

No. 754,418.

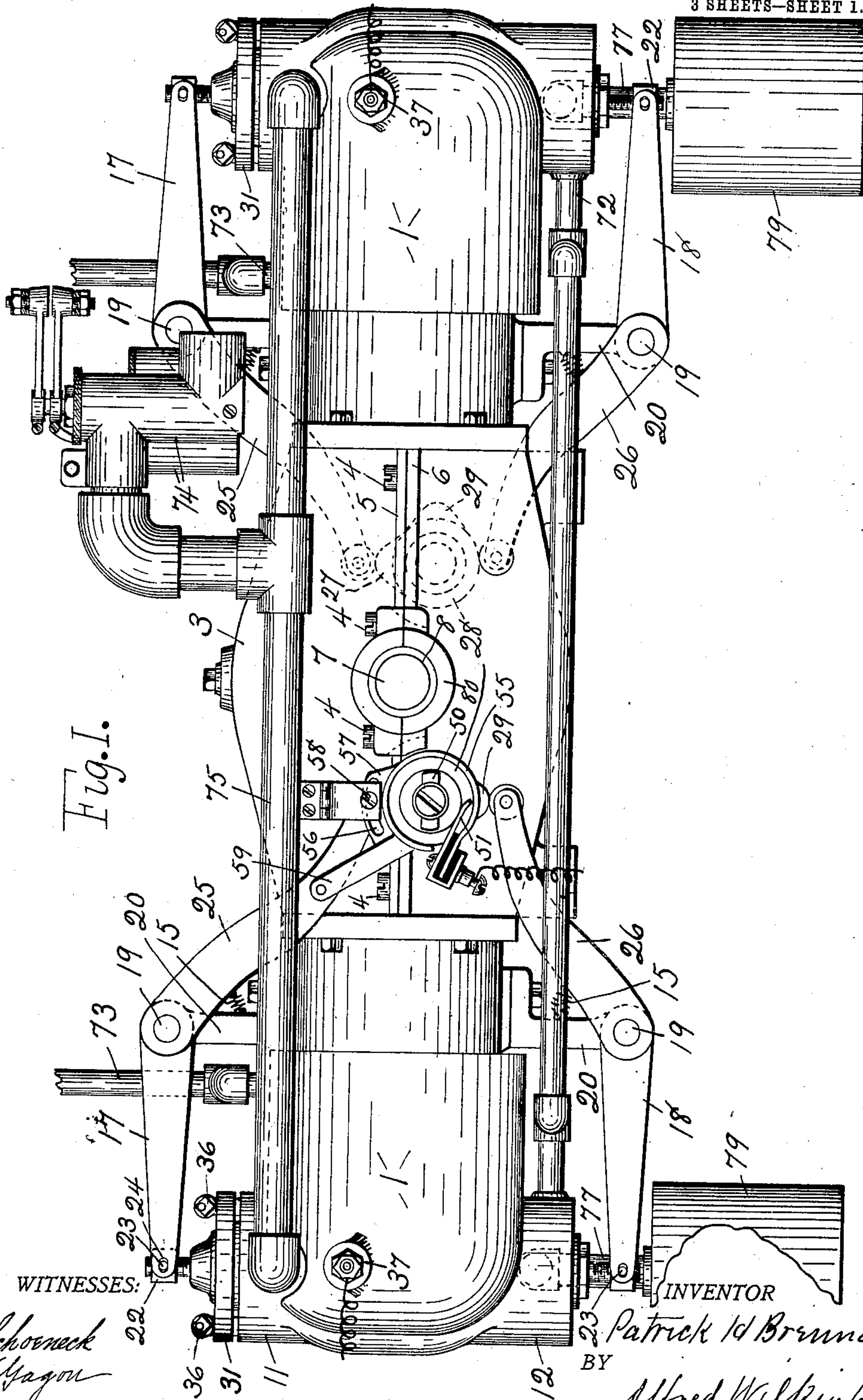
PATENTED MAR. 15, 1904.

P. H. BRENNAN.  
GAS ENGINE.

APPLICATION FILED JUNE 26, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



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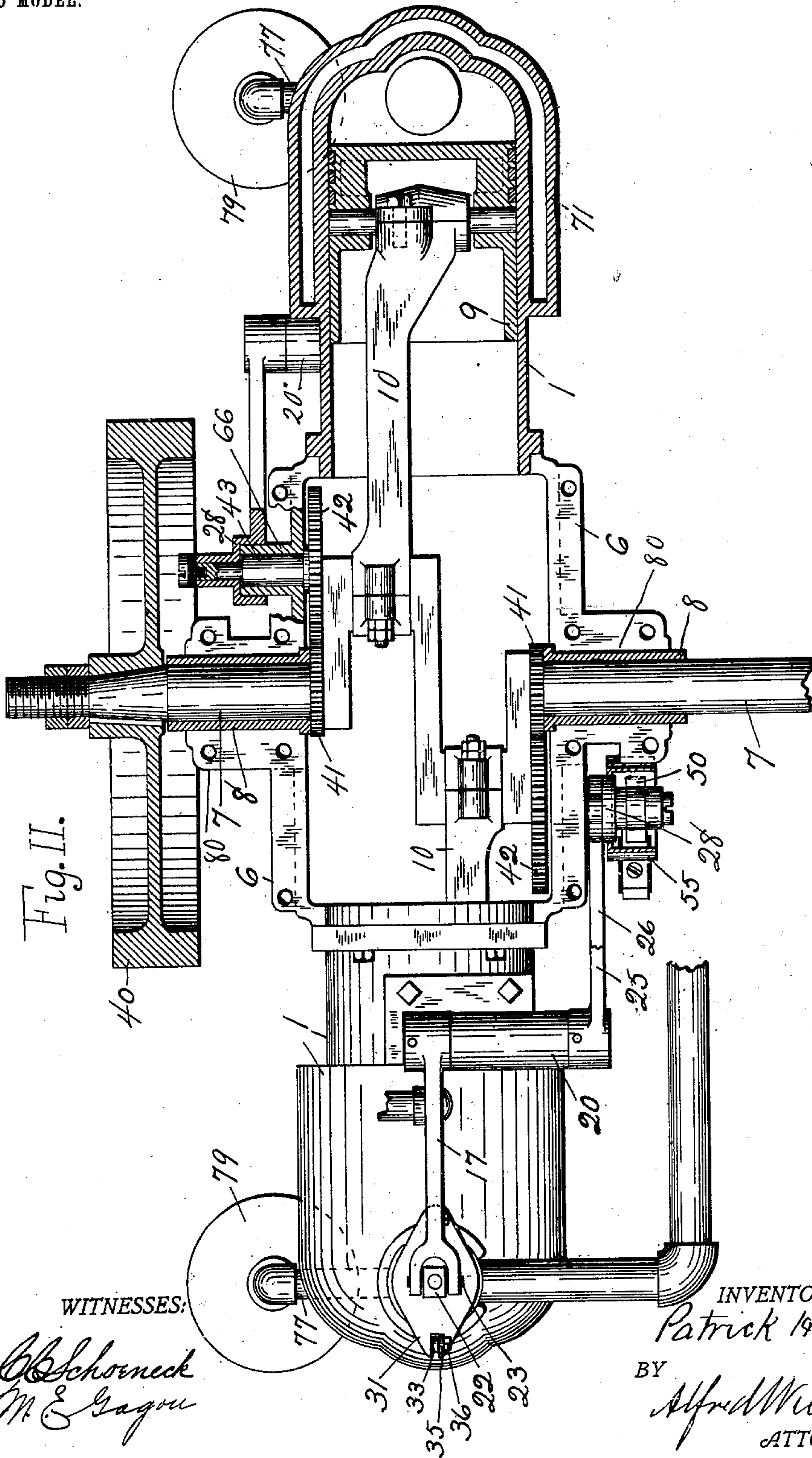
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WITNESSES:

*O. Schornack*  
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ATTORNEY.



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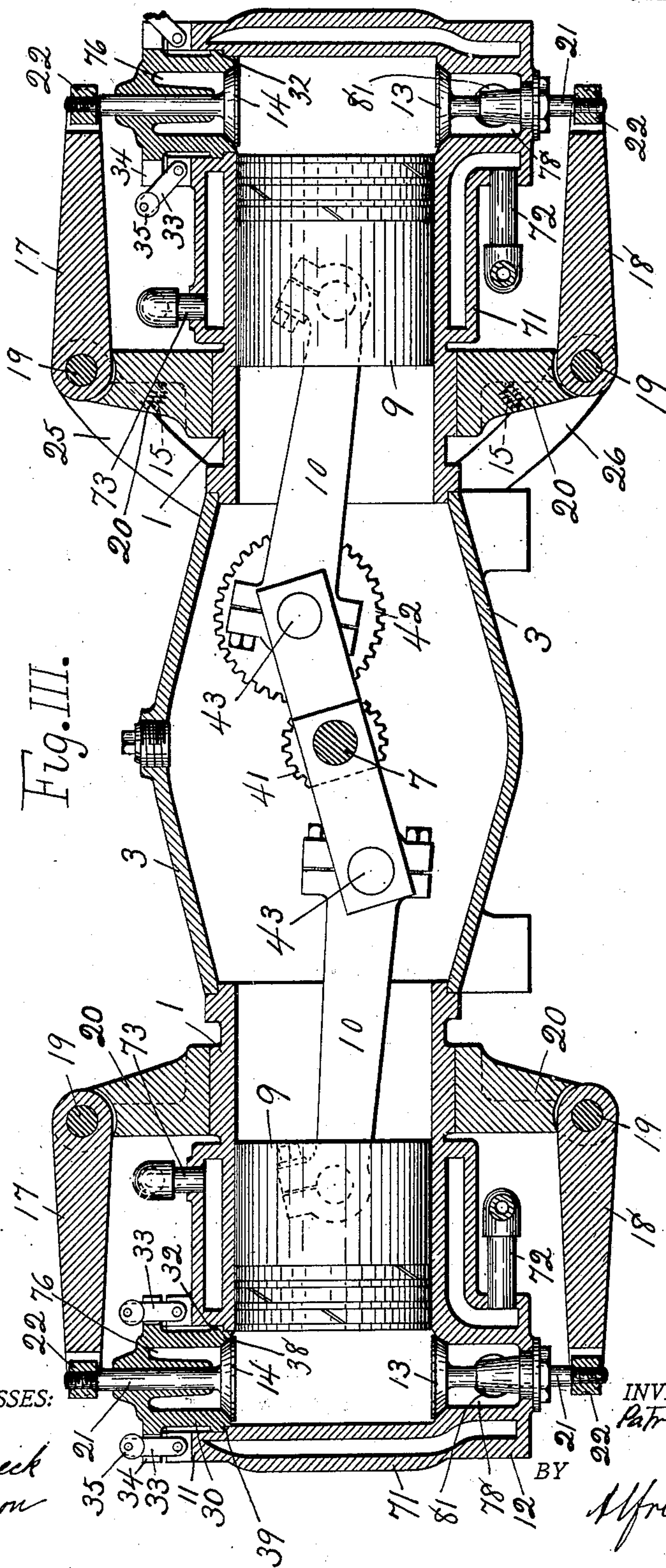
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## GAS ENGINE.

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**WITNESSES:**

Chas Schoneck  
M. E. Lagon

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# UNITED STATES PATENT OFFICE.

PATRICK H. BRENNAN, OF SYRACUSE, NEW YORK.

## GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 754,418, dated March 15, 1904.

Application filed June 26, 1903. Serial No. 163,202. (No model.)

*To all whom it may concern:*

Be it known that I, PATRICK H. BRENNAN, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, 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.

My invention relates to so-called "gas" or "explosive" engines, and has for its object to produce a light, simple, and compact engine which is effective in operation and adapted for all uses where power is required, particularly in automobile vehicles.

The essential features of my invention are the construction of crank-case so that its upper half is removable without disturbing the operative parts, the separate one-piece cylinders removable with their levers, &c., the arrangement of the valves opposite to each other and at right angles to the cylinders without pockets or projections, so that when the explosion takes place the whole power is applied directly against the piston without loss. There are also details of construction by which a light, simple, and economical engine is produced which is certain and effective in operation.

My invention will be understood by reference to the drawings herewith, in which the reference-numerals of the specification indicate the same parts in all the figures.

Figure I is a side elevation of my engine. Fig. II is a top plan thereof with portions in section. Fig. III is a longitudinal section at right angles to the preceding and parallel to Fig. I.

In the drawings, 1 1 indicate the cylinders, preferably arranged horizontal and bolted to the upper and lower halves of the crank-case 3, the upper half being easily removable without disturbing the other parts for examining the interior, to make repairs and adjust, add lubricant, &c., and secured in position by bolts 4, fitted to flanges 5 6.

7 is the crank-shaft, fitted to bushings 8 in bearings 80 between the halves of the case.

9 9 are the pistons, connected, respectively, to the opposite cranks by pitmen 10 10.

Each cylinder is provided with opposite extensions 11 12, arranged at right angle to the cylinder, one, 12, having a solid head to receive the stem of the exhaust-valve 13 and the other with an open end to receive the removable shell for the inlet-valve 14. These valves are arranged exactly opposite, are normally held closed by springs 15, and are opened at the proper times by similar inlet-valve and exhaust-valve levers 17 18, fixed on rods 19 19, journaled in bearings 20 20, bolted to the respective cylinders, on whose outer ends are fixed inlet-valve and exhaust-valve arms 25 26, provided with antifriction-rollers to engage with cam-surfaces 27 29 on cams 28, so arranged as to open inlet-valves for the vapor at the inspiration-stroke and then after the explosion and the impulse given to the piston to open the exhaust-valves. Each valve is adjustably connected to its lever by engagement of the threaded top of valve-stem 21 with block 22, secured in forked end of lever by lugs 23 in slots 24 and adapted to play slightly therein, maintaining the valve straight as the lever swings on its center.

Valve-shell 30 for inlet-valve is provided with seat 38 and with inner flange 32, fitting against shoulder 39, and is secured in place by latches 33, pivoted in extension 11 and adapted to be swung into slots 34 in outer flange 31 of the shell, when the eccentrics 35, pivoted in ends of the latches, may be turned to force home the shell by means of squared heads 36 on their eccentric-pins. The inlet-ports in extensions 11 and corresponding ports in shell are on the opposite side from port 81, therefore do not appear in Fig. III; but their position is indicated by pipe 75, entering the extensions 11 11 in Fig. I.

Each cylinder is provided with a sparking device 37, arranged near the inlet, where there is a tendency to cool it by the inflowing vapor.

The crank-shaft carries the fly-wheel 40 on its outer end and on its inner ends pinions 41, arranged within and on opposite sides of the case to engage with gears 42 of twice the diameter fixed each on the inner end of its sec-



ondary shaft 43, journaled in bearings 66 in the case parallel to and on opposite sides of the crank-shaft. As best shown in Fig. II, the cams 28 are secured by screws to the smaller outer ends of the secondary shafts and are concave on their inner faces to fit and bear on the exterior of the bearings 66, so that they are well supported. On one side is secured the commutator or current distributor in which the rotating contact-surfaces 50 engage alternately with brush 51 to close the circuit to the sparking devices through suitable wires and produce the igniting-spark in the cylinder-heads.

The commutator-case 55 is provided with curved slot 56 in flange 57, engaging with guide-screw 58 in a bracket on the case, and with handle 59 to shift the contact-surfaces to make the spark sooner or later, increasing or diminishing the speed of the motor, as may be desired.

Each cylinder and exhaust-port is entirely surrounded by a water-jacket 71, the cool water entering the lowest point of the cylinder through the inlet-pipe 72 and passes around the exhaust-chamber and the cylinders and out of the highest point through outlet-pipe 73 to the water-supply, thereby cooling and keeping the exhaust-chamber at a proper temperature and preventing warping of the parts and accidental explosions or impulses caused by the intense heat from the exhaust-gases and commonly known as "premature" explosions.

74 is a generator or carbureter in which the gas is properly mixed and is carried through pipe 75 to the admission-chamber 76 in the inlet-valve shell 30, supplying the gas for the explosion.

77 represents pipes leading from the exhaust-valve chambers 78 and port 81 to suitable muffles 79.

The cranks are set at one hundred and eighty degrees, and the crank-shaft makes two revolutions while each secondary shaft is making one, so that the valves are operated alternately and the current transmitted to each igniter or sparker and the pistons operated alternately, first, to draw in the vapor; second, to compress; third, to receive the force of the explosion when it is at its full outward stroke, and, fourth, to expel the exhaust.

By my particular construction and arrangement the parts of the engine can be separated and inspected without disturbing the adjustment of the valve-operating mechanisms, &c., and the parts being similar and interchangeable it is convenient in assembling and replacing the worn parts.

By removing a few bolts and screws the upper half of the crank-case may be conveniently removed and each cylinder may be removed by itself, carrying its valves, operating-arms, levers, and other parts without disturbing the adjustment of any of those parts.

By the construction of the cylinder-head the interior seats and shoulders may be milled and finished easily, and as the valves are arranged substantially flush with the inner sides of the cylinder all pockets and projections are avoided, and the explosion taking place between the piston and the end of the cylinder in an explosion-chamber of simple and regular form the piston receives the direct impact and full force of the explosion, and none of the force is dissipated or wasted, as would be the case with side pockets, chambers, &c.

I have described a desirable form and arrangement of parts; but this may be varied without departing from the spirit of my invention.

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

1. In a gas-engine, the combination with the crank-case and the cylinders having vapor inlet and exhaust ports in their heads, corresponding opposite inlet and exhaust valves for said ports, said valves being arranged substantially flush with the inner surfaces of the cylinders, corresponding elongated bearings on each cylinder, rods journaled therein, opposite inlet and exhaust valve levers secured to the corresponding ends of the respective rods and connected to the respective valve stems, opposite inlet-valve arms and exhaust-valve arms secured to opposite ends of said rods respectively, secondary shafts journaled in the case, connections to rotate said secondary shafts from the main shafts, cams on the secondary shafts provided with cam-surfaces to engage with the inlet and exhaust valve arms respectively, to operate said valves at the proper times, means to supply gasoline-vapor to the cylinder-heads and a sparking device arranged in each cylinder-head adjacent to the inlet and electrical means for producing a spark, substantially as described and shown.

2. In a gas-engine, the combination with the crank-case and the cylinders having vapor inlet and exhaust ports in their ends, inlet and exhaust valves for said ports arranged substantially flush with the inner surfaces of the cylinders, corresponding opposite bearings on both cylinders, rods journaled in said bearings, opposite inlet and exhaust valve levers secured to the corresponding ends of the respective rods and having forked outer ends, threaded valve-stems on the valves outwardly extending in said forked ends, blocks adjustably connected to said threaded stems and connected to the forked lever ends by lugs fitted to slots in said ends, opposite inlet and exhaust valve arms secured to the opposite ends of said respective rods and carrying anti-friction-rollers on their inner ends, secondary shafts journaled in bearings, one integral with each half of the case and arranged parallel to and on opposite sides of the crank-case, means



to rotate the secondary shafts, cams on the secondary shafts provided with cam-surfaces to engage with the antifriction-rollers on the arms to open the respective valves at the proper times, means to admit the gasoline-vapor to the cylinder-heads, and means to ignite said vapor, substantially as described and shown.

3. In a gas-engine, the combination with the crank-case and the cylinders, of pistons fitted to the cylinders, pitmen connecting the pistons to the cranks, opposite extensions on the cylinder-heads, one on each cylinder having a substantially solid end provided with an exhaust-chamber and an exhaust-port, and the other extension having an open end and formed with an inlet-port, an exhaust-valve fitted to a beveled seat inwardly of the exhaust-chamber and lying substantially flush with the inner surface of the cylinder, a valve-shell fitted to the open end of each opposite extension and provided with an admission-chamber communicating with the inlet-port, an inlet-valve carried in said shell and fitted to a beveled seat at the inner end thereof, a flange on said shell engaging with a shoulder in the cylinder, means to lock the shell, forcing the flange tight against the shoulder, outwardly-extending stems on said valves, operative arm and lever connections supported on the cylinders and connected at one end to the valves, cams suitably supported and having cam-surfaces to engage with the opposite ends of said connections to open the valves in turns, springs to maintain the valves closed, means to supply explosive vapor to the admission-chamber and means to ignite the vapor, substantially as described and shown.

4. In a gas-engine, the combination with the crank-case and cylinders having inlet and exhaust ports in their heads, a muffle, an exhaust-valve fitted to a seat adjacent to the exhaust-port and arranged substantially flush with the inner surface of the cylinder, a valve-shell chamber communicating with the inlet-port, an inlet-valve carried in said shell and arranged flush with the inner surface of the cylinder, outwardly-extending stems on said exhaust and inlet valves, elongated bearings bolted to the opposite sides of each cylinder, valve-rods journaled in said bearings, inlet-valve and exhaust-valve levers connected to the opposite ends of the respective rods, inlet and exhaust arms connected to the opposite ends of said rods on each cylinder and having their ends extending adjacent to operative cams, secondary shafts arranged in bearings in the cylinders, means to operate the secondary shaft from the main or crank shaft, concave cams secured to the outer ends of the secondary shafts and fitted internally to the outer surfaces of the secondary-shaft bearings, cam-surfaces on said cams to engage with the inlet and exhaust valve arms respectively, springs secured to said arms to maintain the valves in closed position and the arm ends in contact with the cams, a suitable carbureter, pipes therefrom to the inlet-port and admission-chamber, and sparking devices arranged within the cylinder-heads adjacent to the inlet-valves.

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

PATRICK H. BRENNAN.

Witnesses:

C. C. SCHOENECK,  
M. E. GAGON.