No. 640,018. Patented Dec. 26, 1899.

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

GAS ENGINE.

(Application filed Mar. 2, 1899.)

(No Model.) 3 Sheets—Sheet 1.

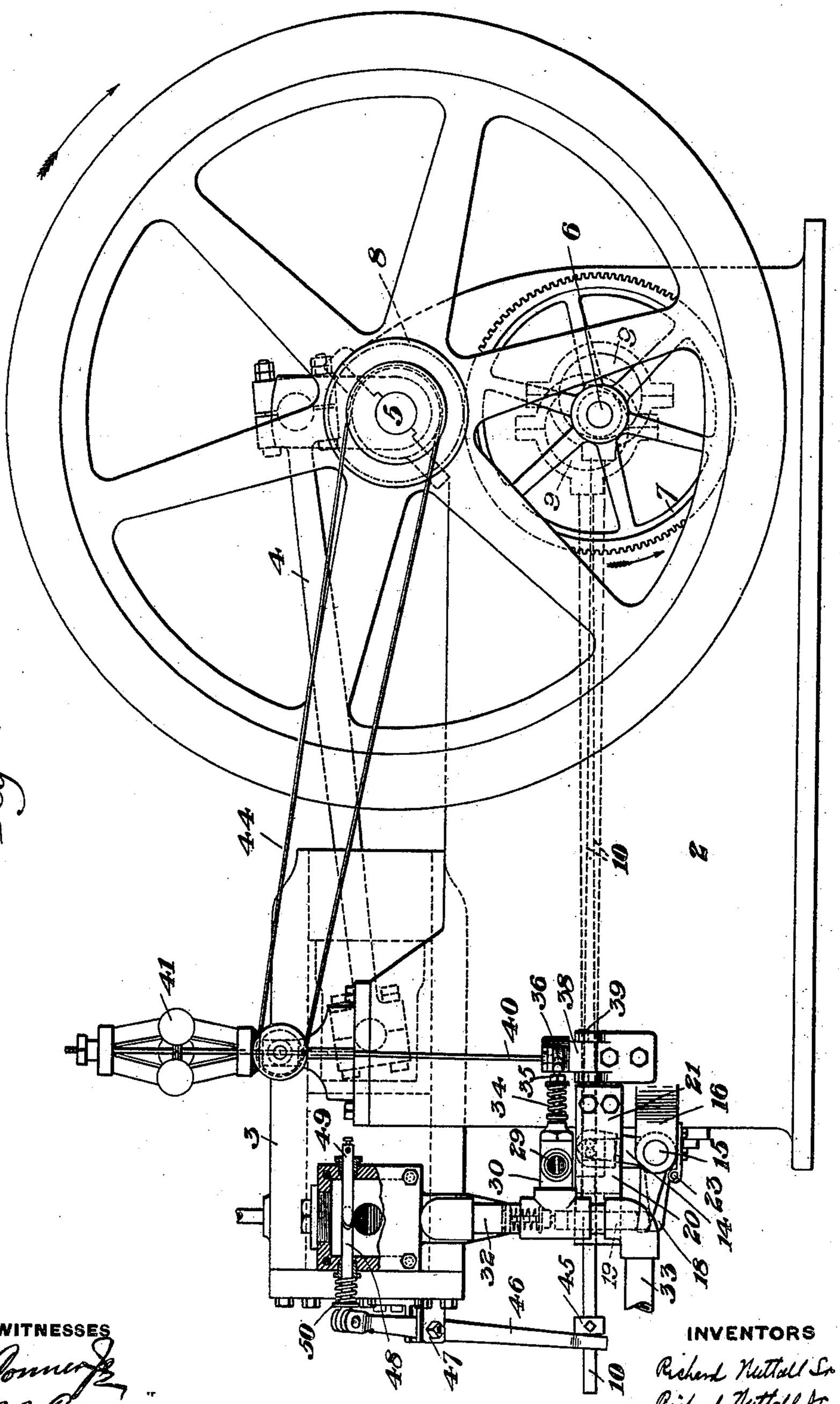

Fig. 1.

WITNESSES

L. A. Connerly
H. M. Conwin

INVENTORS

Richard Nuttall Sr.
Richard Nuttall Jr.
by Bakewell & Bakewell
Their Attys.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

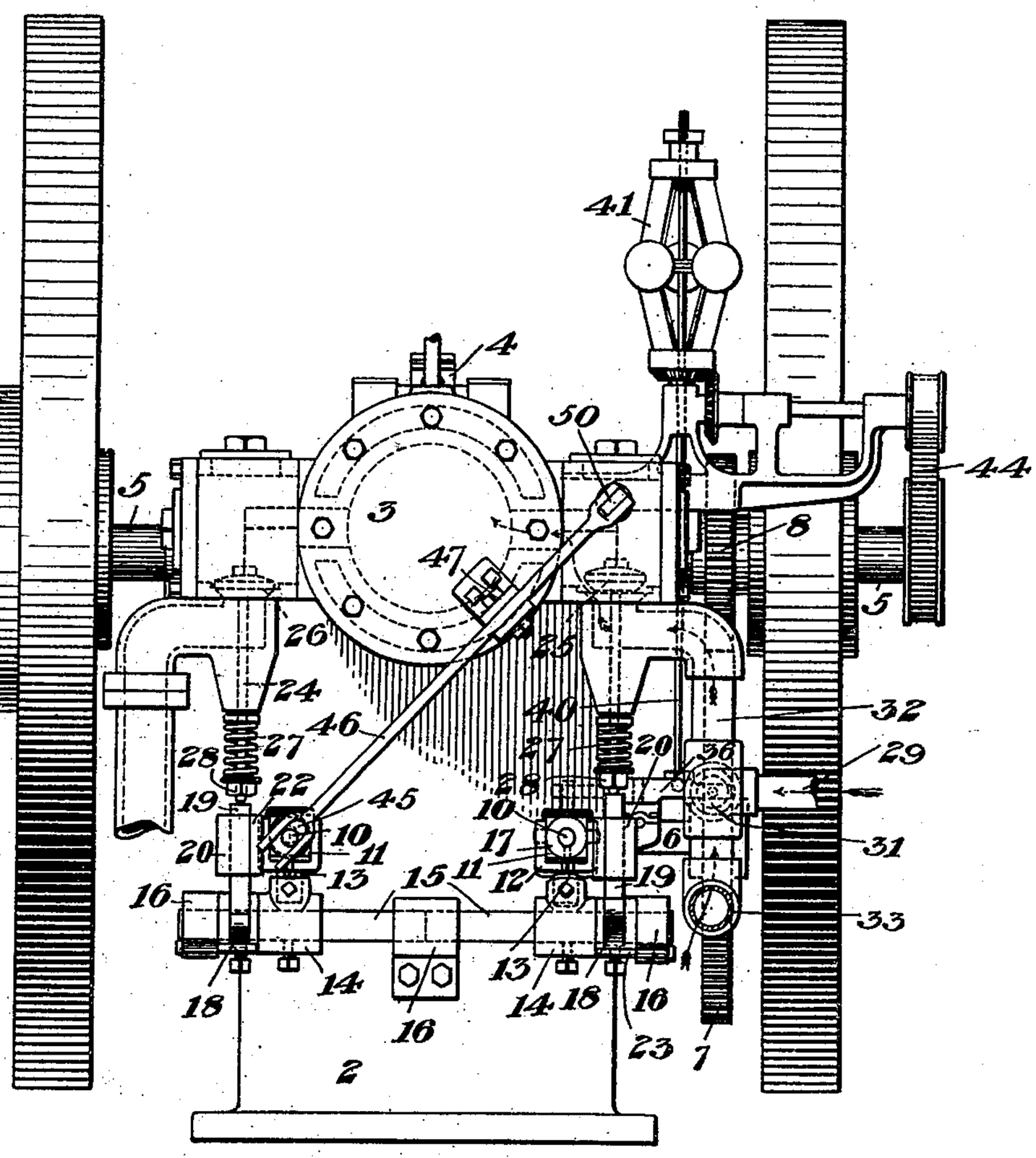
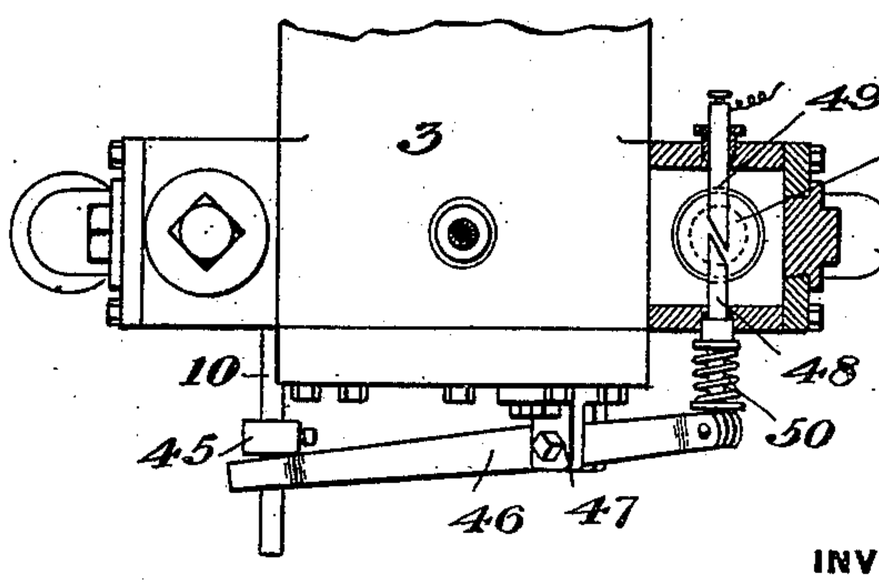


Fig. 3.



WITNESSES

L. A. Somers

A. M. Connor

INVENTORS

Richard Nuttall Sr

Richard Nuttall Jr

by Burwell & Burwell

their attys

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(No Model.) 3 Sheets—Sheet 3.

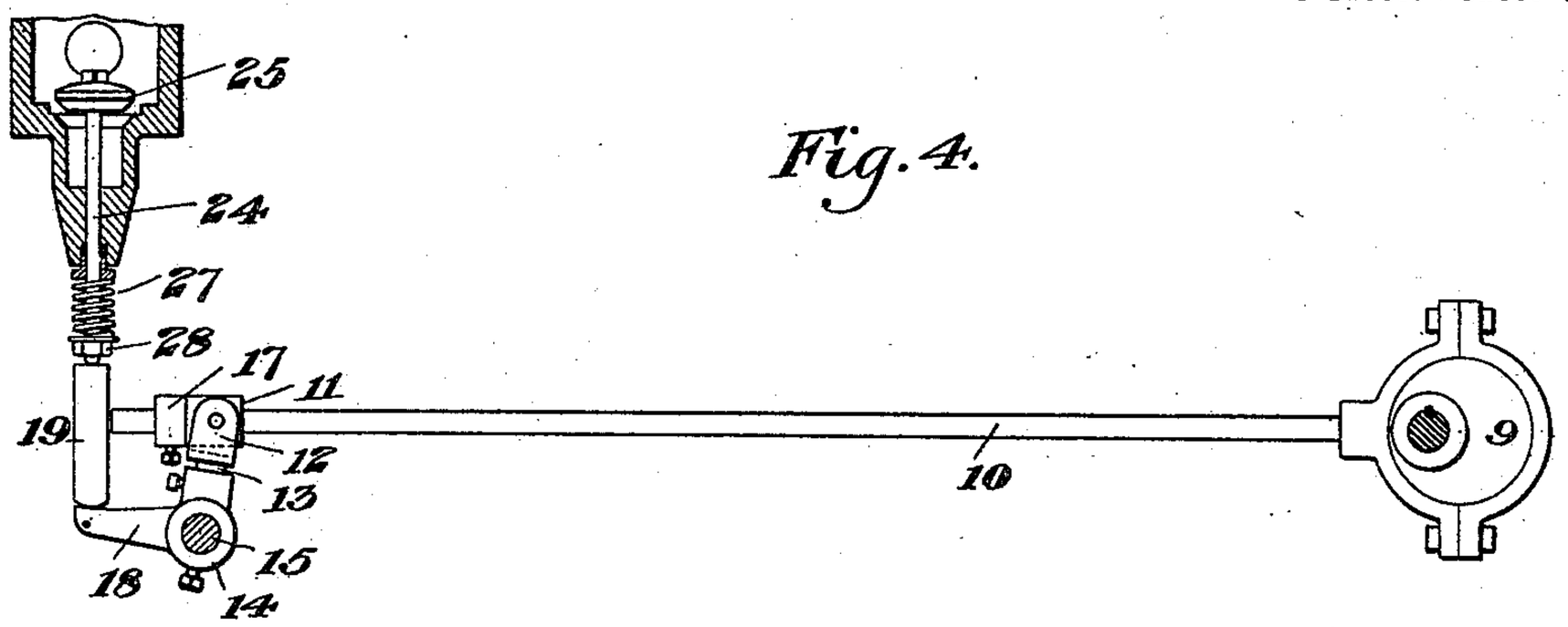


Fig. 4.

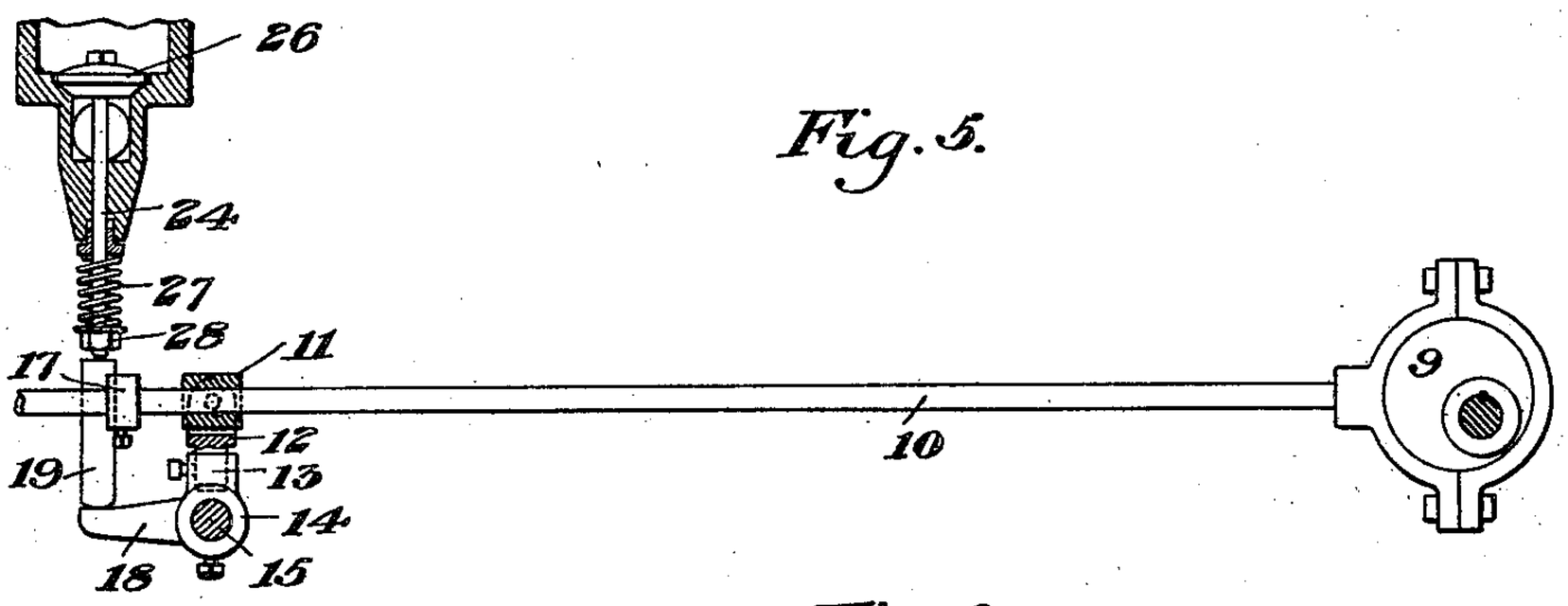


Fig. 5.

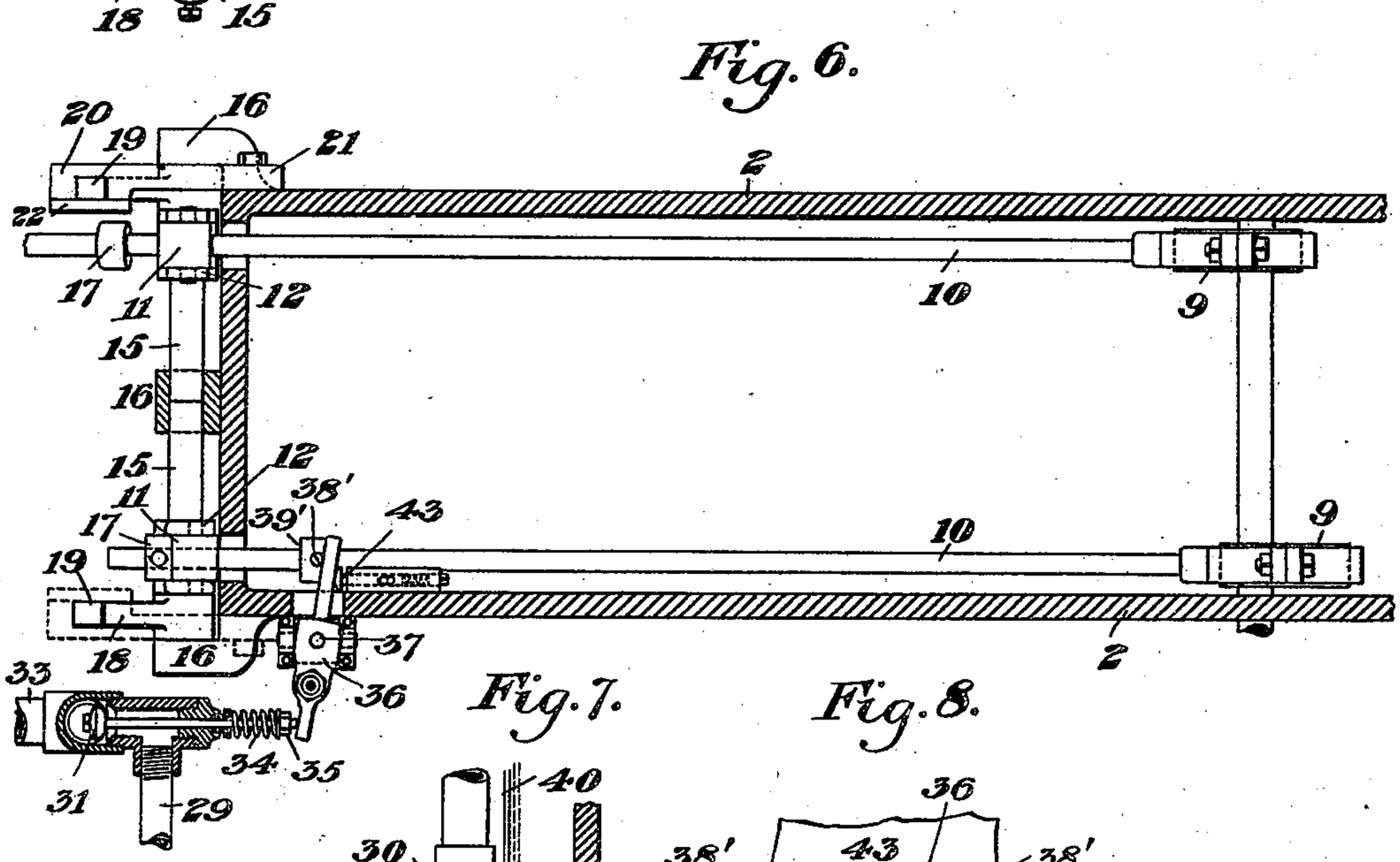


Fig. 6.

Fig. 7.

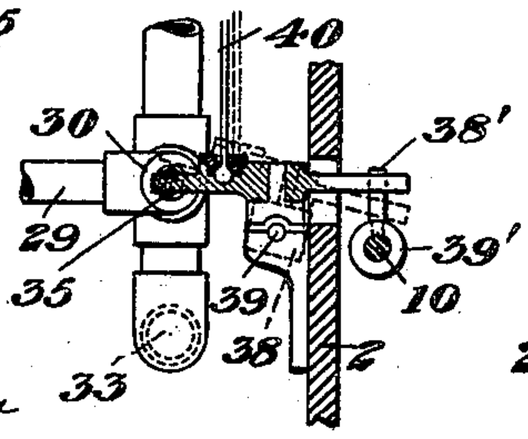
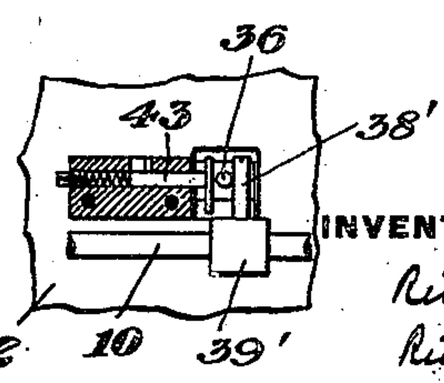


Fig. 8.



WITNESSES

L. A. Connell Jr.
A. M. Connell

INVENTORS

Richard Nuttall Sr
Richard Nuttall Jr
by Bakewell & Bakewell
their attys.

UNITED STATES PATENT OFFICE.

RICHARD NUTTALL, SR., AND RICHARD NUTTALL, JR., OF ALLEGHENY, PENNSYLVANIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 640,018, dated December 26, 1899.

Application filed March 2, 1899. Serial No. 707,466. (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 broken away, of a gas-engine constructed in accordance with our invention. Fig. 2 is an end elevation of the same. Fig. 3 is a partial plan view of the end of the cylinder, partly broken away on the inlet side to show the igniter. Figs. 4 and 5 are detail views of the valve mechanism, showing the inlet and outlet valves in the same position as in Figs. 1 and 2. Fig. 6 is a partial plan view showing the valve mechanism, and Figs. 7 and 8 are detail views of the knock-off governor connections.

Our invention relates to gas-engines, and is designed to improve and simplify the actuating connections for operating the inlet and exhaust valves and also the igniter mechanism, and, further, to provide a new and improved type of knock-off governor for gas-engines.

In the drawings, 2 represents a hollow bed-plate carrying the cylinder 3, the piston-rod 4 of which 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 10 10 extend through slots in the front end of the bed-plate and through rocking blocks 11, trunnioned within yokes 12, mounted on stems 13, adjustably secured within arms projecting from collars 14, adjustably secured to short shafts 15. These short shafts are placed end to end and mounted in bearings 16 in front of the bed-plate. The front end portions of the eccentric-rods are provided with adjustable collars or projections 17, arranged to contact with the rocking blocks 11 on the back stroke of the rods and rock the shafts, and thereby the lifter-arms 18, secured to the outer portions of the short shafts next to their outer bearings.

The lifter-arms 18 contact with the lower ends of vertically-reciprocating slides 19, moving in recesses of brackets 20, secured to the bed-plate at 21 and held in place by cover-plates 22. The downward motion of the arms 18 is limited by suitable stops 23. The upper ends of the slides 19 contact with the lower ends of the stems 24 of the inlet-valve 25 and the exhaust-valve 26 in lifting these valves, and when the valves are closed the upper ends of the slides are slightly below the lower ends of the stems, as shown in Figs. 5 and 2. The use of the separate slide, which releases slightly from the valve-stem after the valve is seated, insures the correct seating of the valve and enables a correct parallel lift to be imparted to the valve-stem, any tipping tendency being taken up in the slide. The stems of both valves are provided with springs 27, extending between the lower end of the valve-chambers, and nuts 28, secured to the valve-stems.

The gas-supply pipe 29 leads to a valve-chamber 30, having a port controlled by valve 31, which leads to the vertical mixing-chamber 32, into which chamber leads the air-supply pipe 33. The stem of the valve 31 extends through the end of the chamber and is provided with a spring 34, bearing against a nut 35. The valve 31 is actuated by the outer end of a swinging lever 36, fulcrumed at 37 to a rocking block 38, mounted on horizontal trunnions 39, carried in brackets secured to the side of the bed-plate. This lever is swung horizontally to open the gas-supply valve 31 by means of a pin 38′, projecting vertically from a collar 39′, adjustably secured to the eccentric-rod 10, which actuates the inlet-valve, and the lever is tilted vertically by a vertical rod 40, leading from the governor 41 and having a ball-and-socket connection 42 with the outer arm of the lever. A spring-actuated slide 43 is arranged to act upon the inner arm of the lever in opposition to the pin 38′ to return the lever to its normal inop-

erative position. The governor is driven by the usual belt connection 44 from the crank-shaft.

The eccentric-rod 10, which operates the exhaust-valve, is extended beyond the collar 17 and provided with a second adjustable collar 45, which is arranged to contact with the forked end of a lever 46, extending in an inclined position across the front end of the engine and fulcrumed in bracket 47. A sliding electrode 48 is loosely connected with the upper end of the lever 46 and is suitably beveled at its inner end to engage with the corresponding bevel upon the other stationary electrode 49. The electrode 48 is moved outwardly by a spring 50, bearing against a suitable collar thereon, and one of the electrodes is suitably insulated and provided with electrical connections.

The operation is as follows: The countershaft being rotated reciprocates the eccentric-rods, and these rods slide freely through the rocking blocks 11, the eccentrics being so arranged that the collar upon one of the rods will contact with the rocking block in the backward movement of the eccentric and lift the inlet-valve at the proper moment, as shown in Fig. 4. During the period that this valve is open the charge is drawn into the cylinder by the rearward motion of the piston, the gas-supply valve having been opened at the same time by means of the pin 38′. The charge is compressed on the forward stroke of the piston and then ignited by breaking contact between the two electrodes, the collar 45 having released the actuating-lever 46. The piston being driven rearwardly by the exploding charge, the exhaust-valve is lifted by the collar 17 upon the rearward movement of the other eccentric-rod and the burned gases are forced out during the forward throw of the piston. This completes the cycle of operation.

If the speed of the engine exceeds a predetermined limit, the rod 40 will be lifted by the governor and will tilt the lever 36 while in its loose inoperative position into the position shown in dotted lines in Fig. 7. In this position the lever will be swung horizontally by the pin 38′ on one of the eccentric-rods, but will not contact with the stem of the gas-supply valve, it passing over it and then being moved back to normal position by the spring-pressed pin 43. The gas-supply valve will thus remain closed and prevent the supply of explosive mixture to the cylinder. As soon as the speed is thus reduced the lever 36 will swing back to its normal horizontal position and the gas-supply valve will be actuated simultaneously with the inlet-valve, as before.

The amount of lift of either valve may be varied by adjusting the stem of the rock-block 11 within the arm of the short shaft, and the time of opening and closing is changed by adjusting the collars along the eccentric-rods.

The advantages of our invention result from the simplifying of the connections between the valves and their actuating mechanism and from the peculiar governor mechanism and connections, the number of parts being greatly reduced. The engine may therefore be cheaply made and assembled and is not liable to get out of order.

The projections or collars upon the eccentric-rods may be arranged to push rather than pull the rock-arms actuating the short shafts, and many other variations will suggest themselves to those skilled in the art without departing from our invention.

We claim—

1. A gas-engine having a rock-shaft arranged to actuate a valve, a projecting arm on the shaft having a rocker-block and an eccentric-rod arranged to slide loosely through the block, and a projection adjustable along the rod and arranged to swing the rock-shaft in one direction; substantially as described.

2. A rock-shaft having actuating connections with a valve, an arm projecting from the shaft, said arm being adjustable in length, and a rod arranged to slide loosely along the arm and having a projection arranged to actuate the same; substantially as described.

3. A gas-engine having a rock-shaft arranged to actuate a valve, a hollow arm projecting from the shaft, a stem adjustably mounted in the hollow arm and having a rock-block carried thereon, and a reciprocating rod extending loosely through the block and having projections arranged to strike the block and swing the rock-shaft; substantially as described.

4. A gas-engine, having a lever mounted upon a universal joint and normally arranged to actuate the gas-supply valve, and a governor having a loose connection with the lever arranged to tilt it out of its operative position; substantially as described.

5. A gas-engine having a lever mounted on a universal joint arranged to normally actuate the gas-supply valve, a reciprocating rod having a projection arranged to swing the rod in one direction, and a governor having a connection arranged to tilt the lever out of the plane in which it normally swings; substantially as described.

6. A gas-engine having a lever mounted on a universal joint, one end of the lever being arranged to normally contact with the end of the gas-supply valve to open it, a reciprocating rod having a projection arranged to swing the lever in one direction, a spring-pressed pin arranged to return the lever to its normal loose position, and a governor having a connection arranged to swing the lever out of the plane through which it normally moves; substantially as described.

7. A gas-engine having an eccentric-rod provided with a projection, a movable arm with which the projection contacts, a gas-supply valve arranged to be normally operated by the arm, and a governor having a loose connection with the arm arranged to swing it out of its normal plane of movement; substantially as described.

In testimony whereof we have hereunto set our hands.

RICHARD NUTTALL, SR.
RICHARD NUTTALL, JR.

Witnesses:
F. E. GAITHER,
G. B. BLEMMING.