(No Model.)

2 Sheets—Sheet 1.

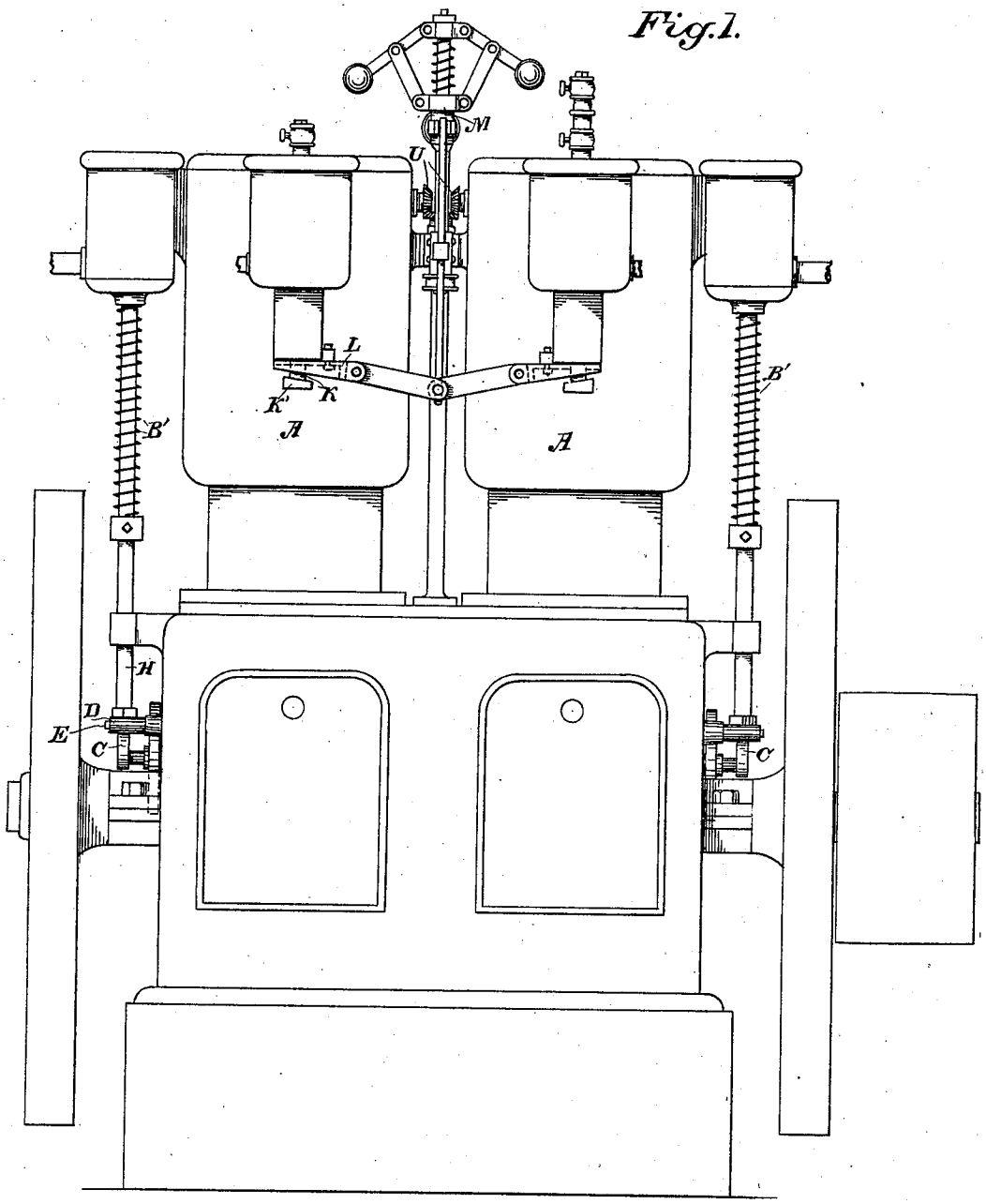
A. J. TACKLE.

GAS ENGINE.

No. 590,796.

Patented Sept. 28, 1897.

Fig. 1.



Witnesses,

J. H. Nourse

H. F. Ascheck

Inventor,

Arnold J. Tackle

By Dewey & Co. attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

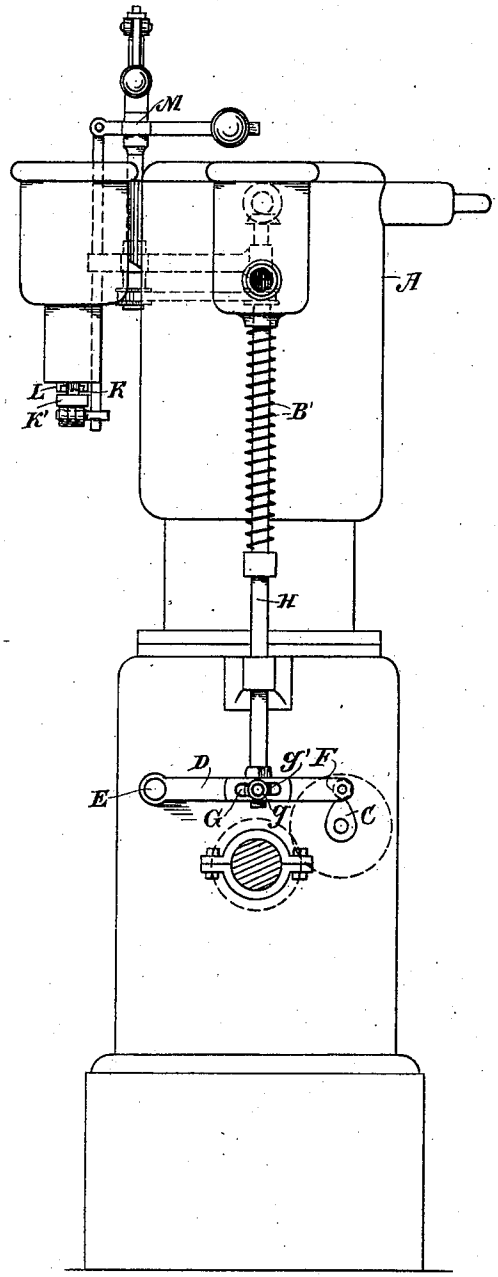


Fig. 3.

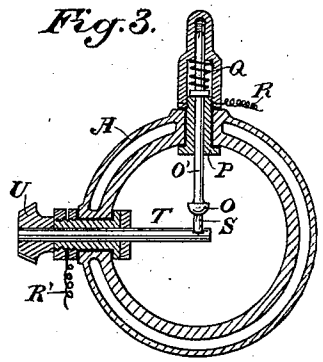


Fig. 4.

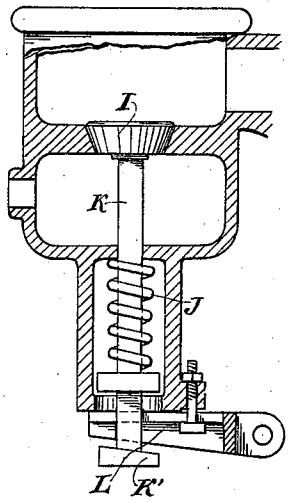


Fig. 5.

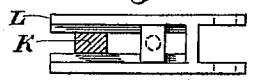
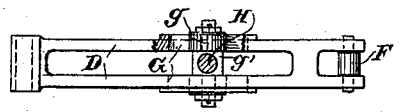


Fig. 6.



Witnesses,
H. Innes
F. F. Ascheck

Inventor,
Arnold J. Tackle
By Dewey & Co. Atty's

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ARNOLD J. TACKLE, OF OAKLAND, CALIFORNIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 590,796, dated September 28, 1897.

Application filed April 15, 1897. Serial No. 632,286. (No model.)

To all whom it may concern:

Be it known that I, ARNOLD J. TACKLE, a citizen of the United States, residing at Oakland, county of Alameda, State of California, have invented an Improvement in Gas-Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in gas or explosive engines.

It consists in certain details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is an exterior front view of a two-cylinder engine. Fig. 2 is an end view of the same. Fig. 3 is a horizontal section through one of the cylinders, showing the igniting device. Fig. 4 is a detail section of the inlet. Fig. 5 is a bottom view of the incline to govern the inlet-valve. Fig. 6 is a top view of the lever to operate the exhaust-valve.

The object of my invention is to provide an improved mechanism for regulating the supply of explosive gas or vapor to the engine, depending upon the load or weight of speed, and in a novel mechanism for igniting each charge of gas, so as to explode it at the proper time.

In the present case I have illustrated my invention as applied to a double-cylinder engine, but it will be understood that it will operate equally well with an engine having a single cylinder.

A A are cylinders having the usual pistons reciprocating therein and connecting rods or pitmen between the pistons and the cranks upon the crank-shaft whereby the power is transmitted from the pistons to rotate the shaft. Suitable balance-wheels are fixed upon the shaft to equalize the revolutions and a belt pulley or pulleys to transmit the motion to any point where the power is to be applied, this being the ordinary construction of such engines.

The exhaust-valve is normally held closed by a spring B′ and is opened by a cam C, driven from the main shaft of the engine, and so connected as to make one revolution for each two revolutions of the engine-shaft, so that it will be opened to allow the exhaust products to escape after the explosion which has forced the piston to the opposite end of the cylinder, and upon its return the piston drives these exhaust products out through the open valve. The valve is actuated by a lever D, fulcrumed at one end upon a stud E, upon which it swings whenever the cam strikes a roller or antifriction device F at the opposite end. Through the center of the lever is a slot G, extending some distance in each direction and at right angles to the rod which opens the exhaust-valve. In this slot a roller *g* upon each arm works freely on a pin *g′*, which connects the two rollers, and through the center of this pin is tapped a hole into which the valve stem or rod H is screwed and where it is held from moving by a lock-nut. By this device the amount of opening of the exhaust-valve can be adjusted without reference to the length of the stem or rod which operates the same.

The weight of the lever helps to keep the valve closed, and the sliding motion of the rollers in the slot prevents any tendency of the rod to strain or bind during its movements.

The inlet-valve I is of the form known as "puppet-valve" and is normally kept closed by a spring J acting on the valve-stem K. It is opened to admit a supply of explosive gas to the engine by the pressure of inflowing vapor caused by the suction or vacuum when the engine-piston moves outwardly in the cylinder.

In order to regulate the opening of the valve and the charge of gas admitted to the cylinder, I have shown a beveled or wedge-shaped plate L for each valve movable at right angles across the line of travel of the valve-stem K, as shown, and so connected with the rising and falling part M of the governor that they are pushed forward or withdrawn by the greater or less speed of the governor. The valve-stems K are flat where they pass through the beveled slotted L-plates to prevent their turning and have upon their lower ends enlargements or heads K′, having the faces beveled to correspond with the inclined plates L, against which they form contact. When these plates are moved transversely to the stems K, as before described, they allow the valve to open more or less according to the speed of the engine and governor, and thus

the charge admitted to the engine-cylinder for each impulse is increased or diminished to suit the needs of the engine.

The electric spark for igniting the charge of explosive gas within the cylinder is produced by the contact of two electrodes. In my invention I have so arranged these electrodes as to preserve them from the action of the intense heat caused by the constant explosions within the ignition-chamber to maintain at all times a bright contact-surface, so as to insure a proper spark for the ignition of the gas, and to so arrange the yielding or elastic portions, which insure the proper contact, that they will be entirely out of reach of the heat of the explosions.

The electrode O is in the form of a semi-globular head, having a stem O′, which extends outwardly through a gland P, which screws into the side of the cylinder and which should be properly insulated therefrom. The stem O′ is acted upon by a spring Q, the tendency of which is to force the globular head O at all times inwardly toward the other contact-point. One of the conducting-wires R connects with this stem, and through it the electric current passes to the contact-head O. The other contacting-point S is in the form of a flat plate or wiper mounted upon a rotating shaft T, which extends into the explosion-chamber at right angles with the stem O′. This shaft T is rotated by suitable gearing, as at U, so that the arm or wiper S will make contact flatwise with the head O at every second revolution of the crank-shaft, thus producing a spark for the explosion of the gas at each compression of the same in the explosion-chamber.

The shaft T is fitted to turn within an insulated sleeve, through which it passes and through which the electric current from the other wire R′ from the battery forms connection with the wiper S.

It will be seen that none of the parts exposed to the heat are elastic or intended to have any especially elastic movement, this being provided by the slidability of the stem O′ and its constant return after each passage of the wiper S by the action of the spring Q, and as this spring is situated at such a distance from the interior of the cylinder that it will not be acted upon by the heat of the explosions any wear on the end of the wiper-plate will tend to make it conform to the shape of the globular head and insure a more perfect contact.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a gas-engine, an igniting device consisting of a collar fitted to the side of the cylinder, having a flanged inner end and a threaded outer end projecting beyond the exterior wall of said cylinder, an exterior housing having internal threads by which it is directly secured to the projecting end of the collar, a stem slidable through the collar, having an integral enlarged head of globular form, a spring in the housing and surrounding the stem, a second collar fitted to the side of the cylinder at right angles with the first-named collar, a rotatable shaft mounted in said sleeve and intersecting the line of movement of the stem, and having a flat wiping-plate rigid with it and adapted to contact with the curved surface of the globular head whereby any wear on the end of the plate will tend to make it conform to the curved shape of the head to insure a perfect contact.

2. In a gas-engine, independent inlet-valves and exhaust-valves, a governor and intermediate mechanism whereby the opening of the inlet-valves is regulated, said intermediate mechanism consisting of wedge-shaped slides, connections between said slides and substantially in line therewith, and extending inwardly toward each other and jointly connected to the vertically-movable part of the governor, whereby they are moved in guides at right angles with the movement of the valve-stems and the amount of said movement is controlled.

3. In a gas-engine, inlet-valves with valve-stems movable in the line of travel of the valves and springs by which the valves are normally closed, heads upon the outer ends of the valve-stems with inclined contact inner faces, beveled slotted plates slidable in guides on the valve-casing at right angles with the line of travel of the valve-stems with the inclined sides movable upon the inclined contact-faces of the valve-stems, a governor having a part movable at right angles with the travel of the inclined slides, and intermediate connections extending inwardly substantially in line with the plates and connected directly with said movable part of the governor whereby motion is transmitted from the governor to the slides and the opening of the valves is controlled.

4. In a gas-engine, inlet-valves with stems and springs by which the valves are normally closed, heads upon the outer ends of the stems, wedge-shaped slides movable in contact with said heads at right angles with the line of movement of the valve-stems and connections with a governor whose speed is dependent upon that of the engine whereby the slides are moved to increase or decrease the opening of the valve, the valve-stems having rectangular or flattened sections and the slides slotted so that these flattened sections pass through the slots, and the valve-stems and heads are prevented from turning.

5. In a gas-engine having independent inlet and exhaust valves, springs by which the exhaust-valves are normally closed, and means for actuating each of said valves comprising a longitudinally centrally slotted lever fulcrumed at one end and extending transversely to the lower end of the valve-stem, a cam actuated from the engine-shaft and adapted to engage the free end of the lever so as to move the lever at suitable intervals, an antifriction-

roller-bearing pin extending across the slot in the lever, said pin having a screw-threaded hole in the center, screw-threads on the lower end of the valve-stem, fitting said pin whereby the latter is adjustably connected with the lever, and is prevented from transverse movement by the movements of the lever.

In witness whereof I have hereunto set my hand.

ARNOLD J. TACKLE.

Witnesses:
S. H. NOURSE,
JESSIE C. BRODIE.