

A. P. GUBRUD.
 AUTOMATIC MIXER AND CHARGER FOR GAS ENGINES.
 APPLICATION FILED MAR. 15, 1911.

1,056,666.

Patented Mar. 18, 1913.

2 SHEETS—SHEET 1.

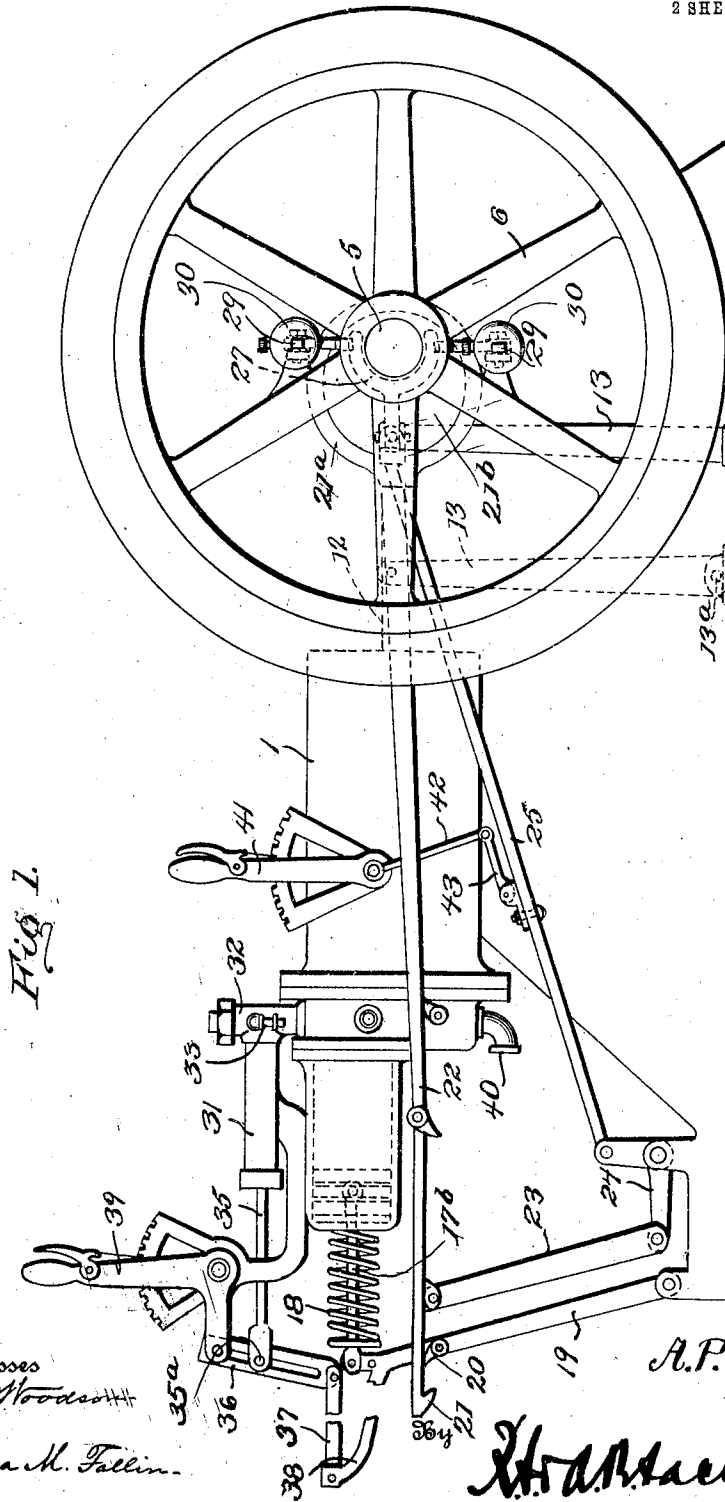


Fig. 1.

Witnesses
W. P. Woodcock
Joana M. Tallin

Inventor
A. P. Gubrud

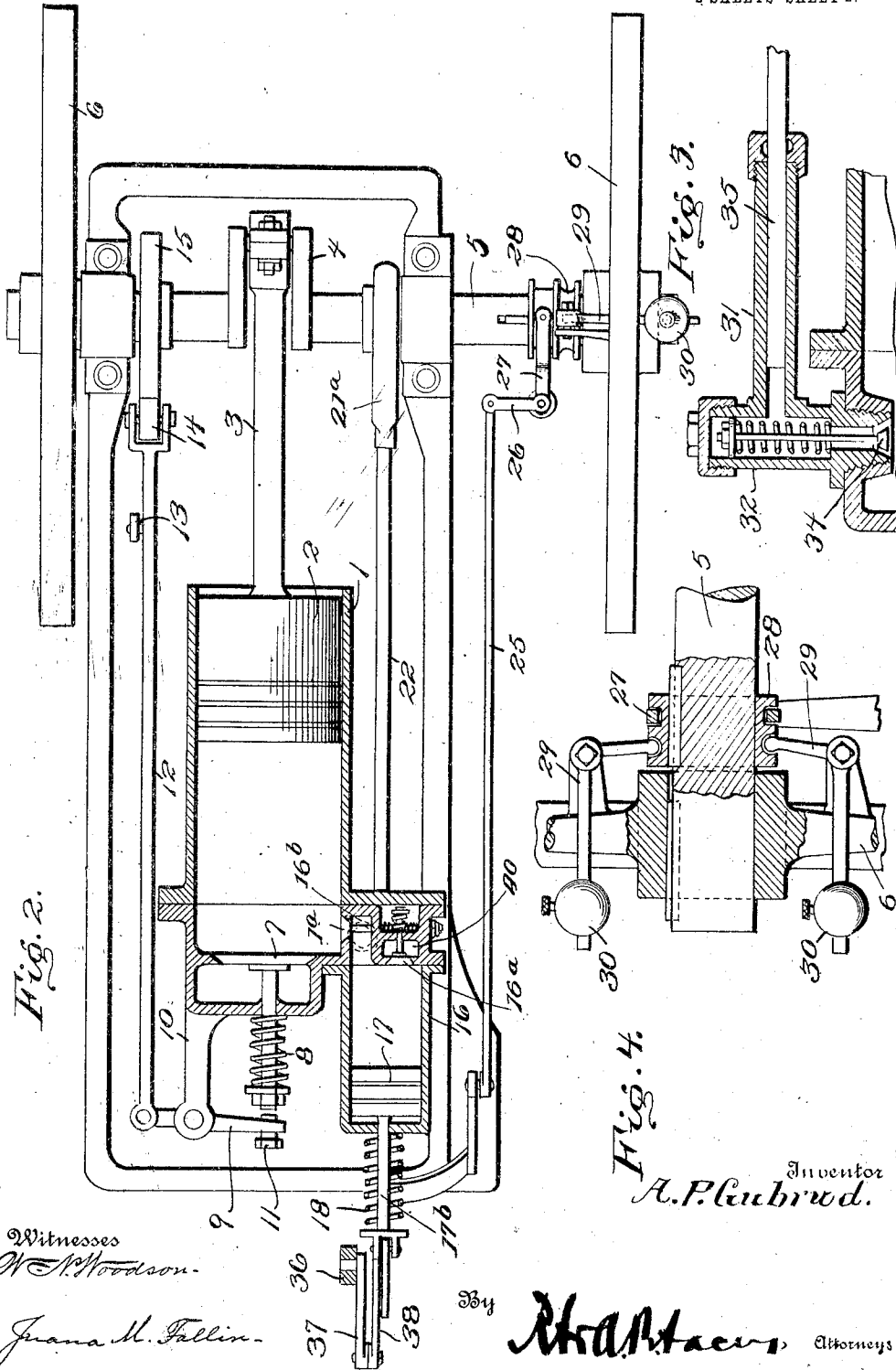
H. A. Macy Attorneys

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Witnesses
 W. R. Woodson.

J. M. Hallin.

Inventor
 A. P. Gubrud.

Attorneys

UNITED STATES PATENT OFFICE.

ADOLPH P. GUBRUD, OF HUDSON, SOUTH DAKOTA.

AUTOMATIC MIXER AND CHARGER FOR GAS-ENGINES.

1,056,666.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ADOLPH P. GUBRUD, citizen of the United States, residing at Hudson, in the county of Lincoln and State of South Dakota, have invented certain new and useful Improvements in Automatic Mixers and Chargers for Gas-Engines, of which the following is a specification.

This invention comprehends certain new and useful improvements in charge forming devices for internal combustion engines, and the invention has for its primary object an improved automatic and manually controllable mixing and charging apparatus, which when attached to or incorporated in an internal combustion or explosive engine, will increase the efficiency thereof, and will effect the explosion of a charge in each cylinder employed, for every revolution of the fly-wheel shaft. And the invention also has for its object an improved construction and arrangement of air and liquid fuel pumps, together with governor mechanism, whereby the engine may be easily kept under control at all times and expand its gaseous fuel according to the load imposed on the drive shaft.

With these and other objects in view as will more fully appear as the description proceeds, the invention consists in certain constructions, arrangements and combinations of the parts that I shall hereinafter fully describe and claim.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a side elevation of an internal combustion engine embodying the improvements of my invention; Fig. 2 is a top plan view thereof, partly in section; Fig. 3 is a fragmentary sectional view; and, Fig. 4 is detail sectional view of one form of governor which may be employed.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Referring to the drawings, the numeral 1 designates an internal combustion engine working cylinder which in the present instance is shown as horizontally disposed and supported upon a bed or casing which may be of any desired construction.

2 designates the power piston which is mounted for reciprocation in the cylinder 1,

and 3 designates the ordinary pitman which connects the piston 2 with the crank 4 of the drive shaft 5.

6 designates the fly wheels.

The cylinder 1 is provided at one end with an exhaust port controlled by an inwardly opening valve 7, the stem of said valve projecting outwardly, as shown, and being encircled by a valve closing spring 8. A rocker 9 is fulcrumed intermediate of its ends on a bar 10, which projects outwardly from one end of the cylinder 1, said rocker carrying at one end a set screw 11 designed to strike the outer end of the stem of the valve 7 when the rocker is moved in one direction, so as to open the valve against the tension of the spring 8. The other end of the rocker 9 is connected to a rod 12 which extends longitudinally along one side of the cylinder 1 toward the crank shaft 5, the rod 12 being connected near one end to a lever 13 fulcrumed at 13^a on the engine 1, the lever holding the rod in such position that a roller 14, carried by the rod, will be intermittently engaged by a cam 15 formed on the crank shaft 5.

All of the before-named parts may be of any desired construction, design or type and are here disclosed for the purpose of illustration only.

In carrying out my invention, I secure to the cylinder 1 an air pump cylinder 16 which in the present embodiment of the invention extends longitudinally of the main or working cylinder 1. The cylinder 16 is provided with a spring closed air inlet valve 16^a which controls the passage of air from an air inlet opening 40 to the interior of the cylinder 16 and said cylinder is also provided with a mixing chamber 16^b from which the gaseous fuel passes into the main cylinder 1, a spring closed valve 1^a being mounted in the cylinder 1 and opening inwardly to admit the gaseous charge from the chamber 16^b to the interior of the working cylinder.

The cylinder 16 contains a piston 17 having a stem 17^b which projects outwardly through one end of said air cylinder and which is encircled by an expansion spring 18. The stem 17^b is pivotally connected to a vertically disposed rocker arm 19, and said rocker arm carries a hooked finger 20 which is designed to be engaged by the hooked forward end 21 of a reciprocating rod 22. This rod is provided at one end with an eccen-

5 tric strap 21^a mounted upon an eccentric 21^b
 forming part of the crank shaft 5. A link
 23 is pivotally connected at one end to the
 rod 22 near the forward end of the latter,
 10 and the other end of said link is pivotally
 connected to one arm of a bell crank lever
 24 which is fulcrumed at its elbow on the
 bed of the engine. The other arm of the
 bell crank 24 is connected to the forward
 15 end of a rod 25, and the rear end of said rod
 is connected to a bell crank 26, one arm of
 which is forked as indicated at 27 so as to
 encircle a spool 28, (see Fig. 2) forming a
 part of a centrifugal governor mechanism
 20 29 carried by one of the fly wheels 6, where-
 by the rod 25 will be raised and lowered
 according to the speed of the engine. When
 the speed of the engine rises, the rod 25 will
 be moved to the right, as viewed in Fig. 1
 25 and the bell-crank 24 will be rocked in a
 direction to raise the oscillating rod 22,
 whereby the hook 21 thereof will be disen-
 gaged from the finger 20 and no motion will
 be imparted to the actuating rocker arm 19
 30 which is connected to the piston stem 17^b
 of the piston 17 of the air cylinder. As soon
 as the speed has dropped to a predetermined
 point, it will be understood that the rod 22
 will have been lowered to a point where its
 hook 21 will engage with the finger 20 upon
 35 every rearward movement of the rod 22,
 thereby repeatedly moving piston 17 and
 drawing in fresh charges of air. As best
 illustrated in Fig. 4, the governor mecha-
 nism in the present instance includes cen-
 trifugally acting bell-cranks carrying ad-
 justable balls or weights 30.

The controlling means hereinbefore speci-
 40 fied not only serves to control the admission
 of the air charges, but also controls the ad-
 mission of the volatile fuel to mix with the
 air.

A pump barrel designated 31 is connected
 45 to a valve casing 32 which opens into the
 mixing chamber 16^b, as indicated by the
 dotted lines in Fig. 2, said valve casing hav-
 ing a fuel inlet 33 and a spring closed out-
 let valve 34 which opens into the mixing
 50 chamber 16^b, so that as the piston of said
 barrel in the form of a rod 35 moves to-
 ward the barrel 34, the same will open and
 inject a charge of hydrocarbon fuel into
 the mixing chamber of the cylinder 16 to
 55 mix with the air that has been aspirated
 into said cylinder by the rearward move-
 ment of the piston 17. The return move-
 ment of the piston 35 will permit the valve
 34 to close, and at the same time draw fresh
 fuel into the valve casing 32 through the
 60 inlet 33.

The piston 35 is forked at one end and
 said fork carries a pin 35^a which extends
 transversely through and is movably mount-
 65 ed in the slot of a link 36, said link being
 pivotally connected at one end to a rod 37

and said rod being in turn pivotally con-
 nected to the rocker arm 19 through the in-
 strumentality of a rod 38. The upper end
 of the link 36 is pivotally connected to a
 bell crank hand lever 39, so that by shifting
 70 the hand lever, the position of the crank
 may be changed, that is, it may be raised or
 lowered. As the arm 19 is rocked, it will
 obviously, through the connection 38 and
 37, rock the slotted link 36 and thereby re-
 ciprocate the piston 35, and it is clear, hav-
 75 ing special reference to Fig. 1, that by ma-
 nipulating the lever 39 so as to shift the slot
 of the link 36 along the pin 35^a, a greater
 or less stroke will be given to the piston 35
 80 and a greater or less amount of liquid fuel
 injected at each reciprocation of the piston
 35 into the mixing chamber 16^b. It will
 also be understood that by moving the hand
 lever 39 to a position where the link 36
 85 comes down on the pin 35^a to the limit, there
 will be practically no stroke whatever on
 the pump rod or piston 35, this manipula-
 tion constituting an easy way of stopping
 the engine.

In addition to the foregoing means for
 controlling the speed of the engine, I pro-
 vide a hand lever 41 fulcrumed in any de-
 sired way on the engine, and connected at
 its lower end to a preferably flat spring 42.
 95 The lower end of the spring 42 is pivotally
 connected to a link 43 and the link is in
 turn pivotally connected to the rod 25. The
 spring 42 is preferably made of flat and
 thin leaf spring steel which will bend either
 100 way in the operation of the engine, and to
 vary the tension of the governor to higher
 or lower speeds, the spring 42 is fastened
 rigidly to the lower end of the hand lever
 41. By adjusting the hand lever 41, the
 105 spring 42 may be flexed and thereby in-
 crease its resistance on the rod 25 and thereby in-
 crease the tension on the governor mecha-
 nism.

As the operation of the different parts has
 110 been described in connection with the de-
 tails of construction and arrangement of
 the parts, I deem it unnecessary to further
 describe the operation except to state that,
 as will doubtless be understood, the air
 115 pump and fuel pump are left stationary so
 long as the engine is running above or at a
 predetermined speed and are actuated only
 when the speed of the engine falls below
 such predetermined point at which time the
 120 hook 21 of the rod 22 will be lowered and
 be brought into operative relation with the
 finger 20 of the actuating rocker arm 19 that
 operates the piston of both pumps.

What I claim is:

1. In an internal combustion engine, and
 in combination with the working cylinder
 thereof, an air pump adapted to pump air
 into said cylinder, a fuel pump adapted to
 125 pump fuel into said cylinder, a rocker arm

arranged to operate both pumps, an eccentric actuating rod, a bell crank having a link connection with said rod, and a governor controlled by the speed of the engine and operatively connected with said bell crank to move the eccentric actuating rod into and out of engagement with the rocker arm.

2. In an internal combustion engine and in combination with the working cylinder thereof, an air pump adapted to pump air into said working cylinder and including a piston provided with a stem projecting out at one end of the pump, and a spring encircling said stem, and holding the piston at one end of its stroke, said stem being provided with a hooked finger and an eccentric actuating rod provided with a hook adapted to engage the hooked finger, and means connected to said actuating rod and controlled by the speed of the engine for moving the hooked end of the rod into and out of operative relation to the hooked finger of the piston stem.

3. In an internal combustion engine and in combination with the working cylinder thereof, an air pump adapted to pump air into said cylinder and including a spring-held piston, a rocker arm pivotally connected to the piston, an eccentric actuating rod, a bell-crank having a link connection with said rod, and a governor controlled by the speed of the engine and operatively connected with said bell-crank to move the eccentric actuating rod into and out of engagement with the rocker arm.

4. In an internal combustion engine and in combination with the working cylinder thereof, air and fuel pumps operatively connected to said cylinder and including pistons, an operative connection between the two pistons whereby one will be actuated by the other, means for adjusting the connection to vary the stroke of one of said pistons, a governor, and means controlled by said governor and arranged to operate said pistons at a predetermined point in the speed of the engine.

5. In an internal combustion engine and in combination with the working cylinder thereof, air and fuel pumps operatively connected to said cylinder and including

pistons, an operative connection between the two pistons whereby one will be actuated by the other, means for adjusting the connection to vary the stroke of one of said pistons, a governor, an actuating rod engageable with said pistons to drive the same in one direction, means for reciprocating said rod, and means controlled by the governor for moving said rod into and out of operative relation with the pistons.

6. In an internal combustion engine and in combination with the working cylinder thereof, pumps adapted to pump air and fuel into said cylinder and including pistons, an operative connection between said pistons, said connection including a rocking link and means for shifting the fulcrum of said link, for the purpose specified, an eccentric actuating rod arranged to operate said pistons, means for reciprocating said rod, and means controlled by the speed of the engine for moving said rod into and out of operative relation to the pistons.

7. In an internal combustion engine and in combination with the working cylinder thereof, an air pump cylinder, a piston mounted in said air pump cylinder and adapted to pump air therefrom to the working cylinder, the piston being provided with a stem projecting out of the pump cylinder, and spring-pressed in one direction, the stem being provided with a hooked finger, an eccentric driven actuating rod adapted to engage the finger and move the piston against the tension of its spring, a fuel pump adapted to pump fuel into the working cylinder and embodying a piston, a hand lever, a slotted link pivotally connected to said hand lever, a pin connected to the piston and movably mounted in the slot of said link, an operative connection between said link and the stem of the air pump piston, and means controlled by the speed of the engine for moving the actuating rod into and out of operative relation to the hooked finger.

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

ADOLPH P. GUBRUD. [L.S.]

Witnesses:

F. E. JOHNSON,
HENRY THORPE.