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HAND TORCH AND IGNITER FOR USE WITH LOW BOILING POINT FUEL

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2 Sheets-Sheet 1

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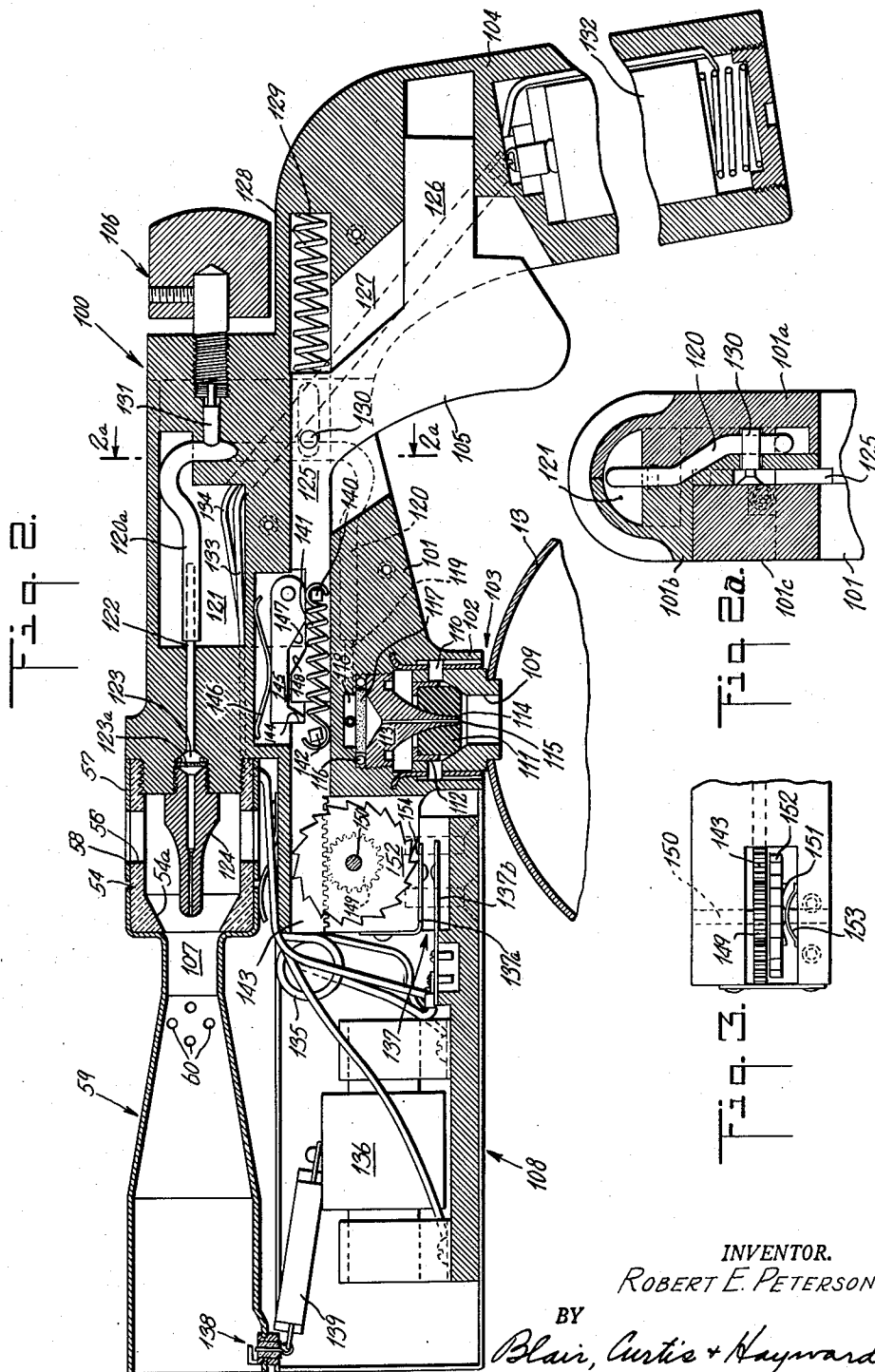
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UNITED STATES PATENT OFFICE

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HAND TORCH AND IGNITER FOR USE WITH
LOW BOILING POINT FUELRobert E. Peterson, New York, N. Y., assignor to
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This invention relates to torches, and more particularly to a portable blow torch, characterized by a self-contained igniting device and adapted to burn in gaseous form a low boiling liquid fuel.

Portable blow torches of the type commonly and frequently used by plumbers, electricians, mechanics and the like are, for the most part, the well-known pressure type which burn gasoline or kerosene. Such torches, while satisfactory for heating soldering irons, or melting fusible materials in readily accessible locations, are nevertheless of relatively limited application. As it is unsafe for a workman to carry any type of torch while it is ignited, this common type of blow torch is characterized by very material difficulties in use, by reason of the time and difficulty encountered in initially igniting or reigniting it. As is well known, such a torch must be primed or preheated before it will burn vigorously and at the high temperatures necessary. Thus, for example, if a painter finds it necessary to mount a ladder to get at the paint he wishes to burn, he cannot safely carry the ignited torch up the ladder with him, but must attend to the ignition of the torch while sometimes precariously balanced on a ladder top. Then too, such torches periodically require pumping to restore the pressure in the fuel tank, with the result that pressure failure, with resultant lessening of the flame and lowering of its temperature, may occur, and indeed frequently does occur at a critical time.

Then too, such gasoline blow torches are usually relatively heavy and cumbersome, must be frequently cleaned, are troublesome to refill, and occasion the waste of a substantial amount of time and fuel for both initial ignition and reignition. Also, such torches, because of inherent incapacities, cannot provide a flame of sufficient heat intensity and shape for certain types of jobs.

It is accordingly among the objects of my invention to provide a simple, relatively inexpensive and light weight but rugged blow torch, which overcomes the above disadvantages, in addition to others, in a simple and practical manner. Other objects will be in part apparent, and in part pointed out hereinafter.

In accordance with one form of my invention, I provide a light-weight container for a low boiling liquid fuel, which may be detachably secured to a pistol-like torch, provided with manually controllable valve mechanism and adjustable means for providing variable amounts of primary air for adjusting the air fuel ratio to its most efficient value. Also included in the torch is an

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automatic ignition apparatus which ignites the air-fuel mixture automatically when the valve mechanism is opened to permit the passage of gaseous fuel from the fuel tank to the mixing chamber. More particularly, the valve mechanism may, in accordance with my herein disclosed invention, comprise a flexible tube formed of non-corrosive material which, when the torch is out of use, is automatically pinched closed, thus to shut off the flow of gas, but which, by reason of its resilience and the gas pressure, readily opens to permit the flow of gas when the torch trigger is depressed.

In the drawing, wherein I have shown several forms of my invention,

Figure 1 is a sectional elevation of one form of my torch detachably secured to a fragmentary portion of a fuel container;

Figure 2 is a sectional elevation of another form of the torch;

Figure 2a is a fragmentary sectional elevation taken along the line 2a—2a of Figure 2.

Figure 3 is a fragmentary top plan portion of the igniting device.

Referring first to Figure 1, the torch, which is generally indicated at 10, comprises a preferably two-piece body casting 11 or the like, having a neck 12 for detachable connection to a container 13, a hand grip 14, a trigger 15, a metering valve, generally indicated at 16, a mixing chamber 17, and an ignition device generally indicated at 18. Thus, when the trigger 15 is depressed, the valve mechanism to be described hereinafter is opened to permit the flow of inflammable gas from container 13 to mixing chamber 17, wherein the gas is mixed with primary air, and from which the mixture flows for ignition by the device 18.

Container 13 is of a type adapted to contain a low boiling point liquified gas, such as propane or butane, or a mixture of the two, and should accordingly be sufficiently sturdy to withstand the pressure of vaporization of such fuel or fuel mixture. To the top of the container is swaged or otherwise secured an exteriorly threaded neck 19 having an annular rabbet formed in the upper end thereof to receive a flanged bushing 20. This bushing, in turn, has secured therewithin a flexible seal or stopper 21 which, for example, may be formed of neoprene or any other suitable material which is not affected, or rather which is not subject to attack by the liquid fuel in the container. Seal or stopper 21 is provided with a downwardly extending neck 22 embraced by a spring clip 23 which normally closes the hole extending through the stopper.

The neck portion 12 of pistol body 11 is in-

teriorly threaded so as to detachably receive the threaded neck 19 of container 13. The upper portion of body neck 12 is drilled and threaded to receive a fitting 24 provided with a downwardly extending conical needle 25 or the like, provided with a small diameter bore 26. The upper surface of fitting 24 is sealed as by a packing ring 27, which is squeezed between the top of the fitting and the top of the bore within the body casting. Also threaded into the top of the pistol body neck 12 is a gland 28, sealed as by a packing ring 29, and having secured therewithin a metal tube 30, which communicates by way of bore 26 with the interior of container 13.

Pistol body 11 is hollow, so as to provide a chamber 31 within which the top of gland 28 and tube 30 are disposed. Within this chamber is disposed a bracket 32, which is preferably formed of a phenolic condensation compound, or other suitable dielectric material, and which may be secured to the side of the pistol casing in any suitable manner, as, for example, by screws 33. Bracket 32 is suitably drilled to receive a flexible tube 34, the lower end of which is attached to the upper end of tube 30, and the upper end 34a of which is attached to the right-hand end of a tube 35. Tube 35 is also formed of a flexible material, e. g. neoprene, or other material not subject to attack by the gas flowing therethrough. The hole extending through bracket 32 is just large enough to receive tube 34 and adequately support it against movement within chamber 31.

Tube 35 which, as noted above, is connected to the upper end of tube 34, is preferably of metal, and extends through a wall 36 of the pistol casing, and into a jet 37 which is screwed into this wall. The orifice 32 of jet 37 opens into mixing chamber 17.

The flow of gas through tube 34 is controlled by both trigger 15 and valve 16, as will now be described. Trigger 15 includes a body portion 39, a downwardly extending finger engageable portion 40, and a pilot 41 received respectively within a guide 42, a recess 43, and another guide 44 formed in pistol casting 11. A spring 45 is disposed within the pistol casting and has one end seated against an inner portion of grip 14, and the other end bearing against the right-hand side of trigger body 39, so as constantly to bias trigger 15 to the left, i. e. to closed position. Attached to one side of trigger body 39, as by pins 46, is a plunger 47, the free end 47a of which extends into a hole 32a formed in bracket 32, and communicating with the vertical hole therein within which the center section of tube 34 is disposed. This end 47a of plunger 47 is adapted to bear against tube 34 with sufficient pressure, by virtue of spring 45, as to pinch tube 34 hard enough to tightly close the passage therethrough, even against the substantial pressure of the gas in container 13. Thus it may be seen that when it is desired to use the torch, trigger 15 is pressed into pistol handle 14, i. e. is moved to the right, as viewed in Figure 1, thus to relieve the pressure of plunger end 47a on tube 34, permitting the tube to open and gas to flow therethrough.

To meter the flow of gas through tube 34, valve 16 is provided. This valve comprises a thumb piece 48, secured to the end of a shaft 49, threadably received within a hole 50 in the upper portion of casting 11, and having secured to its end a stem 51 having a rounded end 52 extending into a hole 53 formed in the upper portion of bracket 32. This hole communicates with the hole within which tube 34 is disposed, so that when thumb

piece 48 is rotated in one direction, stem end 52 can be forced against tube 34 to pinch the tube as much as desired. Thus the flow of gas through the tube can be metered, as desired, or when it is desired to store the torch between periods of use, tube 34 may be completely closed by valve 16, thus providing an adequate factor of safety over and above the closing action of plunger 47.

Mixing chamber 17 is formed by a fitting 54 of heat insulating material, which may be threadably attached to the boss 55 of the pistol casting 11, which carries jet 37. Fitting 54 is tapered as at 54a and is provided with one or more openings 56, and has rotatably mounted therein a sleeve 57, similarly provided with holes 58. Thus sleeve 57 may be rotated relative to fitting 54 to bring into complete or partial registry holes 58 and 56, respectively, to provide the desired amount of primary air for mixture with the gas to the desired air fuel ratio within mixing chamber 17. It follows that jet 37, fitting 54 and sleeve 57 comprise, in effect, a venturi. The free end of fitting 54 detachably receives a nozzle or burning chamber, generally indicated at 59, having holes 60 for admission of secondary air. Nozzle 59 supports the ignition device 18, as shown. If desired, nozzle 59 may be provided with one or more fins 61 for the dissipation of heat, and also may carry an end cap 62 or the like, of greater diameter than the nozzle end, for regulation of the shape of the flame, and also for drawing in supplementary air to assist the combustion of the air-fuel mixture.

The structural aspects of the torch hereinbefore described are such as readily lend themselves to fabrication from light-weight materials, so that the weight of the torch and tank together is materially less than that of the conventional blow torch, thus greatly facilitating the use of the torch, and indeed making use thereof possible under conditions which would preclude the use of a gasoline blow torch of the well-known type. Thus, as shown, the body of the torch may comprise a single casting which may be closed on one side and open on the other to provide access to the interior of the torch for the installation therein of the parts heretofore and hereinafter described, the open side conveniently being closed by a cover plate (not shown). It should also be noted that the nozzle 59 is releasably mounted on the end of fitting 54, where it is held in proper operative position by a spring clip 63, fastened as by a rivet 64 to the pistol casting. Thus it may be seen that different nozzle sizes and shapes may readily be provided, thereby to control within limits the size and shape of the flame.

As noted hereinbefore, the fuel for the torch may be a low boiling point fuel which, because of its high vapor pressure, maintains itself in liquid form within the container 13. I have found it advantageous to employ pure propane in liquid form, although any other liquid fuel having properties similar to those of propane may be used. Thus any fuel having a boiling point of the order of -40° F. may be used, as such low boiling point fuels create satisfactory pressures which do not become dangerously high in temperatures of 0° F. to 130° F. For example, propane boils at -44.5° F. and at 0° F. has a vapor pressure of 37.3 pounds per square inch, and at 130° F. has a vapor pressure of 274.5 pounds per square inch. It will be appreciated, of course, that this higher pressure does not have any occupational hazards attendant thereto, as modern

steel containers are designed to withstand such pressures with a factor of safety in excess of five. Also, from the foregoing description of container 13, it will be readily apparent that it is an easy matter for the user of the torch to carry with him one or more extra fuel containers which may be readily attached to the torch when the fuel supply in the container in use becomes exhausted. Also, by reason of the nature of the seal or stopper 21, the container in use may, if desired, be disconnected from the torch without danger of escape of gaseous fuel therefrom, as the spring clip or ring 23 tightly closes the neck of the stopper when the needle 25 is withdrawn.

As hereinbefore noted, ignition of conventional gasoline blow torches has certain disadvantages. I have provided the ignition system now to be described. The igniter 18 may comprise a flanged bushing 65, having secured therein a dielectric 66, the bushing being threadable into nozzle 59 or frictionally held therein, as desired. The dielectric plug 66 carries a conductor pin 67, to which is attached one end of a resistance element or coiled wire 68, the other end of which is grounded, as to the bushing 65. To pin 67 is fastened one end of a conductor 63, the other end of which is attached to a binding post 70, mounted on bracket 32. Electrically connected to this binding post is a resilient spring arm 71, the free end of which carries a contact 72. This contact is adapted to engage in the manner to be described a stationary switch arm 73, electrically connected to a second binding post 74, also mounted on bracket 32. This binding post 74 has connected thereto one end of a wire or conductor 75, which extends through the pistol casting and is carried down through the handle 14 thereof, where it is connected to a fixture 76 which supports a contact 77. This contact 77 is adapted to be engaged by a contact 78 of a dry cell 79 which is conveniently removably disposed within the bottom of torch handle 14, the other side of the battery being grounded in customary manner. Thus it follows that when switch contact 72 engages switch arm 73, a circuit to the resistance element 68 is completed, causing the element or wire to glow with sufficient heat to ignite the gaseous mixture flowing through the nozzle.

Energization of the heater element 68 which, incidentally, may advantageously be a platinum wire of proper diameter, is automatically effected upon depression of trigger 15. To this end, trigger body 39 has pivotally fastened thereto one transverse end 80 of a U-shaped link which is biased counterclockwise by a link 81 which is biased counterclockwise by a link 82. This U-shaped link 81, together with its other transverse end 83, extends from trigger body 39 into a longitudinal groove 84 molded in bracket 32 in such manner that the link end 83 rides along the bottom 85 of the groove, being held thereagainst by spring 82. When trigger 15 is in the position shown, wherein tube 34 is pinched closed, link end 83 lies to the left of a pawl 86, pivotally mounted on bracket 32, and spring-biased counterclockwise. It may now be seen that when trigger 15 is depressed to permit gas to flow through tube 34, link end 83 rides up pawl 86 and ultimately engages the resilient switch arm 71, forcing this arm upwardly to engage its contact 72 with the other switch arm 73, thus to close the circuit to heater element 68. It should be noted, however, that before this circuit is closed,

tube 34 is released so that gas may flow there-through, thus to assure the presence of a gaseous mixture in the vicinity of the heater element when the circuit thereto is closed. As the trigger 15 is further depressed, link end 83 finally rides over the top of pawl 86, and the link spring 82 swings the link and accordingly the end 83 downwardly against the bottom 85 of groove 84, so that the switch contact 72 can move away from switch arm 73 and break the circuit to the heater element. It follows, of course, that when trigger 15 is released, link end 83 underrides pawl 86, swinging it clockwise as it rides thereunder to its position shown. Thus the heater element 68 is energized for a brief period of time only, sufficient, however, to ignite the gaseous mixture within the nozzle.

While a liquified gas such as I have hereinbefore described is usually free of foreign particles, I have nevertheless found it desirable to provide one or more filters between the gas container and the torch jet to preclude clogging of any of the gas passages within the torch, particularly in view of the fact that these passages are of small diameter of the order of .013 of an inch. Thus I have provided a filter wafer 87, which may be formed of a suitable ceramic material, and is interposed between fitting 24 and gland 28 at the entrance to the gas passageway within the torch. At the exit end of the gas passageway, I provide another filter wafer 88 which may be conveniently disposed within wall 36 of the casting at the base of the bore, which receives the nipple end of jet 37. Thus it may be seen that any foreign particles which might be forced from container 13 into the torch are stopped by filter 87, filter 88 precluding the passage of any foreign particle that might pass filter 87 into the minute orifice 38 of jet 37.

Referring now to Figure 2, wherein I have shown another form of my invention, the torch is generally indicated at 100, and, as in the case of torch 10, includes a body casting 101 having a neck 102 by which the torch is detachably fastened, as by a bayonet joint, generally indicated at 103, to container 13. Torch 100 also includes a handle or grip 104, within which is slidably mounted a trigger 105. A metering valve, generally indicated at 106, is disposed in the top of the torch casing to meter the flow of gas into a mixing chamber 107, wherein the gas is mixed with air, and from which the mixture flows for ignition by an igniting device, generally indicated at 108.

In the present instance, container 13 has brazed, or otherwise secured to the top thereof, a neck 109 in which are mounted pins 110 forming one element of the bayonet joint 103. Neck 109 also has disposed therein a stopper or seal 111 which is tightly secured in place by a flanged bushing 112 press-fitted into the top of neck 109. The entrant end of the neck is frusto-conical, as shown, so that when the flanged bushing 112 is pressed in over seal 111, the seal, which is formed of resilient, non-corrosive material, is compressed against the sloping sides of the neck's entrant end, so as to squeeze closed a small hole formed centrally through the seal.

This hole in seal 111 is adapted to receive a fitting 113 which is threadably disposed within casing 101, and has a downwardly extending generally conical needle 114, fitting 113 and needle 114 being generally similar to fitting 24 and needle 25 of Figure 1. Thus when container 13 is attached to the torch casing, the fitting

needle 114 enters the aforementioned hole in seal 111, spreading the hole sufficiently, and accordingly further compressing the material of the seal, so that a tight fit is afforded between the needle and the seal. As needle 114 is provided with an axial hole 115, communication is established with the interior of container 13.

The top of fitting 113 is sealed relative to the casing 101, preferably by a sealing ring 116, which conveniently forms a space, within which is disposed a filter 117, between fitting 113 and a small, transverse channel 118, formed in casing 101. This channel communicates with one end of a small pipe 119, the other end of which is secured to a resilient tube 120, the dotted line portions of the pipe and tube being disposed within a chamber (not shown) formed within casing 101. Tube 120 is threaded through a hole in the casing, with its upper end 120a being disposed within a chamber 121 formed in the upper portion of the casing. This end of the tube is secured to a small pipe 122, which is mounted in and extends through a hole in the casing and communicates with an opening 123 formed therein. This opening is threaded, as shown, to receive the nipple end of a jet 124, a filter 123a being disposed between the inner end of the jet and the bottom of the hole 123. Thus it may now be seen that gas may flow from container 13 through fitting hole 115 into chamber 118, thence through pipe 119 and tube 120 to pipe 122 and into jet 124, from which the gas may flow into mixing chamber 107, where it is mixed with primary air admitted through holes 56 and 58 in fitting 54 and sleeve 57.

Trigger 105 includes upper and lower slides 125 and 126, which are slidably disposed, respectively, in guides formed in the torch casing 101, the casing, of course, being suitably recessed as at 127 to receive the body of the trigger 105 when it is depressed. The trigger is constantly biased to the left of the drawing, as by a spring 128, one end of which bears against the torch handle 104 within a recess 129 formed therein, and the other end of which bears against the right-hand end of trigger portion 125. Trigger portion 125 also carries a transversely extending pin 130 which acts in the manner of plunger 47 (Figure 1) to pinch tube 120 closed when the trigger is in the position shown in Figure 2. Metering valve 106 includes a stem 131 which may be axially adjusted, as desired, with respect to tube 120, to control the size of the opening therein in the same manner, and for the same purpose as hereinbefore described with respect to tube 34 and valve stem 51 (Figure 1). Thus it follows that tube 120 may be held open or closed at will by manipulation of trigger 105, and the flow of gas through the tube may be metered or controlled as desired by manipulation of metering valve 106.

It might be well to note at this point that casing 101 comprises a pair of castings 101a and 101b (Figure 2a) which are so formed that, when secured together, they form the chambers hereinbefore referred to, as well as a channel in which tube 120 is disposed, thus adequately to support the tube against the pressure of pin 130 when trigger 105 is released, to pinch off the tube. Also, casting 101b is so formed as to receive a filler 101c, the inner vertical surface of which comprises a guide or supporting surface for trigger portion 125.

The ignition system for the torch shown in Figure 2 is of the hot spark type, wherein a suc-

cession of sparks is rapidly generated upon depression of trigger 105 by a condenser inductor system. Thus the handle 104 of the torch is hollowed to receive a dry cell 132 which comprises the power source for a circuit including leads 133 and 134, a condenser 135, an inductor 136, a switch generally indicated at 137, a spark plug or the like, generally indicated at 138, located in the end of nozzle 59 and spring clip 63. This spark plug or spark gap 138 is connected as by a beryllium resilient conductor 139 to the inductor 136 so that when the contacts of switch 137 are closed, in a manner that will be described, a spark is created to ignite the combustible air and gas mixture flowing through nozzle 59.

Switch 137 is successively and rapidly closed to cause the production of a rapid succession of sparks by plug 138 by the mechanism now to be described. Trigger slide portion 125 has secured thereto a pin 140 which forms an anchor for one end of a spring 141, the other end of which is fastened to a pin 142 secured to and projecting from a rack 143. This rack includes a shoulder 144 which normally rests against the end of a pawl 145 which is spring-biased into its holding position by a leaf spring 146. The underside of pawl 145 is provided with a cam surface 147 adapted to cooperate with a rise 148 formed in the left-hand end of trigger slide 125. It may now be seen that when trigger 105 is depressed, i. e. is drawn into handle 104, slide 125 is moved to the right, as viewed in Figure 2, against the pressure of spring 128. This, of course, tensions spring 141, but does not move rack 143, inasmuch as the rack is held stationary by pawl 145. However, when cam 147 of pawl 145 is engaged by rise 148 of trigger slide 125, pawl 145 is swung clockwise against spring 146 so that as trigger slide 125 continues to move to the right, the pawl is swung clear of shoulder 144 on rack 143. When this occurs, the rack is suddenly and rapidly jerked to the right. This abrupt and rapid movement of rack 143 rapidly closes and opens switch 137 to effect the repeated generation of sparks in the following manner.

Rack 143 meshes with pinion 149 which is secured to a pin 150 (see Figure 3) rotatably mounted in the torch housing. Keyed to this pin 150 is a clutch element 151 which rotates with the pin but is slidable axially thereof, this element 151 being constantly biased into engagement with complementary clutch formations in a ratchet wheel 152 by a leaf spring 153. This ratchet wheel is positioned to ratchet over and accordingly intermittently engage and depress a lug 154 carried by the outer end of the movable arm 137a of switch 137, thus to force this arm intermittently into engagement with the other arm 137b of the switch, to close the switch. It accordingly follows that when rack 143 is abruptly jerked to the right, as hereinbefore described, pinion 149, and accordingly pin 150, are rapidly rotated, and through the interengagement of the clutch elements described, the teeth on ratchet 152 are rapidly moved in a clockwise direction, as viewed in Figure 2, alternately to close and open switch 137 and accordingly effect the production of the succession of sparks referred to. Thus, reliance is not placed on the production of but a single spark to ignite the combustible gas mixture flowing through nozzle 59.

When trigger 105 is released, rack 143, of course, moves to the left and consequently ro-

tates pinion 149 counterclockwise. This, however, does not effect counterclockwise rotation of ratchet 152, as clutch element 151 merely overrides its complementary element carried in or on ratchet 152, thus precluding the production of sparks in plug 138 upon release of the torch trigger. To preclude any possibility of the production of sparks at this time, ratchet wheel 152 and lug 154 are so formed that the lug precludes counterclockwise rotation of the ratchet.

It may now be seen that in my improved torch, structural simplicity and operating efficiency are judiciously combined in a manner that attains the several objects hereinbefore set forth in a thoroughly practical manner.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth without departing from the scope thereof, it being understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative only and not in a limiting sense.

I claim:

1. In apparatus of the character described for burning a low boiling point fuel, the combination of, a container adapted to receive and hold a low boiling liquefied fuel which is maintained in liquid form in said container by reason of its own vapor pressure, a body member having fuel inlet and outlet openings the former of which is connected to said container, said container being outside of said body member, means forming a fuel passageway within said body member between said openings, a spring-biased member engageable with said fuel passageway means normally closing said passageway to block the flow of fuel therethrough, said body member including a hand grip, a manually operable member carried by the hand grip and associated with said body member and with said spring-biased member and operable to move said spring-biased member to open said fuel passageway so that fuel can flow therethrough, a carbureting device in communication with said outlet opening, means forming an air supply communicating with said carbureting device, means forming a mixing chamber on the discharge side of said carbureting device, means forming a burner chamber communicating with said mixing chamber, an igniting mechanism including an igniting member operatively associated with said burner chamber whereby the air-fuel mixture within the

burner chamber may be ignited, and means including a transmission system extending from said manually operable member to said igniting mechanism for actuating said mechanism, whereby when said manually operable member is operated said spring biased member is moved out of operative position with respect to said fuel passageway means to permit the latter to open and said igniting member is operated to ignite the air-fuel mixture, further movement of the said manually operable member interrupting the operation of the said igniting member.

2. Apparatus according to claim 1, wherein said transmission system includes a delay device operatively associated with said manually operable member and said igniting member whereby when said manually operable member is operated said passageway is first opened and thereafter said igniting member is operated to ignite the air-fuel mixture, further operation of the manually operable member interrupting the operation of the igniting member.

3. Apparatus according to claim 1, wherein said igniting mechanism includes an electrically energizable member, a switch and a battery, said energizable member being disposed in said burner chamber, said switch being disposed in said body member, and said battery being disposed in said hand grip.

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