

Oct. 28, 1958

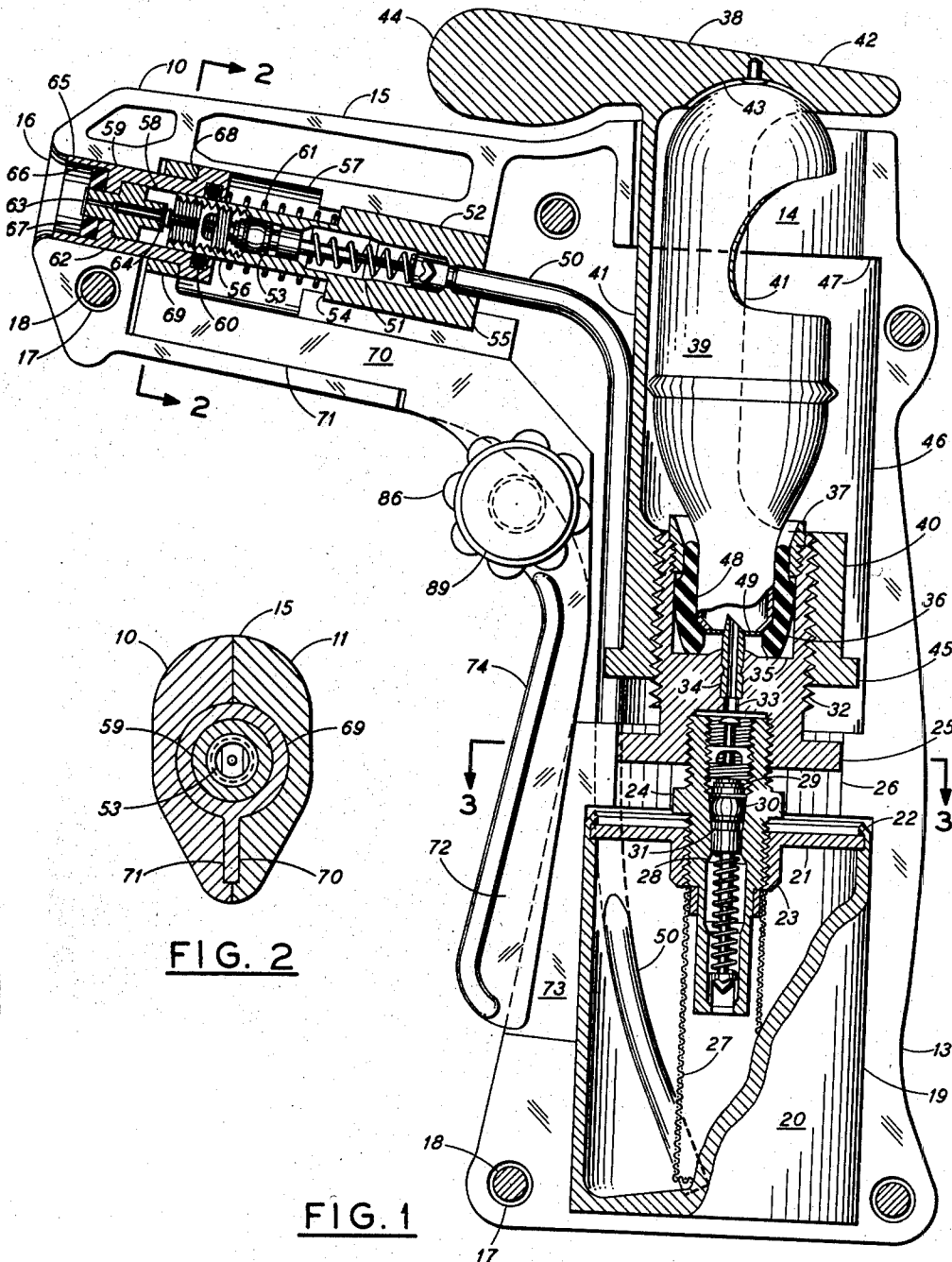
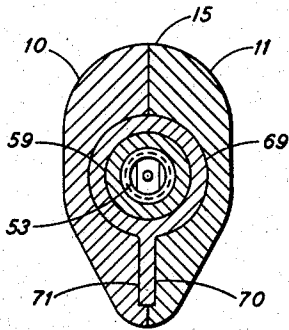
G. L. NEELY

2,857,900

STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed Nov. 25, 1955

2 Sheets-Sheet 1



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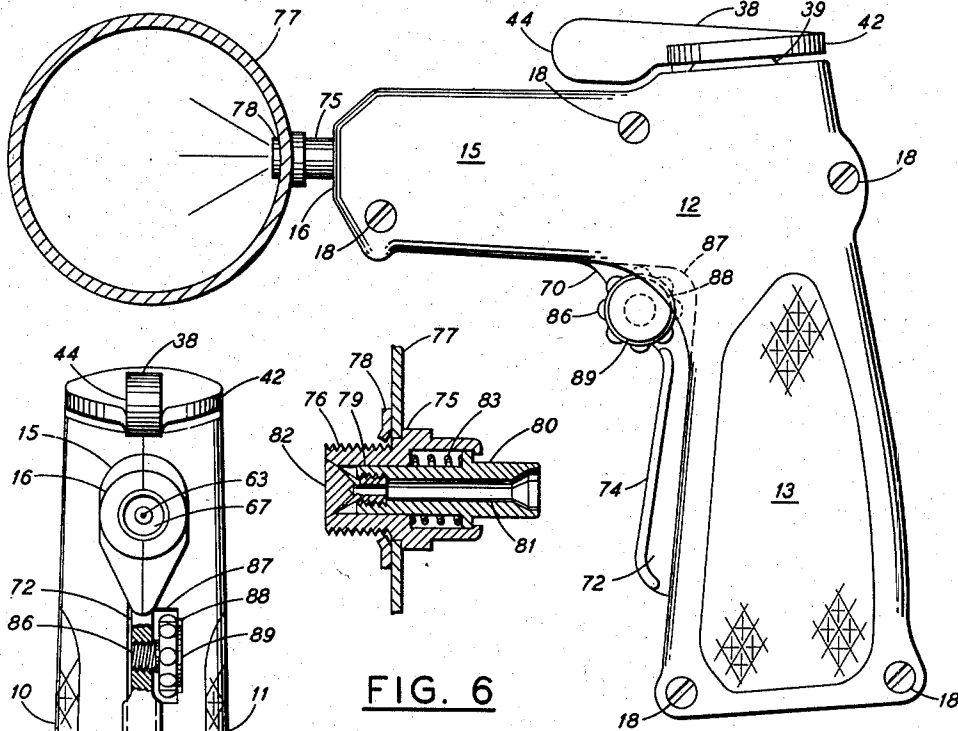


FIG. 5

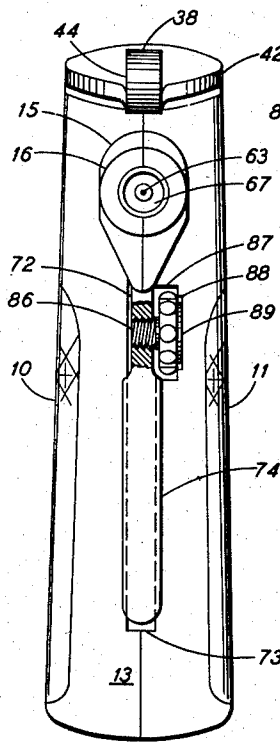


FIG. 4

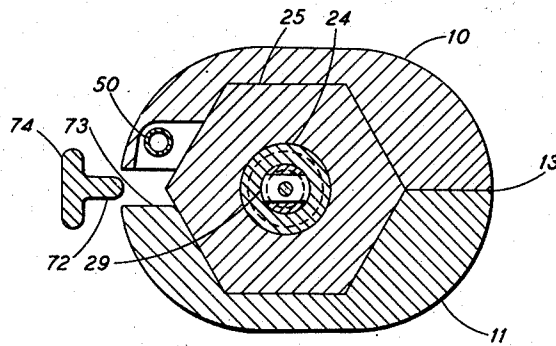


FIG. 3

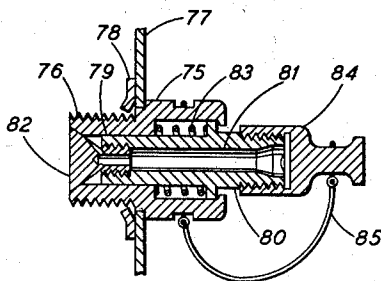


FIG. 7

INVENTOR
GEORGE L. NEELY
BY *[Signature]*
Walter G. Miller
ATTORNEYS

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2,857,900

STARTING DEVICE FOR INTERNAL
COMBUSTION ENGINES

George L. Neely, Berkeley, Calif., assignor, by mesne assignments, to California Research Corporation, San Francisco, Calif., a corporation of Delaware

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13 Claims. (Cl. 123—187.5)

This invention relates to apparatus to aid in the starting of internal combustion engines, particularly at low temperatures, and particularly refers to a portable device which is adapted to receive and retain one or more unit charges of flammable gas-pressurized liquid fuel and controllably release or inject it into the intake system of such an engine during the starting period.

This application is a continuation-in-part of my co-pending application Serial No. 319,219, filed November 7, 1952, entitled "Hand-Held Discharger," which issued January 10, 1956, as United States Patent No. 2,730,093. It is particularly adapted to use the cartridge unit described and claimed in my U. S. Patent No. 2,708,922, issued May 24, 1955, entitled "Means for Starting Internal Combustion Engines." That cartridge may be characterized as a sealed metal bulb or container for a charge of priming fuel consisting essentially of diethyl ether and maintained under superatmospheric pressure by a flammable gas, for example, methane. One end of the cartridge is sealed by a thin closure which may be perforated to release the pressurized charge into a sealed chamber in this device, wherein it is retained under pressure for use by arrangements and structures which will be described below.

The "hand-held" unit of my Patent No. 2,730,093, identified above, is characterized by a cylindrical housing containing a sealed chamber and cartridge receiving and perforating means communicating with the chamber to discharge one or more unit charges of flammable gas-pressurized fuel into the chamber. A valved conduit leads from the chamber to a fixed nozzle from which a spray of the fuel may be released into the air intake of the engine to be started just prior to and, if desired, during its cranking or starting period.

This improvement resides primarily in the structural features of the housing, in the selectively operable valve-actuating means to control the ultimate release of priming fuel, and in the arrangement and cooperation of fittings or other means for introducing the fuel directly and without leakage or loss into the intake system of the internal combustion engine.

It is an object of this invention to provide an engine starting device which is readily portable, adapted to be operated with one hand, and which may also be actuated by alternative means depending on the conditions of use.

Another object is to provide a device which is adapted to rapid and economical production, as well as assembly and maintenance, and in which the several parts are securely retained in their respective positions under conditions of charging and use.

Another object is to provide a starting device of this character which is adapted to cooperate with a standardized fitting for the intake systems of a variety of types and sizes of both spark and compression ignition internal combustion engines.

Another object is to provide a starting device which

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may either be sealed to the intake system of the engine, or which may be spaced, for example, from the air intake or air filter to admit controlled quantity of priming fuel thereto during an interval of time dependent upon the conditions of starting and the amount of pressurized fuel available in the storage or expansion chamber of the unit.

These and other objects and advantages of the invention will be further apparent from the following description of a preferred embodiment, taken in connection with the accompanying drawings, which form a part of this specification.

In the drawings,

Figure 1 is an enlarged longitudinal and part sectional view illustrating one-half of the split housing with the internal mechanism in place therein.

Figure 2 is a transverse sectional view of the barrel of the device taken on line II—II of Figure 1.

Figure 3 is a transverse sectional view of the handle of the device taken on line III—III of Figure 1.

Figure 4 is a vertical elevational view of the device from the muzzle end of the barrel and showing in partial section a form of locking or safety device.

Figure 5 is a side elevational view of the device showing it in place to engage directly an inlet fitting communicating with an engine intake system.

Figure 6 is a longitudinal sectional view, to an enlarged scale, of a preferred type of inlet fitting to cooperate with the valve release mechanism of the device.

Figure 7 is a longitudinal sectional view of a fitting of the type of Figure 6 with the addition of a closure cap and retaining means for the cap.

Referring to the drawings and particularly to Figures 1, 2, and 3, reference numeral 10 designates one-half, and reference numeral 11 designates the opposite or mating half, of a longitudinally split housing which may be generally designated 12. Desirably the halves of the housing are die-castings or are molded of light metal alloy or suitable plastic, and are appropriately recessed to receive the internal mechanism to be described. The housing 12 consists essentially of a handle 13 having a circular opening 14 at its upper end and a barrel 15 extending substantially laterally from the upper end and terminating in a muzzle 16 so that the outer configuration (Figure 5) somewhat resembles that of a semi-automatic pistol. The two mating halves 10 and 11 of the housing 12 are provided with aligned transverse holes 17 appropriately threaded so that the halves may be secured together by screws 18.

In the base of handle 13 is a cylindrical recess 19 in which fits a chamber 20 closed at the top by a disc 21 secured by crimping and welding or silver-soldering at 22 to retain safely a pressure upwardly of 100 lbs. per square inch. A threaded connection 23 is adapted to receive a valve housing 24, to the top of which is threaded a polygonal, usually hexagonal, nut 25, the latter being secured against rotation in housing 12 by a closely fitting polygonal recess 26. From the lower end of valve housing 24 a fine-mesh strainer or screen 27 extends downwardly and serves to receive and retain particles of any contaminating material such as scale or rust that would otherwise reach the interior of chamber 20. Within the bore 28 of valve housing 24 is a conventional pneumatic tire valve 29, desirably with a metal seal 30 for the bore 28 and an annular nylon or other suitable plastic seal 31 to retain pressure within the chamber 20. The construction of such standard and commercially available valves is so well known as to need no further description here, and another form of pressure-responsive valve could equally well be substituted.

Polygonal nut 25 is provided with an externally threaded boss 32 through which extends an axial bore 33

within which is secured a hardened alloy steel hollow perforating member or needle 34. The upper end of boss 32 is recessed as at 35 to receive an annular plastic cartridge sealing ring 36, desirably of Buna "N" plastic, which is removably retained by a threaded sleeve 37.

A manually actuated holder 38 for receiving a charged cartridge 39 of flammable gas-pressurized liquid fuel, such as that of my U. S. Patent No. 2,708,922, is illustrated in the upper portion of handle 13. This consists essentially of a lower threaded ring portion 40 adapted to be received on the threaded boss 32, a semi-cylindrical intermediate portion 41, and a head portion 42 having a recess 43 for engaging the hemispherical bottom of a cartridge 39. To facilitate screwing holder 38 onto and off of boss 32, a transverse wing 44 extends from one side of the head portion. Desirably, the ring portion at the lower end of cartridge holder 38 is provided with a shoulder 45, which will move freely throughout recess 46 in handle 13, but will be retained by face 47 at the inner end of opening 14, so that the holder cannot be removed completely or lost from the housing 12 while the latter is in assembled or operative condition.

By unscrewing holder 38 entirely from boss 32 it may be lifted partially out of handle 13 so that the recess at the side of semi-cylindrical portion 41 will be accessible for the insertion of a filled or charged cartridge 39. Sliding holder 38 downwardly into the handle will permit the ring portion 40 to be screwed onto boss 32, and continued rotation will first engage the neck 48 of the cartridge with the seal 36 and next engage the closure diaphragm 49 with perforating needle 34. When perforation is completed, the pressurized fuel contents of the cartridge will flow downwardly through bore 24 and valve 29 into the chamber 20. After pressure equilibrium is established and the emptied cartridge is removed, pressure-actuated valve 29 will close and retain the charge of priming fuel in the storage chamber 20. Preferably, the volume of the chamber 20 is so proportioned that several cartridges may be discharged successively into it and still leave a free gas space above the liquid therein.

To eject priming fuel from chamber 20 under the pressure therein, a small tube or conduit 50 leads from a point inside of the chamber and near the bottom through the wall thereof and upwardly inside of handle 13 to the inner end of barrel 15 where it terminates in a bore 51 in a valve housing 52. Here again, a conventional pneumatic tire valve 53, similar to valve 29, is threadedly retained in bore 51 to normally prevent release of pressurized fuel from conduit or tube 50 and chamber 20. Desirably, valve housing 52 is polygonal, generally hexagonal in cross section at its rearmost end, so that it will be securely retained in a correspondingly shaped recess in barrel 15 between shoulders 54 and 55 when housing 12 is assembled. A cylindrical extension 56 of housing 52 projects axially into a recess 57 in barrel 15 and is closely fitted inside of bore 58 in a cylindrical sleeve 59, the bore being sealed by an O ring 60 of plastic such as Buna "N" synthetic rubber. Sleeve 59 is normally biased away from valve housing 52 by resilient means such as a helical spring 61. Within bore 58 is a cylindrical sliding plug member 62 having a small axial bore 63, the inner end being slotted transversely as at 64, so that when that end contacts the stem of valve 53 to force it from its seat and release pressurized fuel from conduit 50 and chamber 20, the fluid will pass through bore 62 and emerge in a narrow stream from muzzle 16 of barrel 15. Sleeve 59 projects outwardly along a cylindrical bore 65 in barrel 15, and desirably terminates in a recess 66, in the face of which is an annular resilient or plastic sealing member 67 surrounding the outer end of member 62 and axial bore 63.

The rearmost end of cylindrical sleeve 59 is enlarged at 68 to form a shoulder against which bears a ring 69 mounted at the outer end of an L-shaped flat web member 70 which is slidably mounted in a longitudinal

slot 71 formed between halves 10 and 11 of the lower part of barrel portion 15 of housing 12 (Figures 1 and 2) to form a valve-actuating means. The downwardly projecting portion 72 of web member 70 is guided in slot 73 of handle 13 and is desirably formed with a flanged face or forward portion 74 to provide a movable hand grip. By this arrangement, the user of the device holds it in one hand and by squeezing the hand grip just described, moves the web member 70 rearwardly in its slot 71, causing ring 69 to slide cylindrical sleeve 59 and plug 62 to open valve 53 against the biasing action of the pressurized fluid and the valve spring, as well as spring 61, and thereby to discharge fluid from the device. Release of the hand pressure permits the parts to return to their former position under the biasing force of the pressurized fluid, the spring 61, and the spring of valve 53, closing the valve and shutting off the flow of pressurized fluid from bore 63.

Under some conditions of use, it is desirable temporarily to confine the stream of pressurized priming fuel from the muzzle of the device and to convey it directly to the intake system of the internal combustion engine. To this end, a fitting is provided (Figure 6) which may either be mounted directly in the wall of a part of the intake system (Figure 5) or may be connected to it by a short length of small conduit, if direct access is not convenient.

Referring now to Figure 6, the fitting of this example consists of a body 75 having a threaded portion 76 adapted to be secured in the wall 77 of a part of the engine intake system, for example, the air cleaner, by a lock nut 78. An axial bore 79 receives a sliding sleeve 80, also provided with a substantially unobstructed longitudinal passage 81. At the inner end of passage 81 there is provided a tapered plug valve member 82, fitting a correspondingly tapered seat at the inner end of body 75, so that a stream or jet of fluid traversing passage 81 will be distributed in a conical spray in the engine intake system (Figure 5) to which the fitting is secured. A spring 83 normally biases the sleeve and valve to the closed position shown. This spring is desirably proportioned to be weaker than the combined strengths of spring 61 in the barrel 15 and the spring of valve 53, so that, when the muzzle of the device is placed against the fitting just described (Figure 5) and is pushed against the fitting, the end of the fitting will first seat on the face of seal member 67, and then the spring 83 will be compressed to open the valve 82 in the fitting. Further pressure of the device against the fitting will move the sliding cylindrical sleeve 59 in the barrel 15 against the stronger springs in the barrel to open the valve 53 and release pressurized fluid from tube 50 and chamber 20.

Removal of the device from the fitting will close the valves in reverse order: first the valve 61 in the barrel 15, shutting off the fluid flow, and next the valve 83 in the fitting, giving opportunity for the small quantity of fluid remaining in the passage 81 of the latter to be drawn into the intake system of the engine. It will be obvious that this mode of operation takes place independently of the hand grip described above, due to the relation of the ring member 69 and the shoulder 68 on cylindrical sleeve 59.

Under certain circumstances, to prevent foreign substances such as dust or moisture from entering passage 81 in the fitting just described, it may be desirable to thread the outer end of sleeve 80 (Figure 7) and provide a threaded cap 84 with a light wire bail or retainer 85, loosely securing the cap to the body 75, so that it may be removed or replaced, but not completely detached from the fitting. Alternatively, a simple spring-closed hood may be hinged to the sleeve 80 so as to be movable upwardly by the end of barrel 15 to expose the open end of the sleeve, after which the muzzle may be engaged with the exposed end of the sleeve.

To prevent undesired or accidental actuation of the

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valve 53 by a force that may urge the hand grip 72 of web member 70 to open that valve, a selective locking or safety means may be provided. In this example (Figures 1, 5, and 6) it consists of a knurled or knobbed screw 86 threaded into web member 70 above the flanged face 74. A slot 87 in one face of half 11 of handle 13 receives the entire head of the screw when it is screwed in to be seated against the web so that it will not interfere with its sliding motion. A counterbore 88 for slot 87 is adapted to receive a cylindrical boss 89 on the head screw 86 when it is in its outermost position shown, preventing rearward motion of the hand grip and web member 70.

From the foregoing description of this example of the invention, it will be apparent that the device is capable of operation as an engine starting aid to introduce a priming fuel into the intake system of an internal combustion engine by squeezing the hand grip and ejecting a fine stream or jet of the fluid to be drawn with air into the intake system, or in cooperation with a fitting mounted upon or communicating with that system. In the latter case, it is not necessary to manipulate the hand grip, but merely to engage the muzzle of the device with the fitting and push against it, so that the desired quantity of fluid will be injected into the intake system during the starting period.

Although a specific embodiment has been described and illustrated, it is apparent that numerous changes and modifications could be made without departing from the invention, and all such changes that come within the scope of the appended claims are considered to be embraced thereby.

I claim:

1. In a portable dispenser for engine starting fuel, including a sealed chamber provided with means to receive and retain a charge of flammable gas-pressurized liquid fuel; a housing surrounding said chamber and comprising a handle and a barrel projecting substantially laterally from one end of said handle and terminating in a muzzle, a valve in said barrel spaced inwardly from said muzzle, a reciprocable valve actuator mounted in said barrel adjacent to said muzzle and provided with an axial bore, a conduit connecting said valve and said chamber and means for moving said valve actuator to release fuel from said muzzle.

2. A portable dispenser according to claim 1, with the addition of a movable hand grip on said handle connected to said valve actuator.

3. A portable dispenser according to claim 1, with the addition of movable hand grip for said valve actuator, and means for selectively locking said hand grip, and in which said reciprocable valve actuator is movable to open said valve independently of said hand grip.

4. Apparatus for introducing a charge of fuel into the intake system of an internal combustion engine, comprising a dispenser having a sealed chamber provided with means to receive and retain a charge of flammable gas-pressurized liquid fuel, a housing surrounding said chamber and comprising a handle and a barrel projecting substantially laterally from one end of said handle, said barrel terminating in a muzzle, means forming a fluid conduit connecting said chamber and said muzzle, an annular seal in the face of said muzzle, a valve in said conduit and means for opening said valve while said muzzle face is sealed to a liquid receiving fitting communicating with said engine intake system.

5. Apparatus according to claim 4 in which said valve opening means comprises a movable hand grip on said handle.

6. Apparatus according to claim 4 in which said valve opening means comprises a reciprocable member in said barrel.

7. Apparatus according to claim 4, in which said valve opening means comprises a movable hand grip on said

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handle, said valve opening means being selectively reciprocable independently of said hand grip.

8. Apparatus according to claim 4, in which said valve opening means comprises a movable hand grip on said handle and means for locking said hand grip in its extended position.

9. A system for introducing a charge of fuel into the intake system of an internal combustion engine, comprising a dispenser having a sealed chamber provided with means to receive and retain a charge of flammable gas-pressurized liquid fuel, a housing surrounding said chamber and comprising a handle and a barrel projecting substantially laterally from one end of said handle, said barrel terminating in a muzzle, means forming a fluid conduit connecting said chamber and said muzzle, a valve in said conduit adjacent to said muzzle, actuating means for said valve reciprocally mounted in said barrel adjacent to said muzzle, a liquid-receiving fitting having a longitudinal passage therethrough communicating with the intake system of said engine, a valve in said passage and reciprocable means for actuating said valve, said first and second named valve actuating means being differently resiliently biased to closed position so that when the muzzle of said barrel is pushed against said fitting, said first and second-named actuating means engage to open said valves sequentially in the reverse of the order named above, to admit liquid fuel into said engine intake system.

10. Apparatus for introducing a charge of fuel into the intake system of an internal combustion engine, comprising a dispenser having a sealed chamber provided with means to receive and retain a charge of flammable gas-pressurized liquid fuel, a housing surrounding said chamber and comprising a handle and a barrel projecting substantially laterally from one end of said handle, said barrel terminating in a muzzle, means forming a fluid conduit connecting said chamber and said muzzle, a valve in said conduit, a movable member in said housing, and means connecting said movable member and said valve to open and close the latter.

11. Apparatus according to claim 10, in which said movable member is in said handle and with the addition of reciprocable means in said muzzle for actuating said valve independently of said movable member.

12. Apparatus for introducing a charge of fuel into the intake system of an internal combustion engine, comprising a dispenser having a sealed chamber provided with means to receive and retain a charge of flammable gas-pressurized liquid fuel, a valved outlet for said chamber terminating in a muzzle, and reciprocating means in said muzzle for actuating said valved outlet when said muzzle is pressed against a liquid receiving fitting communicating with said engine intake system.

13. A fitting for an engine intake system or the like to admit a fuel charge thereto from a liquid fuel dispenser having a reciprocable fuel release muzzle, comprising a body having a longitudinal passage therethrough, a sleeve slidable in said passage and terminating at its inner end in a valve for closing said passage, resilient means for biasing said sleeve to close said valve, the outer end of said sleeve terminating in an annular seat adapted to engage said dispenser muzzle and to move said sleeve to open said valve and to release fuel from said muzzle into said sleeve, whereby said fuel charge is admitted to said intake system.

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