

No. 631,224.

Patented Aug. 15, 1899.

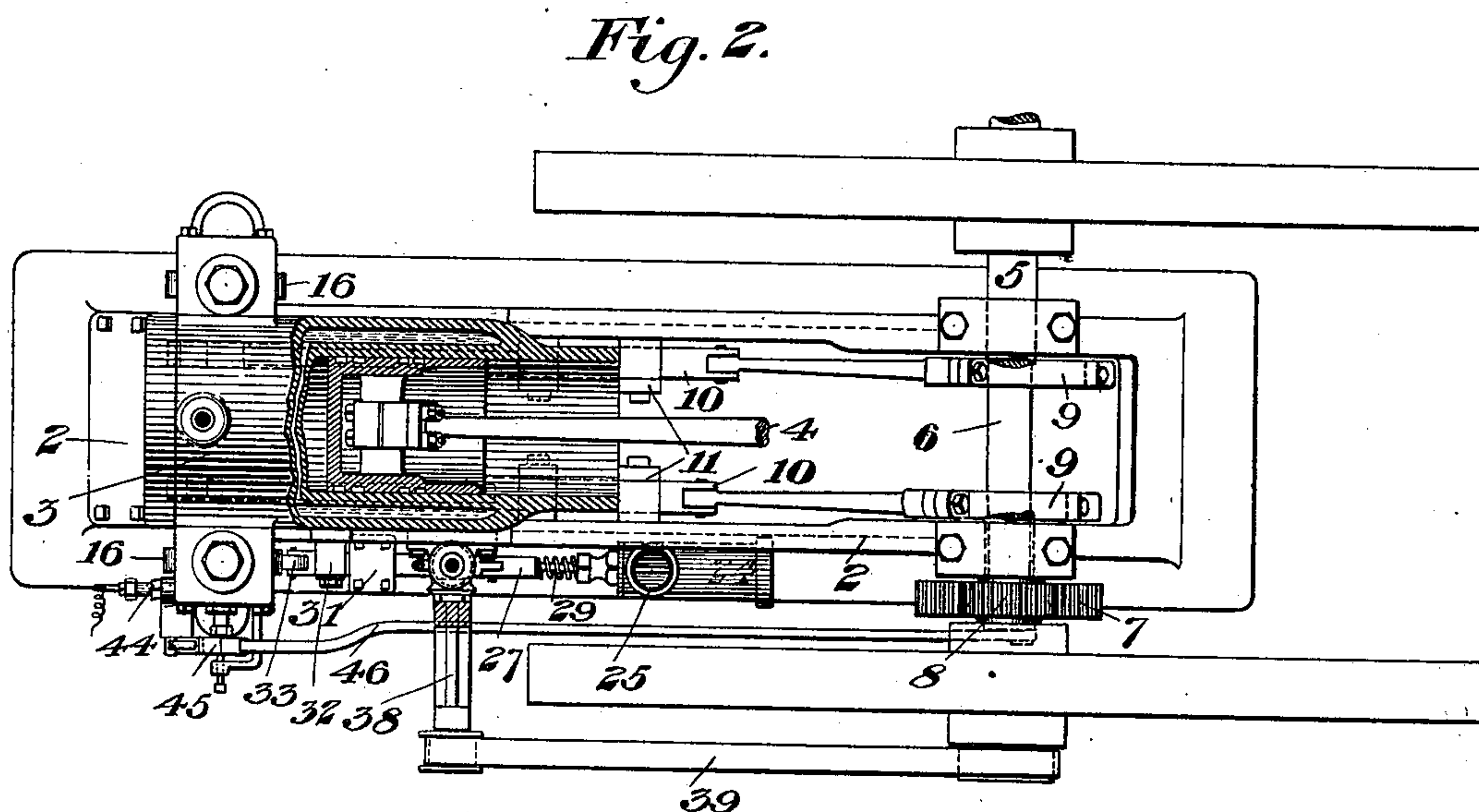
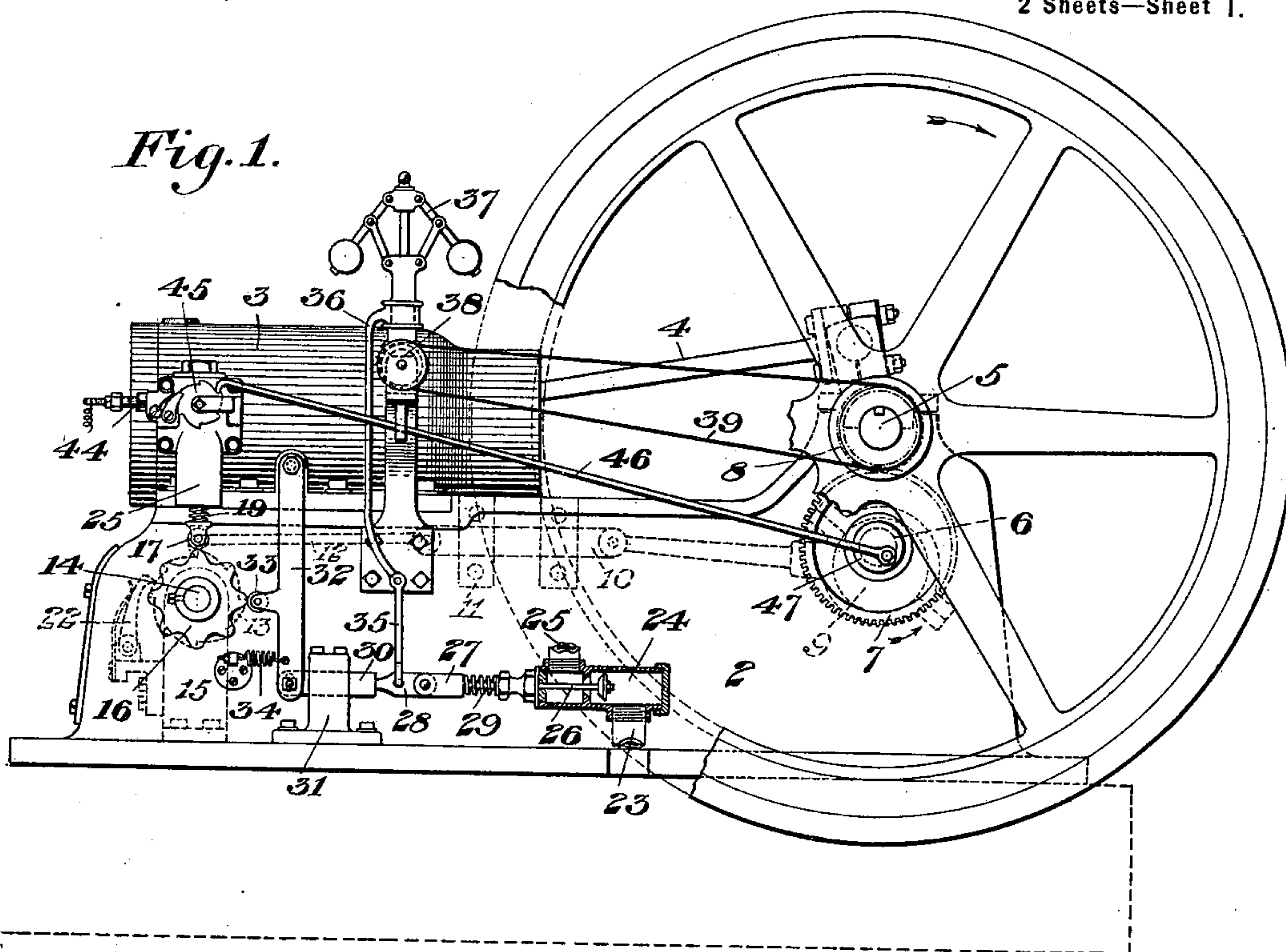
R. NUTTALL, SR. & R. NUTTALL, JR.

GAS ENGINE.

(Application filed Mar. 28, 1898, .

: No Model.)

2 Sheets—Sheet 1.



WITNESSES

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2 Sheets—Sheet 2.

Fig. 3.

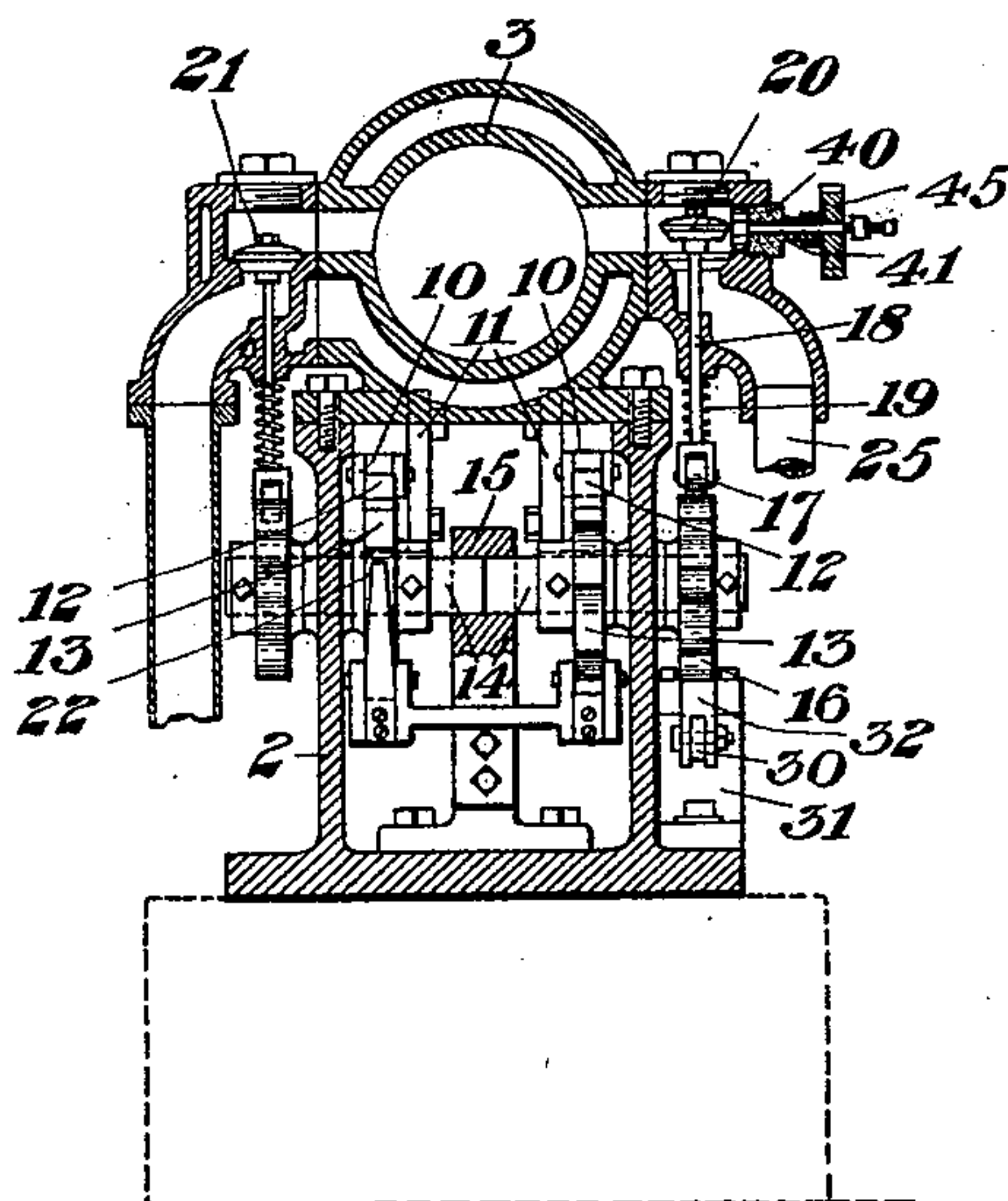


Fig. 4.

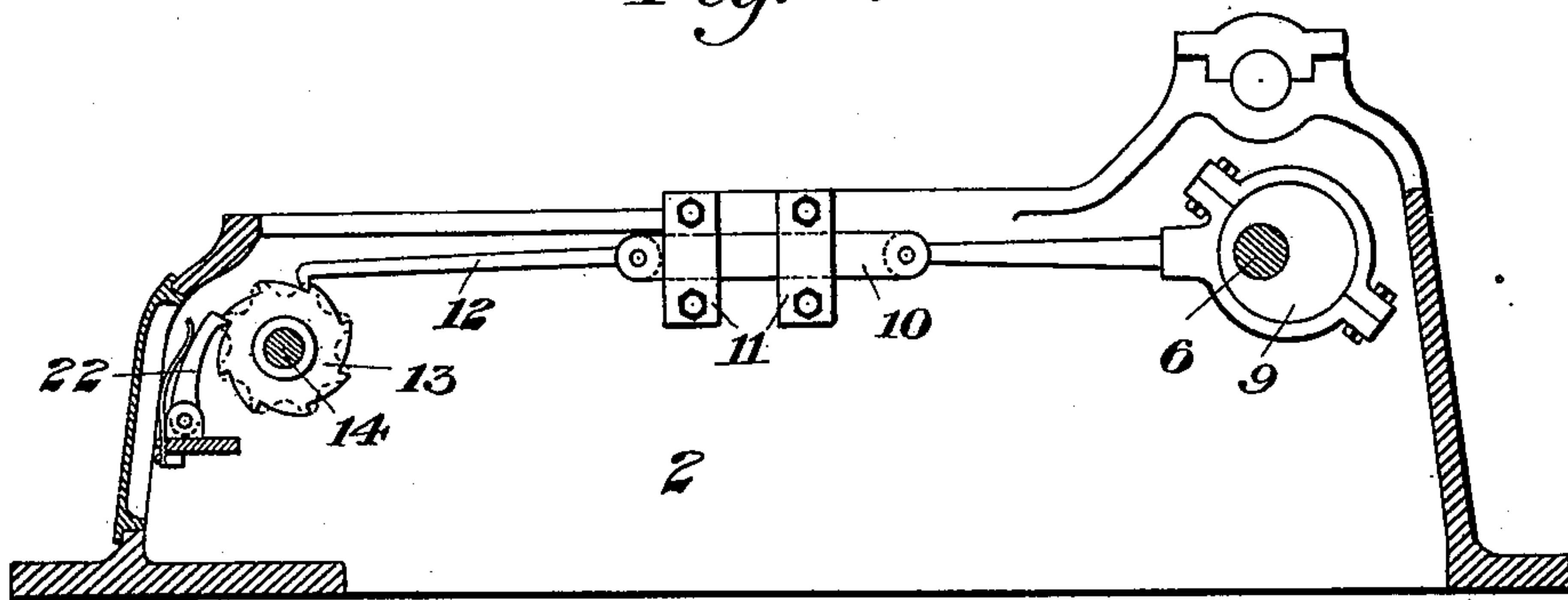
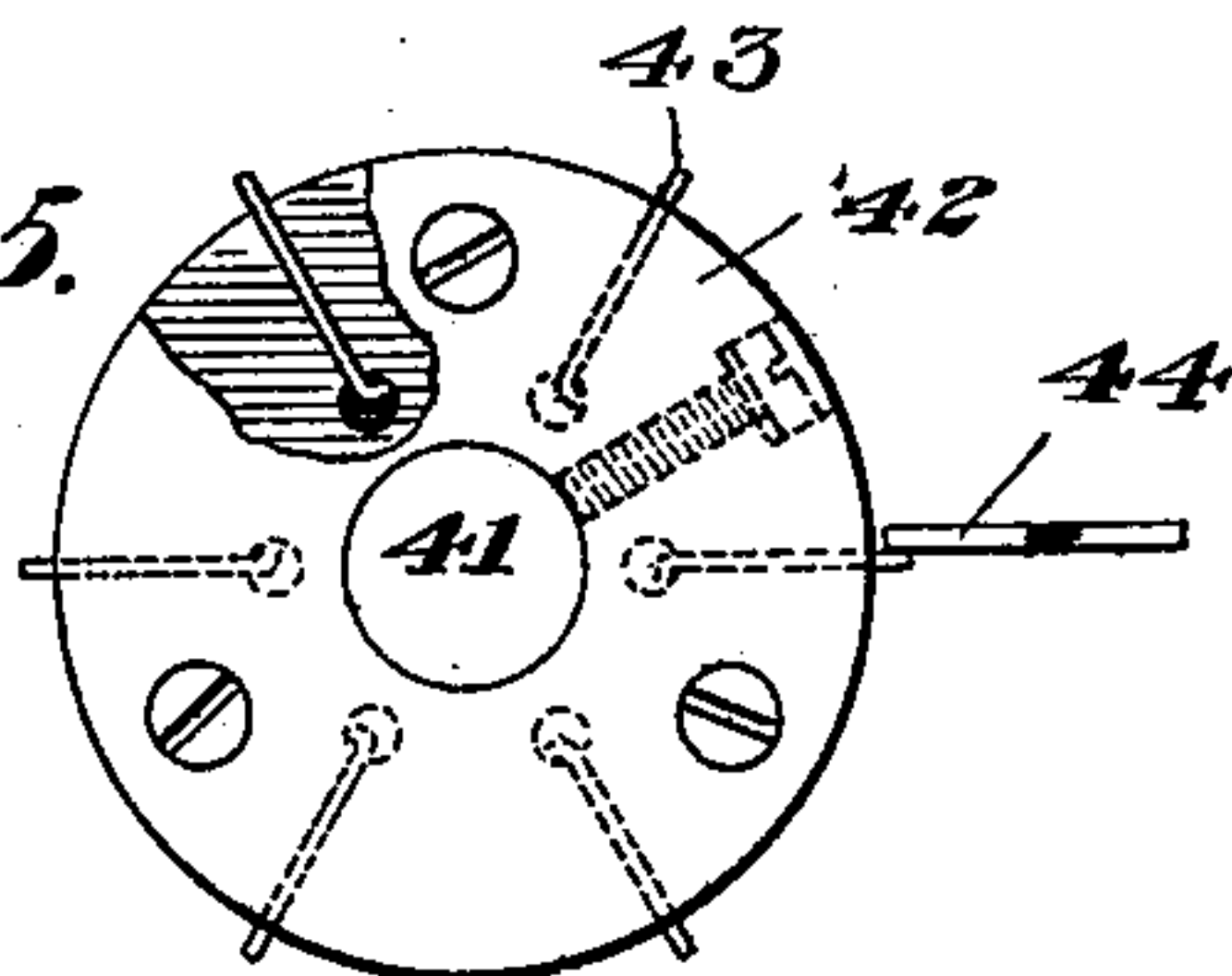


Fig. 5.



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UNITED STATES PATENT OFFICE

RICHARD NUTTALL, SR., AND RICHARD NUTTALL, JR., OF ALLEGHENY,
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GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 631,224, dated August 15, 1899.

Application filed March 28, 1898. Serial No. 675,412. (No model.)

To all whom it may concern:

Be it known that we, RICHARD NUTTALL, Sr., and RICHARD NUTTALL, Jr., of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Gas-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation, partly in section, of our improved gas-engine. Fig. 2 is a top plan of the same, partly broken away. Fig. 3 is a transverse section showing the arrangement of the inlet and exhaust valves. Fig. 4 is a broken longitudinal section showing the mechanism within the bed-plate, and Fig. 5 is a detail view of the rotary electrode.

Our invention relates to gas-engines, and is designed to provide an improved construction of the connections for actuating the inlet and exhaust valves, as well as for actuating the gas-supply valve. It consists, further, in an improved governor of the knock-off type and an improved arrangement of the igniter system.

In the drawings, 2 represents the hollow bed-plate, upon which is carried the cylinder 3, whose piston-rod 4 is connected to the crank-shaft 5 of the engine. Carried in the bed-plate directly beneath the crank-shaft is a counter-shaft 6, having a toothed wheel 7 intermeshing with a pinion 8 upon the crank-shaft, the ratio of these wheels being two to one. Within the bed-plate the shaft 6 is provided with two eccentrics 9 9, whose rods are connected to slides 10, moving in suitable guides 11, secured to the interior of the bed-plate. To each of these slides is pivoted a hook-pawl 12, which engages a ratchet-wheel 13, mounted upon a shaft 14, the two shafts 14 being in line with each other and extending through the bed-plate in opposite directions, while their inner ends are carried in a common bearing 15. To the outer end of each shaft 14 is secured a cam-wheel 16, upon which rides a roller 17, carried at the lower end of a valve-stem 18, the roller being held in contact with the wheel by a spiral spring 19, surrounding the valve-rod.

Referring to Fig. 3, 20 is the inlet-valve,

and 21 the exhaust-valve, each valve having the actuating connections above described. The ratchet-wheels and the cam-wheels are secured to the short shafts 14 by set-screws or similar devices, so that they may be readily adjusted around these shafts to actuate the valves at exactly the proper moment. The ratchet-wheels are retained in their successive positions by spring-pressed pawls 22 engaging their teeth.

The gas-supply pipe 23 leads to a valve-chamber 24, which is connected by a pipe 25, which leads through a mixer (not shown) to the inlet-valve chamber. Within the inlet-valve chamber 24 is a reciprocating valve 26, whose rod projects through the end of the chamber and is provided with a yoke 27, to which is pivoted a swinging latch 28. The valve is normally held closed by a spiral spring 29 and is opened by a slide 30, moving in suitable bearings 31 and having loose connection with a lever 32, pivoted to the upper part of the bed-plate and carrying a roller 33, which bears upon the cam-wheel 16. A spring 34 holds the roller in contact with the wheel. Connected to the latch 28 is a pivoted link 35, which at its other end is connected to a bent rod 36, secured to the sliding sleeve of a centrifugal ball-governor 37, mounted upon the engine-frame. The ball-governor is actuated by a bevel-gear connected with a shaft 38, connected by a belt 39 with the main crank-shaft.

Above the inlet-valve 20, at the outer end of the passage leading therefrom to the cylinder, is a screw-plug 40, through which extends the shaft 41, which carries at its inner end a rotary electrode 42, provided with a series of radial blades 43, which contact successively with the electrode 44 to produce the igniting-spark. The shaft 41 is rotated intermittently by a ratchet-wheel 45, secured to its outer end and engaged by the hooked end of the long rod 46, pivoted to a crank-disk 47, secured to the counter-shaft 6. We have shown in the drawings the parts in the position which they assume near the end of the taking in of the explosive charge.

The operation of the engine will be apparent to those skilled in the art. The counter-shaft 6, through the internal pawl-and-ratchet mechanism, rotates the shafts 14 intermit-

tently, and as the shaft 14, carrying the cam-wheel for the inlet-valve, rotates it lifts the inlet-valve and at the same time, through the lever 32 and its connections, opens the gas-supply valve 26. After the roller of the inlet-valve passes the top of the tooth upon the cam-wheel the spring operates to quickly close this valve. The charge then being drawn into the cylinder by the rearward motion of the piston is compressed upon the forward stroke of the piston and then ignited by the partial rotation of the electrode 42 through the pawl-and-ratchet connection with the counter-shaft 6. The piston being driven rearwardly by the exploding charge the exhaust-valve is lifted by the cam-wheel and the burned gases forced out during the forward throw of the piston. This completes the cycle of operations, which are then repeated. If the speed of the engine exceeds a certain predetermined limit, the governor 37 will lift the latch 28 into such a position that the slide 30 will not contact with it, thus keeping the gas-supply valve closed to prevent a supply of the explosive mixture to the cylinder. As soon as the speed is thus reduced the parts return to their normal position, and the operation goes on as before.

The advantages of our invention result from the construction of the connections for actuating the valves. The eccentric-rods and their pawl-and-ratchet connections being within the bed-plate do not interfere with the placing of the other parts and may be reached through a hole in the end of the bed-plate closed by a plate, as shown. As the cam-wheels are adjustably secured to their shafts, they may be accurately adjusted to bring them into the proper relation to the crank and other parts. The single cam-wheel serves to actuate both the inlet-valve and the gas-supply valve and simplifies the construction.

Springs may be used to hold the hook-pawls in position, though these are not necessary, as the weight of the pawls keeps them in proper place.

The general construction of the engine, the igniter, and the other parts may be va-

ried widely without departing from our invention, since—

What we claim is—

1. In a gas-engine, the combination with a main shaft, of a counter-shaft geared thereto, eccentrics upon the counter-shaft connected to pawls, separate shafts having ratchet-wheels engaged by the pawls, cam-wheels mounted upon said shafts, and inlet and exhaust valves having stems bearing upon the cam-wheels; substantially as described.

2. In a gas-engine, the combination with a main shaft, of a counter-shaft geared thereto and having an eccentric connected to a slide, a hooked pawl-rod pivoted to the slide, a short shaft having a ratchet-wheel engaged by the pawl, a cam-wheel upon the shaft, and a valve having a stem bearing upon the cam-wheel; substantially as described.

3. In a gas-engine, the combination with a hollow bed-plate, of a counter-shaft mounted therein and connected to the main shaft, eccentrics upon the counter-shaft within the bed-plate and connected to slides, hooked pawl-rods pivoted to the slides, and shafts having pawl-wheels within the bed-plate engaged by the pawls, said shafts having external cam-wheels bearing upon the stems of the cylinder-valves; substantially as described.

4. In a gas-engine, an inlet-valve having a stem bearing upon a cam-wheel, a gas-supply valve having a swinging latch actuated by a slide connected to a lever also bearing on the cam-wheel, and a governor connected to the latch; substantially as described.

5. In a gas-engine, a pair of shafts located end to end, each shaft having a cam-wheel and a ratchet-wheel, cylinder-valves having stems bearing on the cam-wheels, and a counter-shaft having actuating connections with the ratchet-wheels; substantially as described.

In testimony whereof we have hereunto set our hands.

RICHARD NUTTALL, SR.
RICHARD NUTTALL, JR.

Witnesses:

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G. B. BLEMMING.