

No. 607,566.

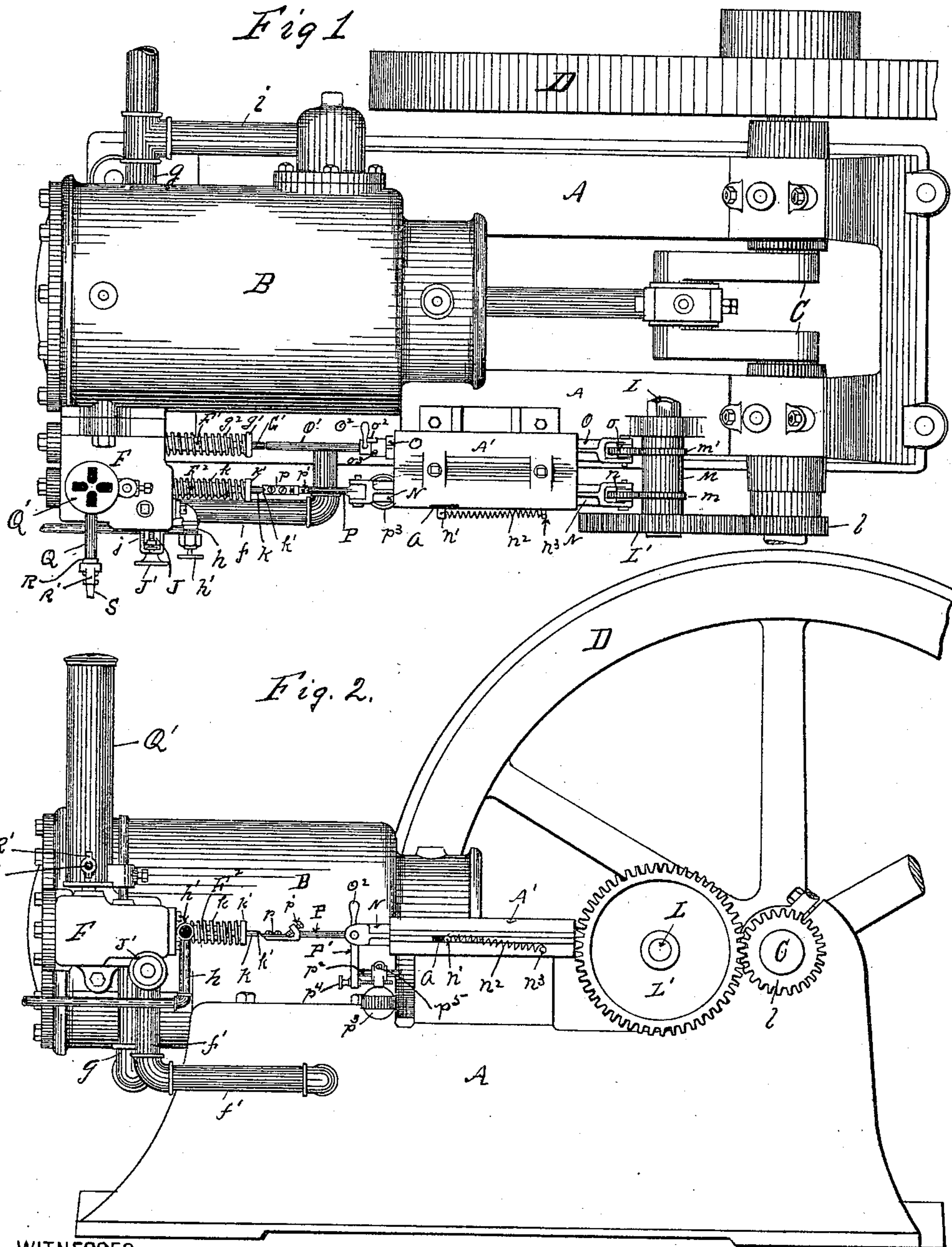
Patented July 19, 1898.

C. JACOBSON.
GAS ENGINE.

(Application filed Dec. 2, 1896.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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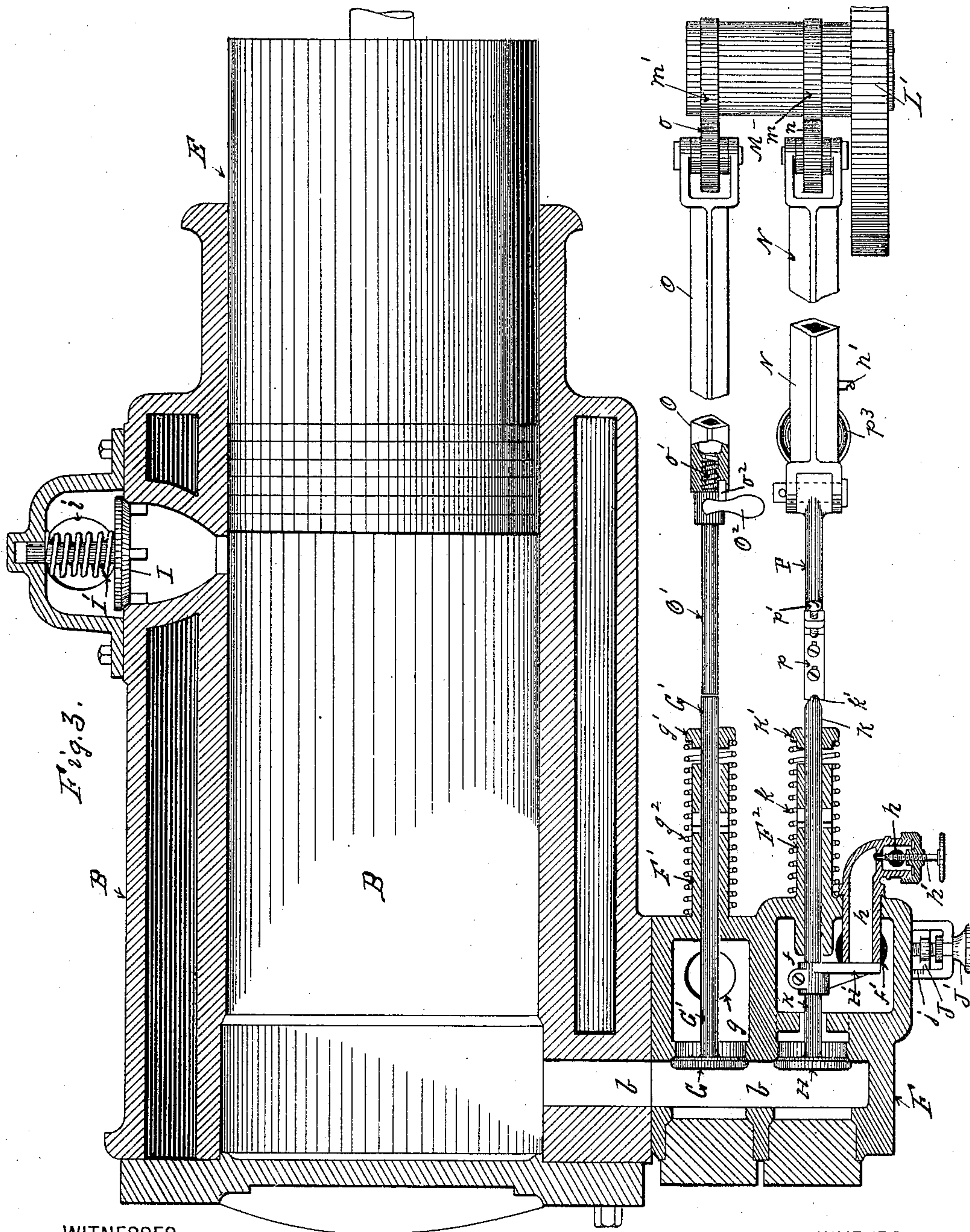
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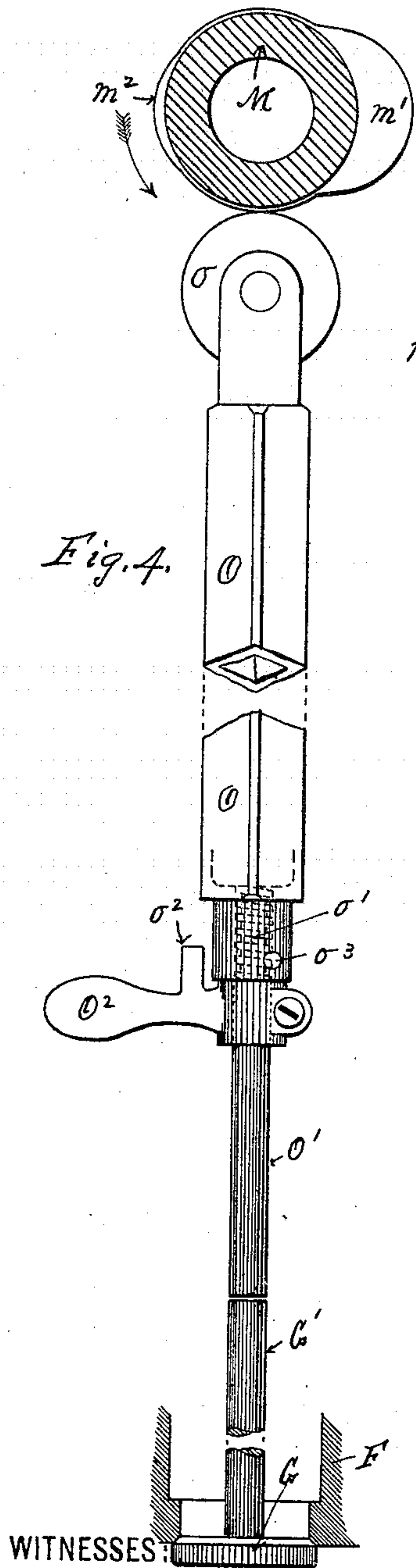
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3 Sheets—Sheet 3.



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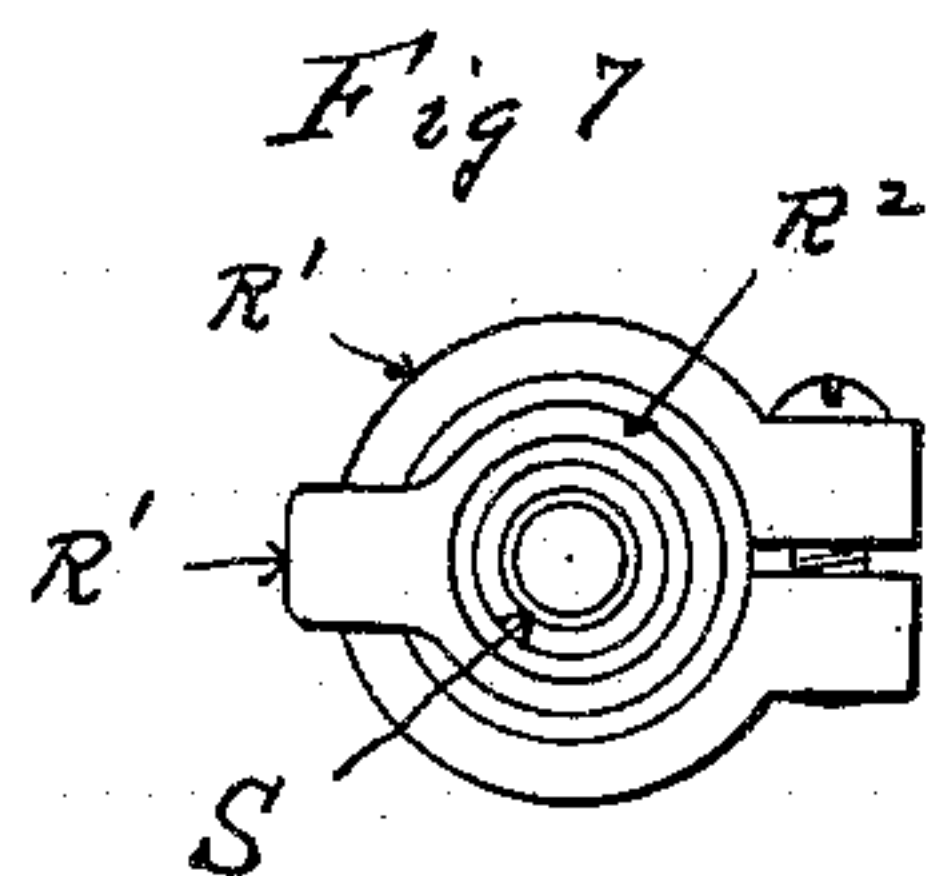


Fig. 6.

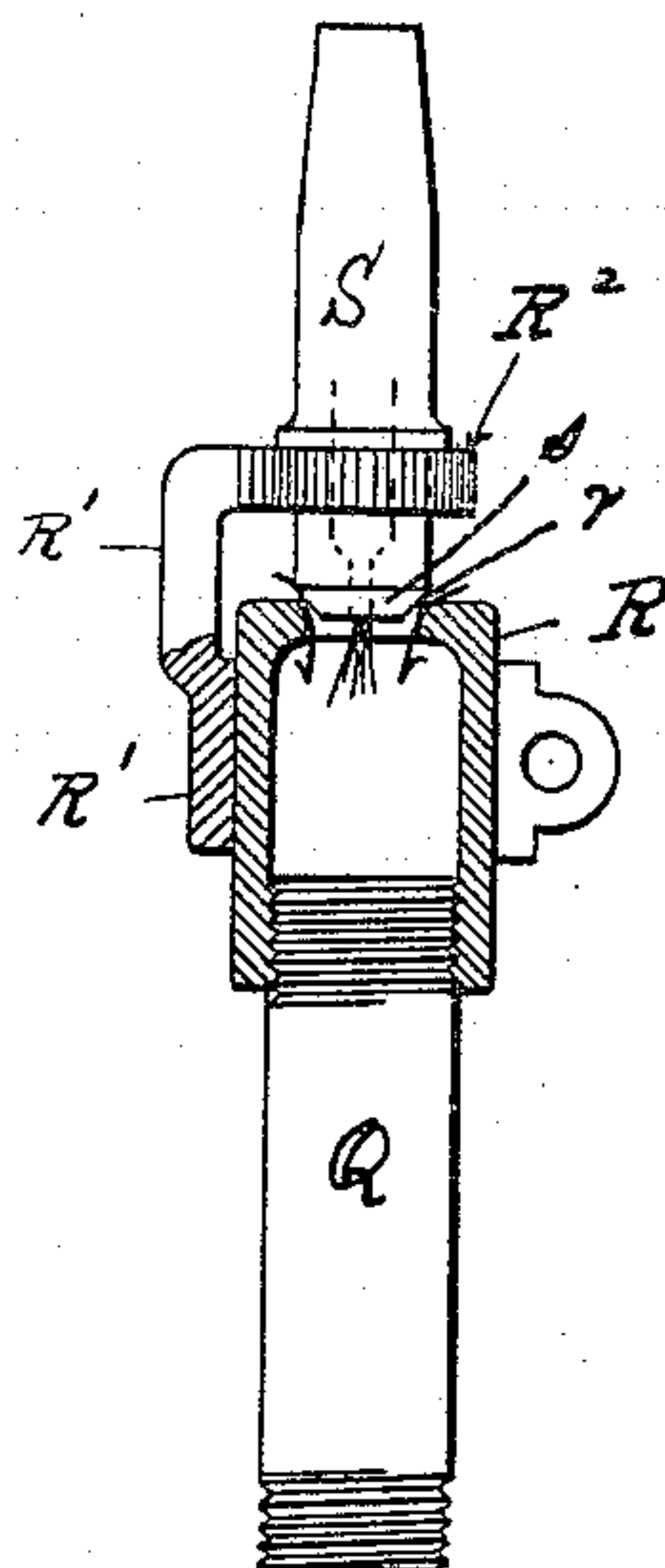
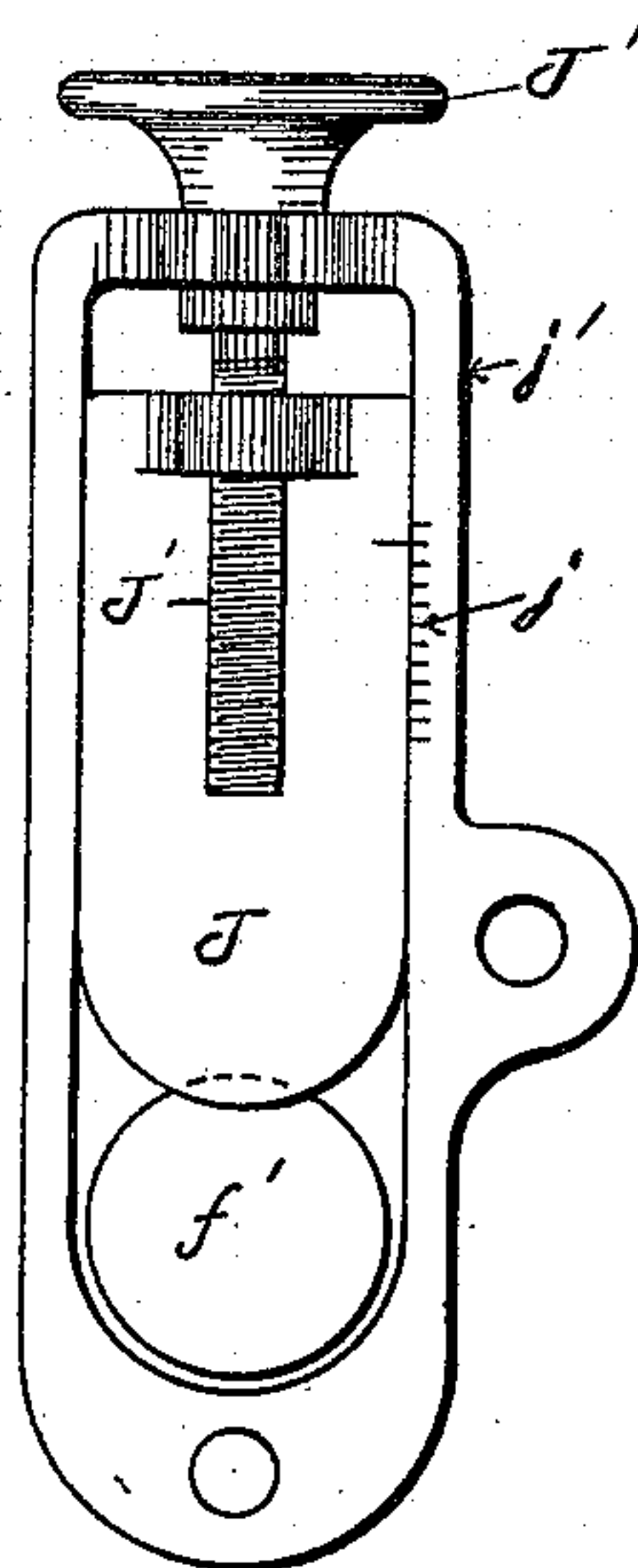


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES JACOBSON, OF ERIE, PENNSYLVANIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 607,566, dated July 19, 1898.

Application filed December 2, 1896. Serial No. 614,192. (No model.)

To all whom it may concern:

Be it known that I, CHARLES JACOBSON, a citizen of Sweden, residing at the city of Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention relates to improvements in gas-engines; and it consists in the improvements hereinafter set forth and described in the specification and claims and illustrated in the accompanying drawings, in which—

Figure 1 is a top or plan view of a gas-engine embodying my invention. Fig. 2 is a side view in elevation of the same. Fig. 3 is a horizontal section of the same through the cylinder and valve-chest mechanism thereof. Fig. 4 is a detail view of a portion of the exhaust-valve mechanism. Fig. 5 is a plan view of a valve for regulating the air-inlet. Fig. 6 is a sectional view of an improved adjustable firing-jet. Fig. 7 is an end view of the same.

In the construction of the gas-engine illustrated in the drawings, A is the bed or frame, B the cylinder, C the main shaft, D the balance-wheel, and E the piston, all of which are of the usual construction. On one side of the rear end of the cylinder I secure a valve-chest F, which communicates with the rear of the cylinder by means of a passage *b*. In this valve-chest I place the main exhaust-valve G and the gas and air inlet valves H and H', and in the opposite side of the cylinder I place an auxiliary exhaust-valve I, which is normally retained on its seat by means of a spiral spring I'. This valve communicates with the exhaust-pipe *i*, which in turn communicates with main exhaust-pipe *g*, extending from the main exhaust-valve G. This auxiliary exhaust-valve I operates as the piston E reaches nearly the end of its forward traverse to exhaust a good portion of the heat and products of combustion from the cylinder before the piston starts on its backward traverse, so that when the main exhaust-valve

G is opened to exhaust the remainder of the products of combustion from the cylinder the greater portion of the heat has been dissipated through the auxiliary exhaust-valve I and a comparatively small amount thereof remains to pass off through the main exhaust-valve G, and thus in a large measure obviating the overheating of the parts.

The main exhaust-valve G is provided with a stem G', which extends out through a sleeve F' on the valve-chest F in the direction of the main shaft C of the engine. This stem G' is provided with a collar *g'*, against which a spiral spring *g*² operates to normally close and retain the valve G upon its seat.

In the valve-chest F there is a mixing-chamber *f*, to which air is admitted through a conduit *f'*. This conduit *f'* is provided with a cut-off valve J. (See Fig. 5.) This valve J is provided with an adjusting-screw J', by means whereof it can be moved in and out at the will of the operator, a scale *j* on one side of the frame *j'*, in which the valve J slides, indicating at all times the position of the valve. The valve H, cutting off the inlet from the mixing-chamber *f* to the passage *b*, extending into the cylinder, and the valve H', closing the end of the gas-conduit *h* within the mixing-chamber *f*, are both mounted on a common valve-stem K, which extends out through a sleeve F² on the valve-chest F in the direction of the main shaft C of the engine. This stem K is provided with a collar K', against which a spiral spring *k* operates to normally close and retain the valves H and H' upon their seats. On the end of the valve-stem K there is a shoulder *k'*, adapted to be engaged by the valve-stem-operating mechanism hereinafter described.

On the side of the engine-frame adjacent to the main shaft C is secured a stud L, upon which is mounted a sleeve M, adapted to rotate upon said stud and provided with a gear-wheel L', which intermeshes with a gear-wheel *l* on the main shaft of such proportionate size to the gear-wheel L' as to rotate the sleeve M at the proper speed relatively to that of the main shaft C. On this sleeve M are cam-surfaces *m* and *m'*, and between these cam-surfaces and the ends of the valve-stems G' and K and in line therewith there are secured to the engine-bed A guides A', in which

are mounted rectangular valve-rods N and O, which reciprocate freely in said guides A', and mounted on the ends of said rods N and O, adjacent to the cams m and m' and adapted to contact therewith, are friction-rollers n and o , so that in the rotation of the cams m and m' they contact with said friction-rollers and move the rods N and O toward the rear, so as to operate the valves G, H, and H', through the intermediate mechanism herein-after described, to open them, the springs g^2 and k operating on the valves at the proper time to close them and retain them in such position until again opened, as hereinbefore described. In one side of the rod N there is a stud-pin n' , which passes out through a slot a in the side of the guide A', and secured to said stud-pin is a spiral spring n^2 , the opposite end of which is secured to a stud n^3 on the forward part of the guide A', which spring operates on the rod N as a retracting-spring to keep the friction-roller n thereon in constant contact with the actuating-cam m .

In the rear end of the rod N there is pivoted a bell-crank lever P P', one arm P of which extends rearwardly and horizontally in line with the end k' of the valve-stem K. This arm P is provided at its rear end with a longitudinally-movable toe-plate p , adapted to contact with the shouldered end k' of the valve-stem K and which can be moved outward by means of an inclined set-screw p' operating against the rear end thereof, so as to lengthen the arm P and operate to open the valves H and H' to a greater or less extent, according to the adjustment of the toe-plate p out or in on the arm P. On the downwardly-extending arm P' of said bell-crank lever there is a forwardly-projecting arm p^2 , upon which a weight p^3 is hung, so that it can be adjusted in and out from the downwardly-projecting arm p' by means of an adjusting-screw p^4 , and by means of the clamp p^5 thereon can be firmly secured to the arm p^2 at any point desired. This mechanism operates as an adjustable pendulum-governor, which acts on the horizontal arm P to prevent the toe-plate p thereon from contacting with the end k' of the valve-stem K, so as to open the valves H H' whenever the speed of the engine rises above the normal speed at which it is regulated to operate, and the weight p^3 being adjustable in and out on the arm p^2 the governing mechanism can at any time be adjusted by moving said weight in or out, so as to vary the normal speed of the engine, as may be desired.

The rod O for operating the main exhaust-valve G is provided with an extension O', which extends horizontally toward the end of the valve-stem G', so that when the cam-surface m' (see Fig. 4) contacts with the friction-roller o on the rod O it operates to force the valve G back from its seat, so as to open the exhaust. The end of this extension O' is secured in the end of the rod O by means of a coarse screw-thread o' . The extension O' is

also provided with a handle O², clamped thereto, by means whereof the extension O' can be rotated so as to screw it out or into the rod O. A stop o^3 is also provided on the side of the end of the rod O, and there is a shoulder o^2 on the handle O², which is adapted to contact therewith, so as to limit the rotation of the extension O' in the end of the rod O, and on the sleeve M there is a small cam-surface m^2 directly opposite the cam-surface m' thereon, which cam-surface m^2 normally does not contact with the friction-roller o . When, however, the engine is being first started, the operator grasps the handle O² and rotates the extension O' of the rod O until the shoulder o^2 thereon contacts with the stop o^3 . This operates through the thread o' to increase the aggregate length of the rod O and its extension O', so that the cam-surface m^2 will operate on the roller o during the backward traverse of the piston E and open the exhaust-valve G and relieve the compression caused thereby in the cylinder and allow the engine to be turned over more freely until started, when the handle O² is again turned back to its normal position, after which time the length of the rods being reduced to the normal the cam-surface m^2 ceases to act upon the friction-roller o .

In constructing the firing apparatus of my engine I make it in the form of an adjustable gas-jet, which is secured to the tube Q, which in turn is secured into the lower part of the vertical heater Q', the base of which is secured to the valve-chest F and communicates with the passage b therefrom into the rear of the cylinder B. On the end of the tube Q (see Figs. 6 and 7) is secured a cap R, having a large opening r in the end thereof, and upon this cap R is clamped an arm R', which projects forward and over the end of the cap R, so that the part R² thereof can be adjusted in or out, toward or away from the end of the cap R, and secured in the central portion of the part R² of the arm R' is a gas-jet S, having a beveled end s concentric with the opening r in the end of the cap, so that in operation the end s of the jet S can be adjusted so as to admit more or less air through the opening r around its periphery, as may be desired.

In operation the cam m , operating the valve-rod N P at each alternate revolution of the engine, simultaneously opens the valves H H' and allows a supply of gas from the gas-conduit h and of air from the air-conduit f' to pass into the passage b and thence into the rear end of the cylinder, which, being filled therewith, is then compressed by the backward stroke of the piston in the usual manner, which compresses the intermixed air and gas and forces it into contact with the firing-jet S, and the piston being moved forward by the explosion caused thereby travels until the auxiliary exhaust-valve I is uncovered, when a portion of the gases exhaust therethrough, while at the same instant the cam m' , acting

on the main exhaust-valve rod O O' operates to open the main exhaust-valve G, through which the remainder of the spent gases are discharged, and thereafter on the forward 5 traverse of the piston gas and air are again taken into the cylinder, as hereinbefore described.

Having thus fully described my invention, so as to enable others to construct and use the 10 same, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination in a gas-engine, of a common valve-chest inclosing the inlet and 15 exhaust valves of the engine, a valve-stem on said inlet-valve, cam and valve-rod mechanism adapted to operate said valve-stem, an adjustable toe-plate on the end of the valve-rod for lengthening and shortening the valve-rod and adapted to contact with the end of said 20 valve-stem, governing mechanism on said valve-rod, comprising a vertical pendulum-arm, and a forwardly-projecting horizontal arm thereon, a weight on said horizontal arm, 25 and means for adjusting and securing said weight in any desired position on said arm, and cam mechanism and an extensible valve-rod actuated thereby for operating the exhaust-valve, substantially as and for the pur- 30 pose set forth.

2. The combination in the valve-rod mechanism of a gas-engine, of a cam-actuated valve-rod reciprocating horizontally in guides on the engine-frame, a bell-crank lever piv- 35 oted in the rear end of said valve-rod, the horizontal arm of which is adapted to contact with

the end of the inlet-valve stem, a longitudinally-adjustable toe-plate on the end of said arm, and a set-screw operating against the rear end of said plate, a forwardly-projecting 40 arm on the pendulum-arm of said bell-crank lever, a weight on said forwardly-projecting arm, and set-screw and clamping mechanism for adjusting said weight in and out on said arm and clamping it thereto, substantially as 45 and for the purpose set forth.

3. The combination in a pendulum-governor for gas-engines, of a reciprocating valve-rod N, a bell-crank lever P P' pivoted in the rear end of said valve-rod, a longitudinally- 50 adjustable plate p on the end of the horizontal arm P thereof and set-screw p' operating against the rear end of said plate, a forwardly-projecting arm p^2 on the pendulum-arm P' of said bell-crank lever, a weight p^3 on said arm 55 p^2 adapted to be adjusted forward and back thereon, and a set-screw p^4 for adjusting and securing said weight, substantially as and for the purpose set forth.

4. The combination in the firing-jet of a 60 gas-engine, of a cap R having an opening r in the end thereof, an arm R' adapted to be adjusted in and out and clamped to the cap R, a gas-jet secured in said arm, substantially 65 as and the purpose set forth.

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

CHARLES JACOBSON.

Witnesses:

JOHN R. McDONALD,
FRED EINFELDT.