No. 653,040. Patented July 3, 1900.

T. B. ROYSE.

GAS ENGINE.

(Application filed June 14, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. I.

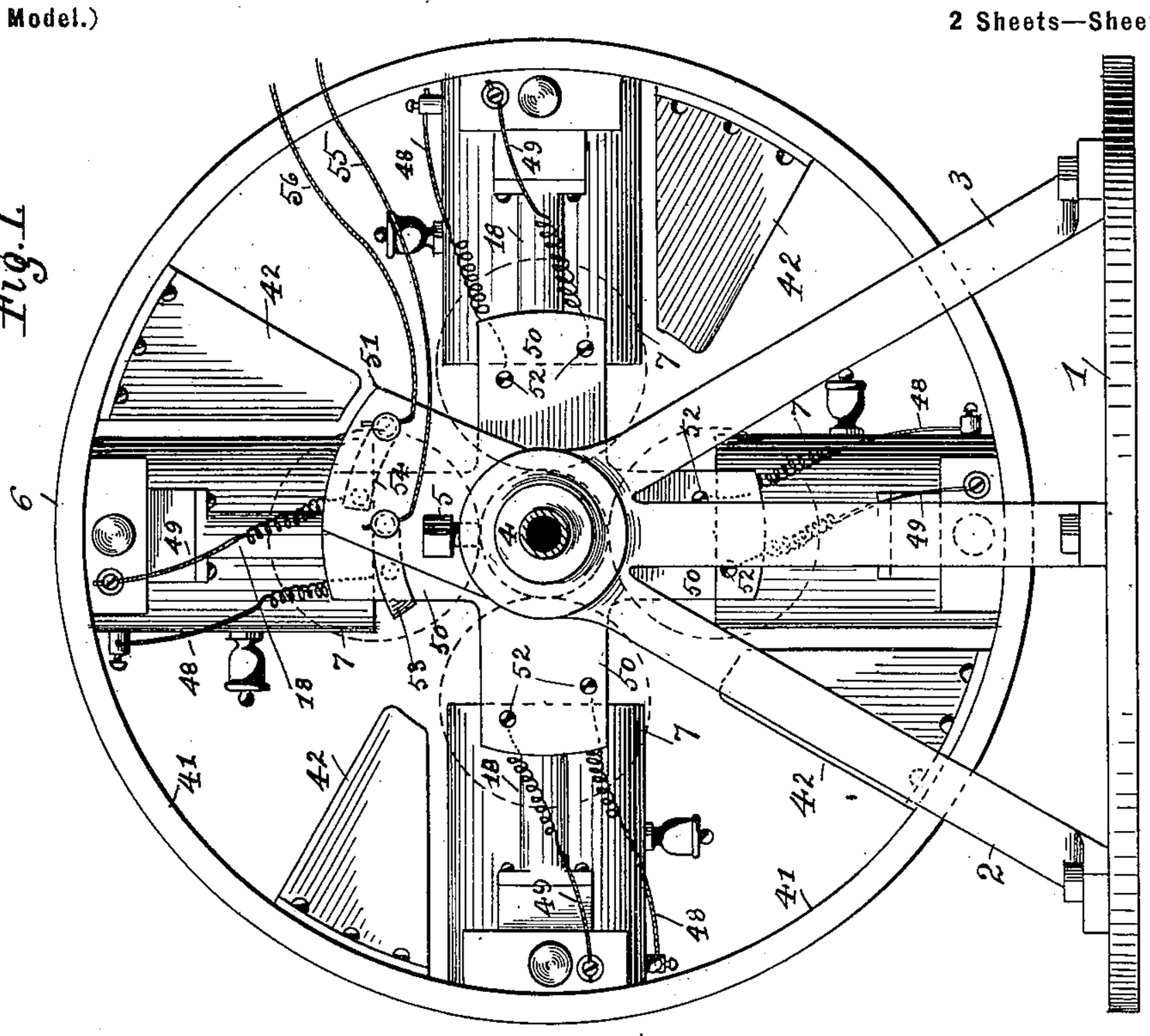

Fig. II.

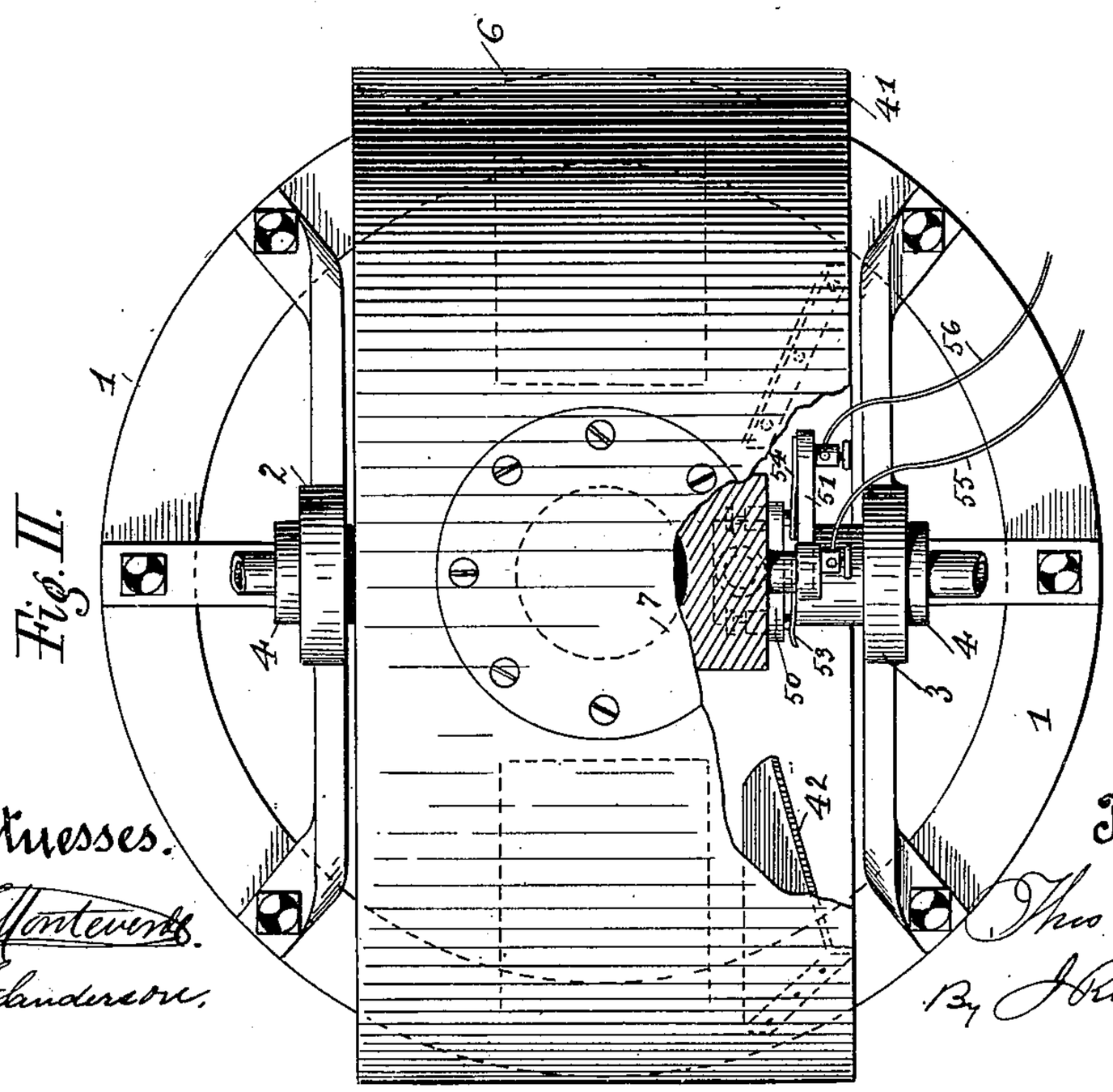

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Fig. III.

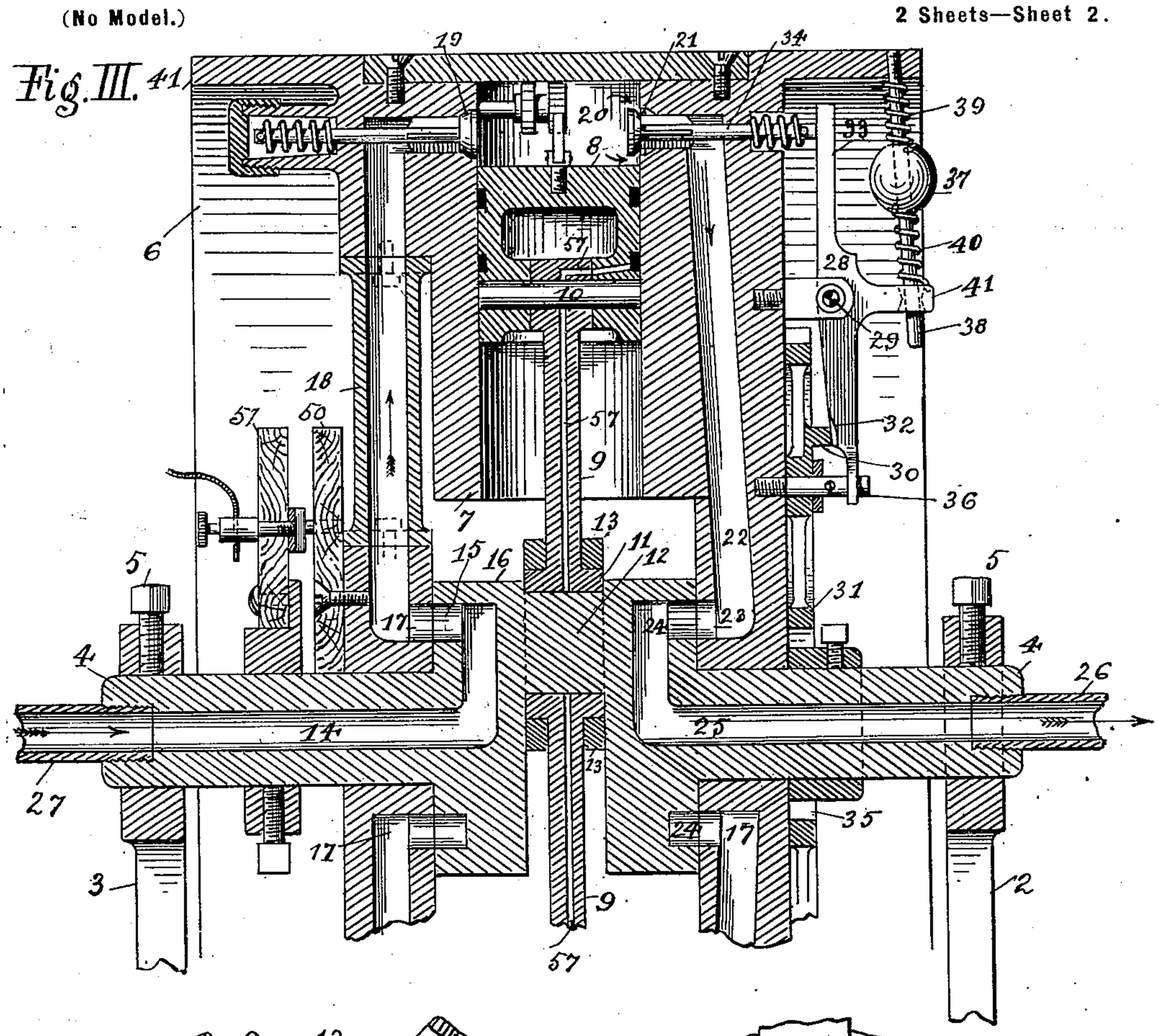


Fig. V.

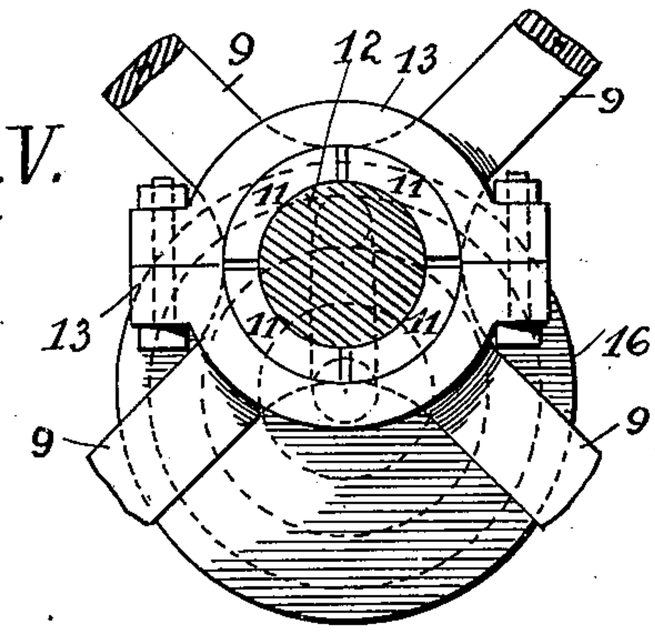
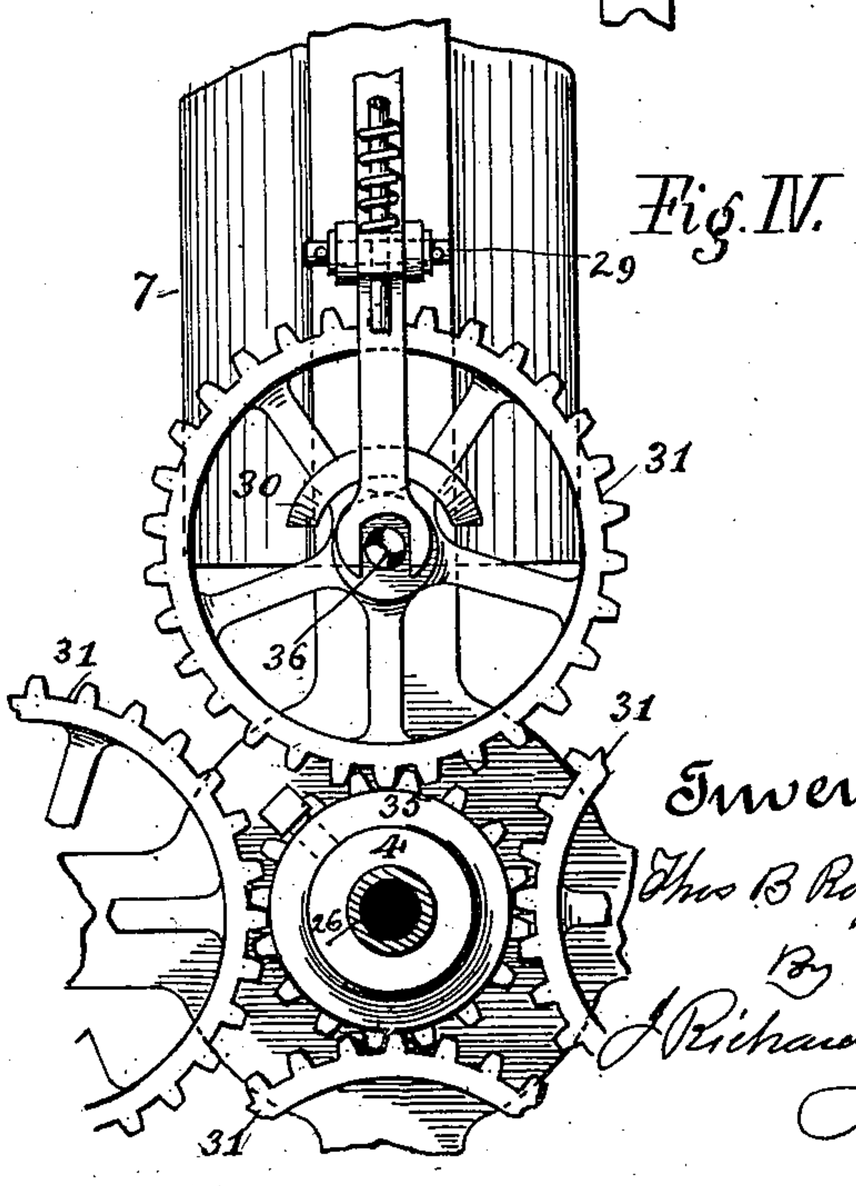


Fig. IV.



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UNITED STATES PATENT OFFICE.

THOMAS B. ROYSE, OF SAN MIGUEL, CALIFORNIA, ASSIGNOR OF ONE-HALF TO THOMAS J. HENNESSEY, OF SAME PLACE, AND HENRY HEIDLAND, OF SAN FRANCISCO, CALIFORNIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 653,040, dated July 3, 1900.

Application filed June 14, 1898. Serial No. 683,421. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. ROYSE, a citizen of the United States, residing at San Miguel, county of San Luis Obispo, and State of California, have invented certain new and useful Improvements in Gas-Engines; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to certain improvements in motive engines impelled by gas or other fuel adapted for internal combustion and to constructing such engines with multiple cylinders for objects hereinafter explained.

My improvements consist in the employment of several or multiple cylinders, the pistons of which are connected to a stationary crank-shaft and to revolve about the same, the crank being eccentric to the axis of rotation and the cylinders attached to and revolving with an outer wheel or drum having its bearings upon the crank-shaft, and also consist in various devices of a constructive and operative nature accessory to and forming parts of the complete engine.

The objects of my invention are to secure by multiple cylinders a more uniform turning strain upon the crank than is possible when one or two cylinders are employed, to render such engines more compact and at high speed and free from vibration caused by the reciprocating weights, to dispense with a fly-wheel, and for other objects that will be more fully pointed out in connection with the drawings herewith and forming a part of this specification.

Referring to the drawings, Figure I is a side elevation of a gas or internal-combustion engine having four motive cylinders and constructed according to my invention. Fig. II is a partial plan view of the same engine. Fig. III is a partial central section of the same engine parallel to the axis of rotation. Fig. IV is a broken view in elevation of the gearing to operate the eduction-valves. Fig. V is a section through the crank-pin, showing in side view the manner of attaching the connecting-links thereto.

The framing of the engine consists of a circular base-plate 1, annular in form, having the tripod standards 2 and 3 fastened thereto, the crank-shaft 4, which is stationary, being held in these standards and fastened by the screws 5, as seen in Fig. III.

Surrounding the crank-shaft 4 and loosely mounted thereon is a wheel or drum 6, constituting the main member of the operating parts and forming a support for the cylinders 7, also serving as a pulley from which the power of the engine can be transmitted by a band. The cylinders 7 (here shown four in number) can be bolted to the drum 6 or cast integral therewith, as shown in Fig. III. These cylinders 7 are set radial with respect to the axis of revolution and are provided with pistons 8 and connecting-links 9 in the usual manner. The links 9 are attached to the cross-pin 10 in the pistons 8 and at the other end are provided with segmental bearings 11, held against the crank-pin 12 by the collars 13, which embrace the bearings 11 of all the links 9, as seen in Fig. V.

The operating fluid or fuel, mingled with air, is admitted through the pipe 27 and passage 14 in the center of the crank-shaft 4, then enters the annular chamber 15, formed in the crank-plate 16, then passes through apertures 17 in the nave of the drum 6, up through the side pipes 18, and is drawn through the automatic induction-valves 19 into the combustion-chambers 20. After combustion and acting on the piston 8 the residual gases are expelled through the eduction-valves 21, passages 22, and apertures 23 into the chamber 24 and from thence through the passage 25 in the center of the crank-shaft 4 and escape by the waste-pipe 26, as seen in Fig. III. The side pipes 18 are made removable, so the crank 16 can be inserted and the various parts of the engine put together.

The eduction or outlet valve 21 is operated by an oscillating lever 28, pivoted at 29, moved by a curved helical cam 30 on the gear-wheel 31, which cam engages the oblique face 32 on the lever 28 and presses it outward so the upper end 33 will bear upon and move the stem 34, opening the valve 21 accordingly.

The wheel 31 meshes into the pinion 35, fas-

tened on the crank-shaft 4, and the number of teeth in these wheels 31 and 35 are so proportioned that while the wheel 31 makes one revolution bodily around the crank-shaft 4 it will make one-half of one complete revolution on its own axis 36, and thus operate the valve 21 in conformance to the four-cycle system.

Regulation of the engine's speed is performed by a centrifugal weight 37, that slides on the rod 38, a spring 39 opposing the outward movement of this weight 37 and a second spring 40 connecting it to the stem 41 of the lever 28, so that when the speed of the engine exceeds its predetermined rate the weight 37 moves outward on the rod 38, compressing the spring 39 and by extending the spring 40 raises the stem 41 and presses the end 33 of the lever 28 inward against the stem 34, holding the valve 21 open, permitting free circulation through this valve and preventing a vacuum in the combustion-chamber 20, so that no gas or fuel is drawn in through the valve 19 and the stroke is cut out or is made without combustion or impulse. When the speed is sufficiently reduced, the weight 37 moves inward and the lever 28 resumes its regular function.

The various devices and parts explained in connection with the induction and eduction of fuel or gases and air are quadruple and the same for each of the cylinders 7.

On the interior of the projecting rim 41 of the drum 6 I provide oblique air-vanes 42, that act in the manner of a propeller or rotary ventilator that drives a current of cool air through the drum 6 parallel to its axis, and thus protects the cylinders 7 and other operating parts from the effects of high temperature.

I preferably employ for igniting the charges of gas or fuel an electric spark generated and timed in any of the well-known ways familiar to the art.

The crank-pin 12 and the upper bearings of the connecting-links 9 are lubricated by the usual oilways 57.

Having thus explained the nature and objects of my invention and the manner of constructing and operating the same, what I claim as new, and desire to secure by Letters Patent, is—

1. In a gas-engine, a fixed shaft having a central passage, a revoluble drum, mounted loosely upon said fixed shaft, a fixed crank, a series of motive cylinders set radially in said drum and connected to said fixed crank, in the cheeks or sides of which are annular chambers communicating with the central passage in the crank-shaft and by other passages or side pipes with the outer ends of the motive cylinders, substantially as specified.

2. In a gas-engine, a fixed shaft, having axial inlet and outlet passages for the impelling and waste gases, a crank in the center of said shaft, a plurality of pistons linked to said crank, cylinders in which said pistons move, said cylinders mounted on bearings arranged to revolve around the fixed shaft at each side of the central crank therein, crank-plates on the said tubular shaft adjacent to said crank, having annular passages 15, 24 passages or ports extending from said axial passages radially out through the crank at each side and communicating with annular grooves 15, 24 in the crank-plates, and side pipes 18, 22 leading into the engine-cylinders, substantially as specified.

3. In a gas-engine, a main frame, a central fixed tubular crank-shaft held thereon, a central crank in said shaft, a plurality of pistons linked to said crank, a plurality of cylinders in which the said pistons move, side pipes 18, 22 forming passages for impelling and waste gases to and from the outer ends of the cylinders, crank-plates on said tubular crank-shaft adjacent to said crank, having annular passages 15, 24 therein, connecting said side pipes with the hollow of the tubular crank-shaft, exhaust ways or passages, a plurality of exhaust-valves, one for each cylinder, mounted therein and revolving therewith, oscillating levers 28 arranged to bear upon and open said exhaust-valves, gear-wheels mounted on and arranged to revolve with the said cylinders, and meshing into a pinion fixed on the crank-shaft, and cams 30 on these gear-wheels to engage and operate levers 28 and the exhaust-valves, substantially as specified.

4. In a gas-engine, a fixed crank-shaft, a central stationary crank in said shaft, a plurality of pistons linked to said crank, passages through the axis of said shaft for the admission and escape of impelling and waste gases, exhaust-valves to open and close said passages for waste gases, oscillating levers arranged to operate said valves, and weights 37 connected to said levers whereby at a predetermined speed the exhaust-valves will be held open and no charge of impelling gas be drawn in, substantially as and for the purposes specified.

5. In a gas-engine, the revoluble drum 6, multiple motive cylinders 7 mounted therein, outlet or exhaust valves 21 for each cylinder, and the oscillating levers 28 to open the same, a centrifugal weight 37 attached to and adapted to move the lever 28 and hold the exhaust-valves 21 open at some predetermined speed of the drum 6, whereby the charges of fuel are cut out or not drawn in, substantially as specified.

6. In a gas-engine, the rotating cylinders 7, automatic inlet-valves 19 and outlet or exhaust valves 21, the sliding centrifugal weights 37, stems 38 and springs 39 and 40, combined and operating substantially as and for the purposes specified.

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