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G. A. BELL

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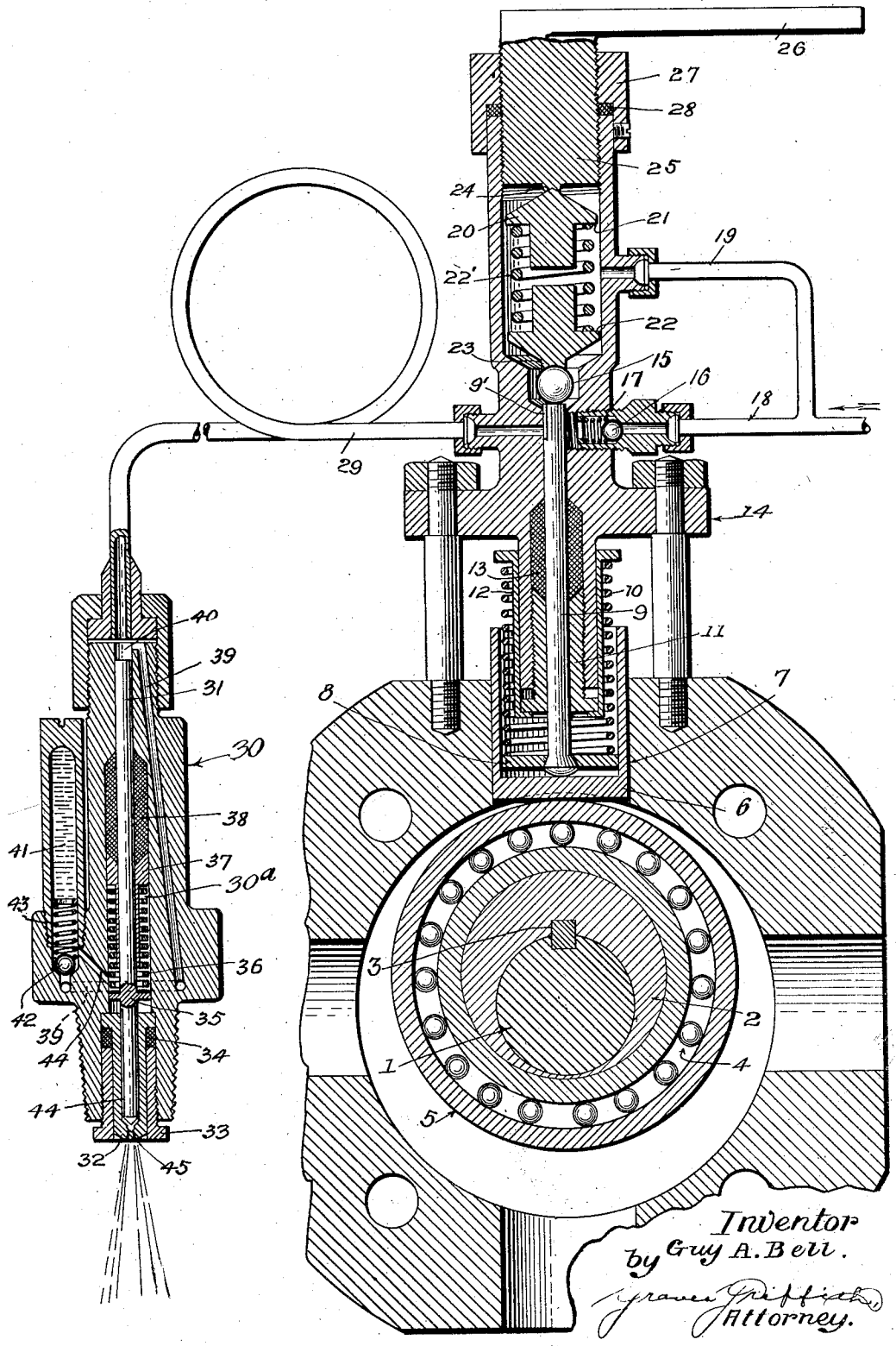

Inventor
by Guy A. Bell.
Grover Griffith
Attorney.

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GUY A. BELL, OF SAN FRANCISCO, CALIFORNIA.

HIGH-PRESSURE METERED FUEL EJECTOR FOR INTERNAL-COMBUSTION ENGINES.

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The present invention relates to improvements in fuel-injectors for that type of internal combustion engines in which an air charge is first admitted to the engine cylinder and there compressed to a degree sufficient for the generation of a temperature high enough for the ignition of a fuel charge, afterward injected thereinto under high pressure.

A principal object of the invention is the provision of means for supplying, under pressure of high and uniformally maximum character, a measure of fuel and withdrawing therefrom while under this maximum pressure a metered portion to an accumulator chamber to be therein trapped awaiting a lowered pressure without for its injection into the combustion chamber.

Other objects sought to be attained are: The elimination of working parts for the injection of the fuel; a thoroughly atomized fuel at the instant of injection; a fuel heated through compressive action prior to injection; and a fuel injection automatically timed.

The invention comprises a fuel pump of the plunger type driven from an eccentric on the crank-shaft and communicating with a fuel-supply reservoir under pressure by a valve-controlled passage, and an ejector comprising a valve-controlled receiving chamber, a valve-controlled accumulator chamber, and means of communication respectively with the fuel pump and the fuel-supply reservoir.

The accompanying drawing, forming a part of this specification, represents a vertical sectional view of a preferred embodiment of my invention, in which are shown the internal construction of both pump and injector, the line of communication therebetween, and the eccentric drive for the pump.

Referring to the drawing with greater particularity, 1 indicates the crank-shaft to which is secured an eccentric 2 by means of a key 3, 4 a ball race, 5 peripheral surface of eccentric 2 bearing against and operating to lift the valve-lift 6 adapted for movement in guide 7, 8 spring-seat carried by lower end of plunger 9, 9′ fuel-return passage for pressure relief, 10 spring operaing to keep valve-lift 6 in contact with the peripheral surface 5 of the eccentric 2, 11 packing gland nut, 12 telescopic shell serving as a means for setting-up packing 13 and affording upper seat for spring 10, 14 pump housing, 15 pressure-governing valve, 16 ball-check held on seat by spring 17, 18 line from fuel reservoir to pump, 19 by-pass from pump to fuel line 18 through which pressure-relief is conducted, 20 detached, divided and spaced stem of valve 15, 21 and 22 spring-seats borne by respective sections of stem 20, 23 and 24 fashioned axial-extremity supports for stem 20, 25 means for the adjustment of pressure relative to stem 20, 26 lever wherethrough means 25 is turned, 27 packing-gland nut, 28 packing, 29 line connecting pump and ejector 30 ejector housing, 30ª auxiliary chamber in ejector housing, 31 needle-valve stem resting on seat at lower end of tip 32, this tip being held in place by packing-gland nut 33, 34 packing, 35 shoulder borne by stem 31 and serving for lower seat for spring 36, 37 packing-ring, 38 packing, 39 by-pass leading from fuel-receiving chamber 40 to accumulator chamber 41, 42 accumulator check-valve held on seat by spring 43, 44 ejaculatory duct leading from the accumulator chamber 41 to and along the side of the lower end of the needle-valve stem 31 to and communicating with the radially disposed nozzle-ducts 45.

In operation, assuming as shown the pump at the limit of its out-stroke, the plunger 9 will have lifted valve 15 from its seat, bringing the fuel-return passage 9′ borne by the plunger 9 as a relief conduit into registration with the mouth of the line 29 and also in communication with the by-pass 19, thereby opening a line of lowered pressure between the injector and the fuel reservoir through which pressure may be withdrawn from the interior of the injector. Following this, the action of eccentric 2, in conjunction with that the spring 10 upon the valve-lift 6, cause a return-movement of plunger 9, permitting the seating of valve 15 through the pressure of spring 22′ exerted upon the stem 20, the which actions contributing to produce a vacuum in the fuel line adjacent the upper end of plunger 9, the "suction" of which draws in through valve 16 a measure of fuel to be afterward subjected to compressive force, upon the return stroke of plunger 9, and driven into the receiving chamber 40 and thereafter, upon an increase of pressure, into the accumulator chamber 41, where it is trapped and retained until a condition or relieved pressure has been again reached, when it is ejected through the duct

44 to the nozzle ducts 45 and therethrough thoroughly atomized, to the combustion chamber.

It is to be observed that the fuel-pressure of receiving-chamber 40 increased by that of the tension of spring 36 is greater in one direction upon the needle-valve stem 31, than is that of the trapped fuel charge in the opposite direction, this serving to seat valve and seal perfectly against fuel leakage through nozzle 45 until release of back pressure.

Having thus described my invention, I claim, and desire to secure by Letters Patent:

1. In a device of the character described, the combination with a fuel pump, of means for trapping a metered fuel charge under pressure as received from a fuel pump, said means comprising an ejector having an auxiliary pressure chamber and a resilient-walled, valve-controlled accumulator chamber, a receiving chamber bearing a spring-controlled valve-stem, a by-pass port connecting said accumulator chamber with said receiving chamber, an ejaculatory duct leading from said chamber accumulator chamber to said auxiliary chamber, a compressible elastic packing member in said auxiliary chamber surrounding said valve stem said resilient-walled accumulator chamber, said auxiliary chamber and said packing member co-acting to accomplish the ejectment of said metered fuel charge from the ejector nozzle upon the lowering of pressure without said accumulator chamber and the shutting off of the fuel supply.

2. In a device of the character described, the combination with a fuel pump, of a means for tapping a metered fuel charge under pressure as received from said fuel pump, said means comprising an ejector having a nozzle and an auxiliary pressure chamber and a resilient-walled valve-controlled accumulator chamber, a receiving chamber bearing a spring-controlled valve-stem, a by-pass port connecting said accumulator chamber with said receiving chamber, an ejaculatory duct leading from said accumulator chamber to said auxiliary chamber, a compressible elastic packing member in said auxiliary chamber surrounding said valve-stem, said resilient-walled accumulator chamber, said auxiliary chamber and said elastic packing member co-acting, upon release of pressure in said receiving chamber, above said valve-stem, to accomplish the ejectment of said metered fuel charge, through said ejector nozzle, upon the lowering of pressure without said accumulator chamber and the shutting off of the fuel supply.

GUY A. BELL.