important advantages. Thus, by providing the valve-actuator in operative relation with the manipulator 14, and thereby accomplishing the automatic opening of the valve 37 in time with the operation of the sparking-mechanism, all waste of gaseous fuel is eliminated and any danger of igniting an excessive accumulation of released gas is obviated. Further, a flame will assuredly be produced in the instant lighter on each performance of the sparking-mechanism, thereby assuring the efficient and reliable performance of the instant lighter on each manipulation thereof, and reducing wear of the flint *f* and fouling of the sparking-wheel 65 to a minimum. The instant coordination of the valve-actuator 91 with the manipulator 14 further affords to the user of the instant lighter a simple and most convenient control over the duration of the flame, since mere holding of the manipulator 14 in its operative or depressed position will result in feeding the flame with gaseous fuel from the cartridge 20 until the manipulator is released for spring-return to its inoperative position. Moreover, the valve-lifting element 91 in the instant lighter is structurally exceedingly simple, yet highly reliable in operation, and facilitates the removal of a spent fuel-cartridge 20 from the casing 12 and its replacement with a new cartridge.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. In a pyrophoric lighter having a casing with opposite slotted side walls, a gaseous-fuel container in said casing having a normally closed valve including a shouldered valve-stem axially movable into a valve-opening position for the release of fuel, and sparking-mechanism in igniting relation with released fuel, the combination of a manipulator carried by said casing for movement in a plane substantially parallel to said casing-walls, and operatively associated with said sparking-mechanism for actuating the latter on movement of said manipulator into an operative position, said manipulator having extensions on the outside of said casing-walls, respectively; and a valve-actuator having a pair of pivotally-connected cam-members on opposite sides of said valve-stem in said casing, said cam-members being normally yieldingly urged apart into an inactive position and having projections extending outwardly through the slots in said casing-walls, respectively, and said projections and extensions being cooperating cams to force said cam-members toward each other into cooperative relation with said shoulder on said valve-stem for moving the latter into its open position on moving said manipulator into said operative position.

2. The combination in a pyrophoric lighter as set forth in claim 1, in which said cam-members are pivotally connected by a leaf spring which joins them and normally urges them apart.

3. The combination in a pyrophoric lighter as set forth in claim 1, in which said projections have cam-edges in the path of said extensions and the latter are in the form of flanges on said manipulator which straddle said casing-walls.

4. In a pyrophoric lighter having a casing with a front wall and opposite side walls and slots in said walls, respectively, a gaseous-fuel container in said casing having a normally closed valve including a shouldered valve stem axially movable longitudinally of said casing into an open position for the release of fuel, and sparking mechanism in igniting relation with released fuel, the combination of a manipulator carried by said casing for movement transversely thereof in a plane substantially parallel to said side walls, and operatively associated with said sparking-mechanism for actuating the latter on movement of said manipulator into an operative position, said manipulator having extensions on the outside of said side walls, respectively, of said casing; and a valve-actuator comprising a pair of end-to-end pivotally-connected cam-members located on opposite sides, respectively, of said valve-stem in said casing and having near their other ends outward projections, respectively, said cam-members being normally yieldingly spread-apart and being with their pivoted ends and outward projections removably supported in said slots in said front wall and side walls, respectively, of said casing for pivotal movement of said cam-members from an inactive spread relative position toward each other into an active relative position and into cooperative relation with said shoulder on said valve-stem for moving the latter into its open position, and said outward projections and extensions being cooperating cams to force said cam-members into said active relative position on moving said manipulator into said operative position.

5. The combination in a pyrophoric lighter as set forth in claim 4, in which said cam-members are pivotally connected by a leaf spring which joins them and normally urges them apart and extends into said slot in said front wall of said casing.

6. In a pyrophoric lighter having a casing with an open top, a cover movably carried by said open casing-top for opening and closing the latter, a gaseous-fuel container in said casing having near the open top of the latter a normally closed valve for the discharge of fuel from said container, and sparking-mechanism in said casing for igniting discharged fuel from said container, the combination of a manipulator carried by said casing for movement into operative and inoperative positions and operatively associated with said cover for opening and closing the latter on movement of said manipulator into said operative and inoperative positions, respectively; an operating connection between said manipulator and sparking-mechanism for operating the latter on moving the former into said operative position only;

a valve-actuator movable in said casing from an inactive position into an active position for opening said valve, and operatively associated with said manipulator for moving said valve-actuator into said active position on movement of said manipulator into said operative position; and a member carried by said cover for locking said valve-actuator against movement from said inactive position when said cover is closed, and for releasing it for movement into said active position when said cover is being opened.

7. In a pyrophoric lighter having a casing with an open top, a cover movably carried by said open casing-top for opening and closing the latter, and a gaseous-fuel container in said casing having near the open top of the latter a normally-closed valve for the discharge of fuel from said container, the combination of a manipulator carried by said casing for movement into operative and inoperative positions and operatively associated with said cover for opening and closing the latter on movement of said manipulator into said operative and inoperative positions, respectively; a valve-actuator movable in said casing from an inactive position into an active position for opening said valve, and operatively associated with said manipulator for moving said valve-actuator into said active position on movement of said manipulator into said operative position; and a member carried by said cover for locking said valve-actuator against movement from said inactive position when said cover is closed, and for releasing it for movement into said active position when said cover is being opened.

8. In a pyrophoric lighter having a casing, a gaseous-fuel container therein having a normally closed valve including a shouldered valve stem axially movable into valve-opening position for the release of fuel, and sparking mechanism in igniting relation with released fuel, the combination of a valve actuator having wedge-like cams on opposite sides, respectively, of said valve stem; means in said casing for supporting said cams and guiding them for movement toward and away from each other transversely of the stem axis to cooperate with the shoulder on said stem in moving the latter into said valve-opening position on movement of said cams toward each other; and a manipulator operatively associated with said sparking mechanism and valve actuator and depressible on said casing for causing operation of said sparking mechanism and operative movement of the cams of said valve actuator.

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