

No. 706,050.

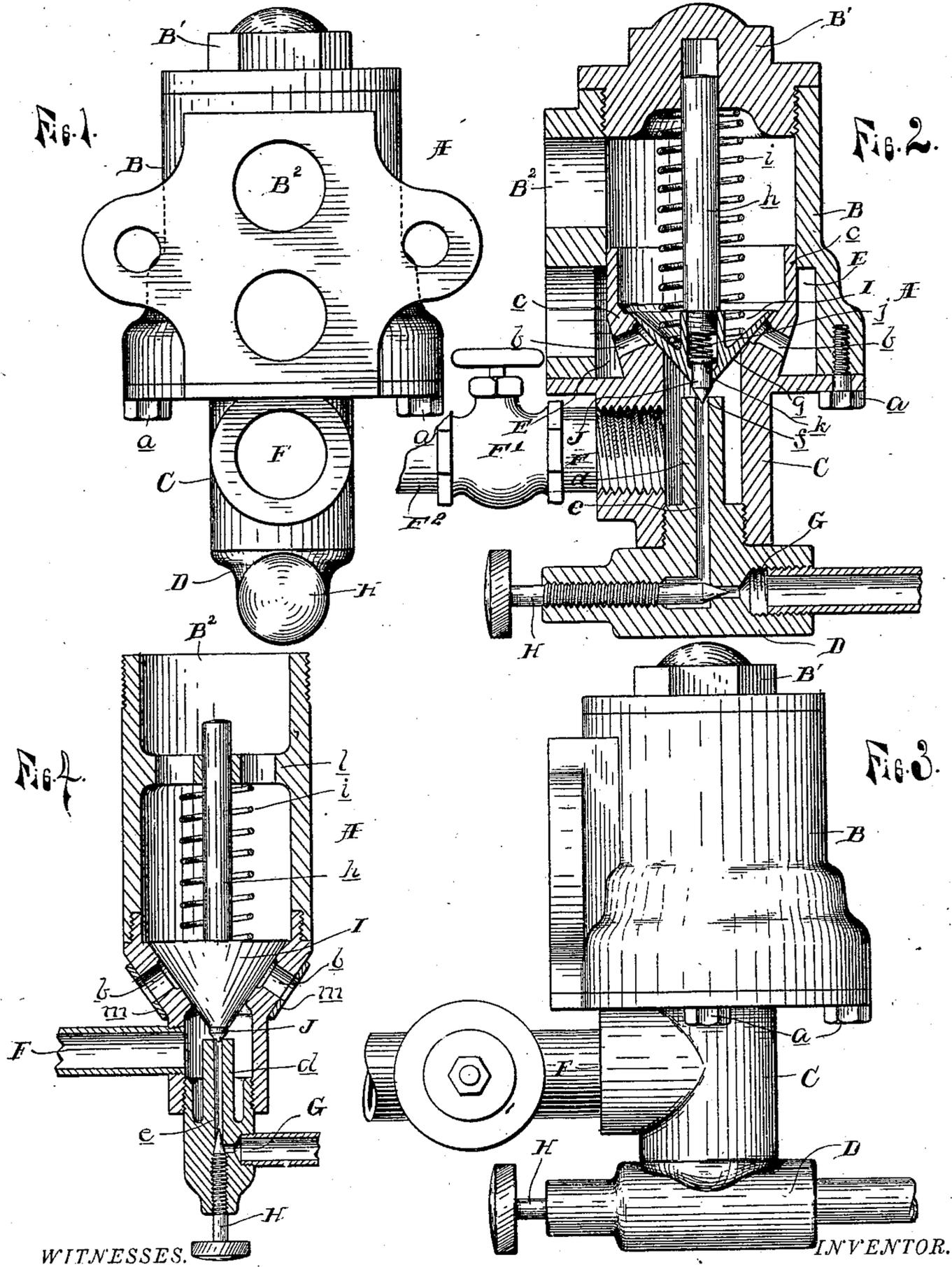
Patented Aug. 5, 1902.

R. E. HARDY.

MIXING VALVE FOR GAS OR GASOLENE ENGINES.

(Application filed May 6, 1901.)

(No Model.)



WITNESSES.

Lewis C. Flanders  
May Ford

INVENTOR.

By Roy E. Hardy  
*[Signature]*  
Attorneys.

# UNITED STATES PATENT OFFICE.

ROY E. HARDY, OF DETROIT, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO HARDY MOTOR WORKS, LIMITED, OF PORT HURON, MICHIGAN, A CORPORATION OF MICHIGAN.

## MIXING-VALVE FOR GAS OR GASOLENE ENGINES.

SPECIFICATION forming part of Letters Patent No. 706,050, dated August 5, 1902.

Application filed May 6, 1901. Serial No. 58,864. (No model.)

*To all whom it may concern:*

Be it known that I, ROY E. HARDY, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Mixing-Valves for Gas or Gasolene Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to new and useful improvements in mixing-valves, and more particularly to that class of mixing-valves designed for use in connection with gas or gasolene engines to supply the combustible mixture for the charge, and has for its object to make a valve adapted to control both the gas or gasolene ports and the air-ports at one and the same time, thus dispensing with the use of separate valves for this purpose; and to this end my invention consists of a single suction-valve adapted to control the admission of either gas and air or gasolene and air to the mixing-chamber; and the invention further consists of a spring-backed secondary valve carried by the suction-valve and adapted to control the gasolene-inlet port free to have a limited vertical movement irrespective of the movement of the main valve, thereby insuring the perfect seating of the same and obviating the battering of the gasolene-valve seat by impact of heavy parts.

The invention consists, further, in the construction, arrangement, and combination of parts, all as more fully hereinafter described, and shown in the accompanying drawings, in which—

Figure 1 is a rear elevation of my mixing-valve detached from the engine. Fig. 2 is a vertical central section through the valve. Fig. 3 is a side elevation of the same. Fig. 4 shows a modified construction of valve.

As shown in the drawings, A is the valve-casing, formed of the parts B C, united together by means of the tap-bolts *a* and the T-shaped part D, having a screw-thread engagement with the part C, whereby I may adjust the same vertically. The part B is provided with the screw-threaded cap B' and the passage B<sup>2</sup>, communicating with the cylinder of the engine, and is also provided with the valve-controlled circular air-inlet passage E, formed conjointly with the part C.

*b* represents a series of air-ports formed in the upward extension *c* of the part C, and F is the gas-inlet, opening controlled by means of a suitable valve F' in the gas-supply pipe F<sup>2</sup>.

The part D is provided with the gasolene-inlet opening G, connecting with the source of supply, controlled by means of a suitable needle-valve H, and has the upward extension *d*, formed with the gasolene-passage *e* and the seat *f* at its upper end.

I is the main valve, made with a tapering head *g* and the stem *h*, guided at its upper end in the cap B', and *i* is a spring sleeved on said stem and adapted to hold said valve to its seat, except when drawing in a charge of the combustible mixture, at which time the valve will be raised from its seat against the action of the spring by the suction of the piston in drawing in a charge.

J is a secondary valve mounted within the head of the main valve and ground to a conical point of slightly-different angle than the main valve and adapted to seat against the upper end of the gasolene-passage *e* to control the same, a suitable spring *j* of considerably less power than the main spring *i* acting against the rear end of the valve to hold it in its extended position, a collar *k* being formed on the rear end of said valve to prevent the same from being projected too far, and the stem of the main valve is preferably made in two parts, as shown in Fig. 2, for purpose of convenient access thereto.

It will thus be seen that by having the point of the valve controlling the gasolene-port movable it will insure the perfect seating of the same irrespective of any inequalities in the main valve, or, vice versa, as the weight of the main valve is sufficient to compress the spring *j* and allow it to seat firmly, which would require the finest of workmanship if all were made in one piece and the valve-seats had to be formed absolutely true, while with my construction by reason of the valves having a slight give and take between them and the gasolene-valve seat being adjustable in relation thereto and to the other valve-seats this nicety of workmanship is not required.

In the modification in Fig. 4 I have shown the needle-valve H and the passage B<sup>2</sup> as being in the same vertical line, the valve-stem

being guided in a perforated web *l* in the valve-casing, and *m* is an annular ring adapted to fit over the air-ports and provided with an equal number of perforations, whereby the amount of air to be admitted can be regulated by slightly turning the same as desired.

Having thus fully described my invention, it is intended to operate as follows: Supposing the gas to be turned off by means of a suitable valve (not shown) and the gasolene-valve *H* opened, the engine-piston then being made to perform its suction-stroke, by turning the fly-wheel by hand, will lift the main valve from its seat, at the same time lifting the secondary valve and draw in a new charge of gasolene and air, when the valve will be returned to its seat and the operation repeated. Should it be desired to use gas instead of gasolene, the gasolene-valve is turned off and the gas turned on and the operation repeated as before.

It will thus be seen that with but the use of a single valve I am enabled to run any explosive-engine equipped with my valve with either kind of fuel by simply turning on the one and off the other as desired.

What I claim as my invention is—

1. In a mixing-valve for gas or gasolene engines, the combination with a casing, of a mixing-chamber for either gas and air or gasolene and air having a seat, a valve for the seat, air-inlet ports controlled by said valve, a valve-controlled gas-inlet opening below the seat, a valve-controlled gasolene-inlet opening projecting in proximity to the main valve and having a seat formed at its upper end, and a secondary valve carried by said valve adapted to seat against said inlet-opening.

2. In a mixing-valve for gas or gasolene engines, the combination with a casing, formed with a seat, of a valve for the seat mounted in the casing, a gas-inlet passage formed in the casing below the seat, and air-inlet ports leading into the seat, a gasolene-inlet port leading into proximity to the main valve, and a secondary valve carried by the main valve adapted to control said port.

3. In a mixing-valve for gas or gasolene engines, the combination with a casing, a valve and valve-seat in the casing, of a series of air-inlet ports leading into the seat, a gas-inlet formed in the casing below the seat, a valve-controlled gasolene-inlet passage extending into proximity to the valve and formed with a seat, a spring-backed secondary valve mounted in the main valve adapted to control said passage, said valve being free to have a limited movement irrespective of the main valve.

4. In a mixing-valve for gas or gasolene engines, the combination with a casing, of a main valve, and corresponding valve-seat formed in the casing, an air-inlet passage surrounding the valve-seat, and ports leading into the valve-seat controlled by said valve, a gas-inlet below said valve, and a valve-controlled gasolene-inlet extending into proximity to said valve, a valve-seat formed in the end of

said gasolene-inlet, and a secondary valve carried by the main valve adapted to seat against said inlet.

5. In a mixing-valve for gas or gasolene engines, the combination with a casing formed with a mixing-chamber in communication with the cylinder, air, gas, and gasolene passages in communication with said chamber, a valve-seat formed in said casing, and a valve adapted to said seat controlling communication between said passages and the mixing-chamber, and an independently-movable valve carried by said valve adapted to control the gasolene-passage.

6. In a mixing-valve, the combination of a mixing-valve chamber for either gas or gasolene, having a seat, a valve for the seat guided in said chamber, valve-controlled gas and gasolene inlet openings below the seat, air-ports leading into the seat, said valve being adapted to control communication between said air gas and gasolene openings and said chamber, and a secondary valve yieldingly mounted in said valve and adapted to individually control said gasolene-inlet opening.

7. In a mixing-valve for gas or gasolene engines, the combination of the three-part casing, *B, C, D*, formed with the vapor, air, gas and gasolene inlet passages *B<sup>2</sup>, E, F* and *G*, respectively, the cap *B'* and the valve *I* having its stem guided in said cap, and the spring *i* sleeved thereon, said valve being adapted to control communication between the air, gas and gasolene passages *E, F* and *G*, and the vapor-inlet passage *B<sup>2</sup>* as and for the purpose described.

8. In a mixing-valve for gas or gasolene engines, the combination of the three-part casing, *B, C* and *D*, formed with air, gas and gasolene inlet openings and an outlet-opening, the part *C* having an upward extension *c* adapted to fit within the part *B* and formed with a valve-seat, and air-ports *b* in said seat and the spring-backed valve *I* guided in said casing and adapted to said seat to control communication between said inlet and outlet passages.

9. In a mixing-valve, the combination with a casing, formed with a valve-seat, and air, gas and gasolene inlet openings below said seat and an outlet-opening above said seat of a two-part valve adapted to said seat comprising the spring-backed main valve *I* adapted to control communication with the outlet-opening and the spring-backed secondary valve *J* mounted within the main valve and adapted to control the gasolene-inlet port, comprising a plunger formed with a stop *k* and the spring *j* of lesser strength than that of the main valve.

In testimony whereof I affix my signature in presence of two witnesses.

ROY E. HARDY.

Witnesses:

OTTO F. BARTHEL,  
JOSEPH A. NOELKE.