No. 713,332. Patented Nov. 11, 1902.

J. McCOY.

GAS ENGINE.

(Application filed Sept. 11, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

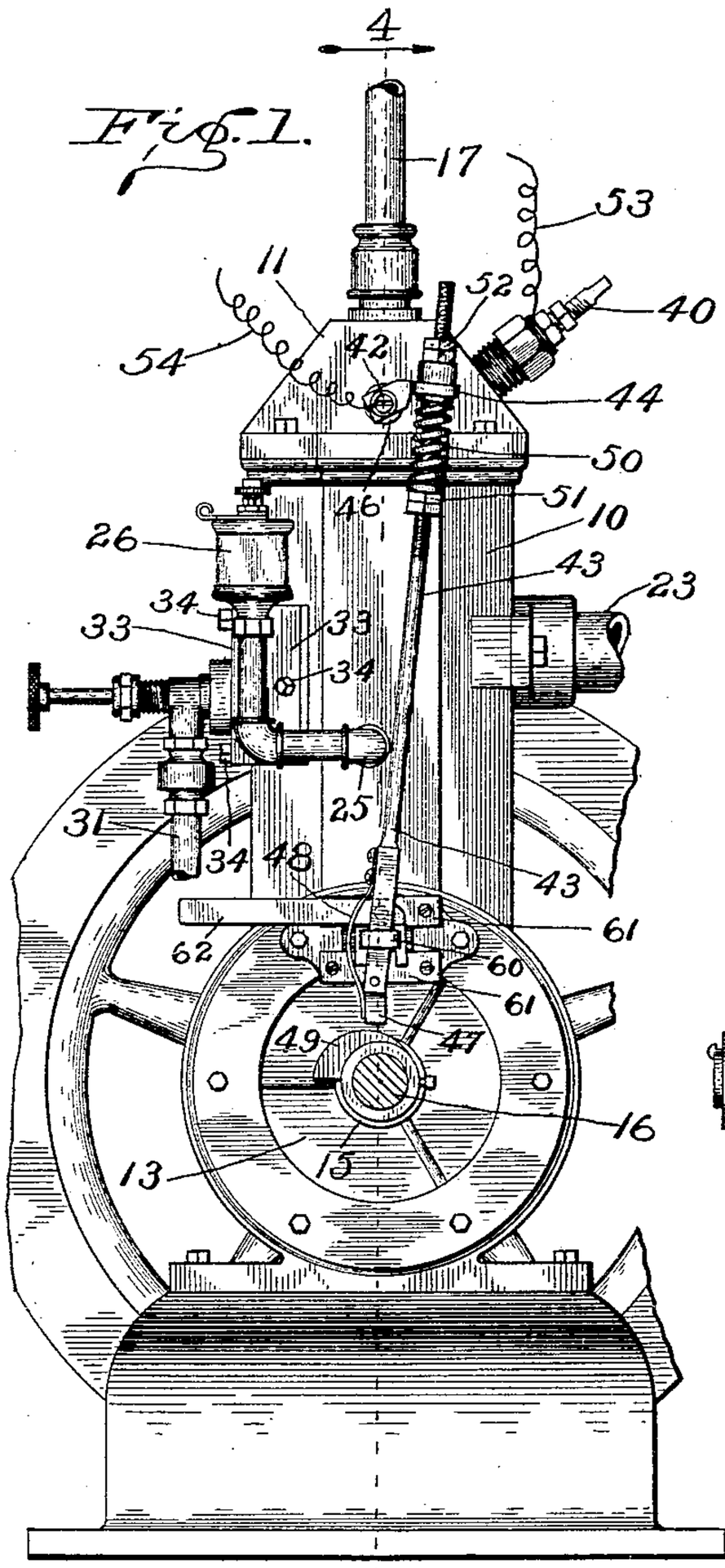


Fig. 2.

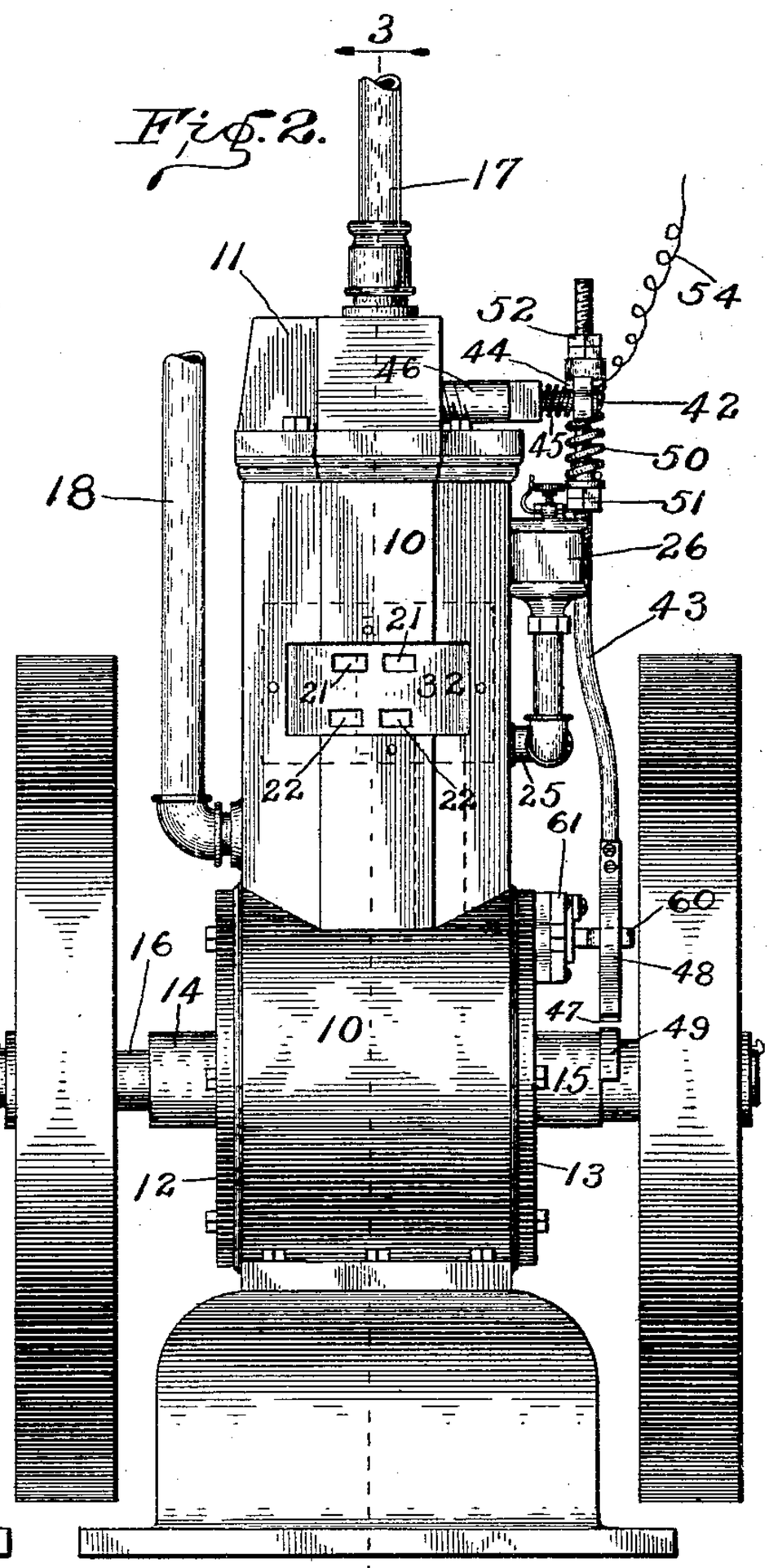


Fig. 7.

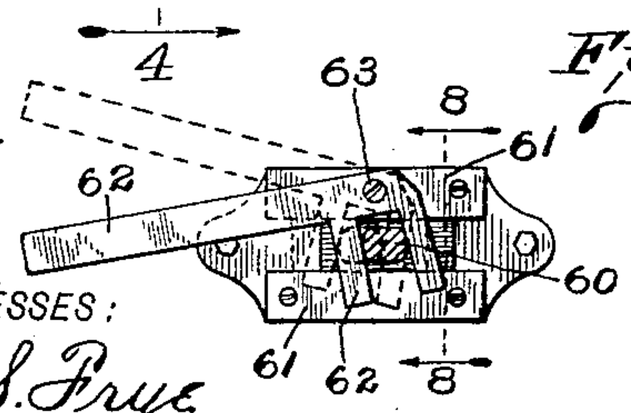
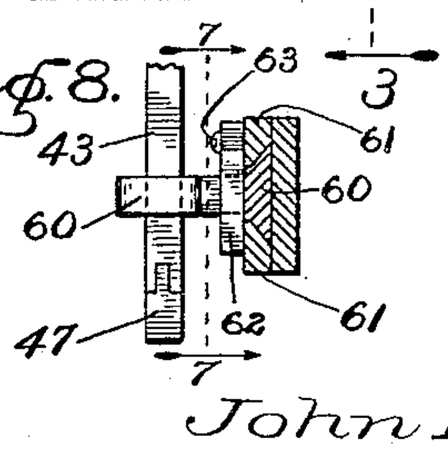


Fig. 8.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

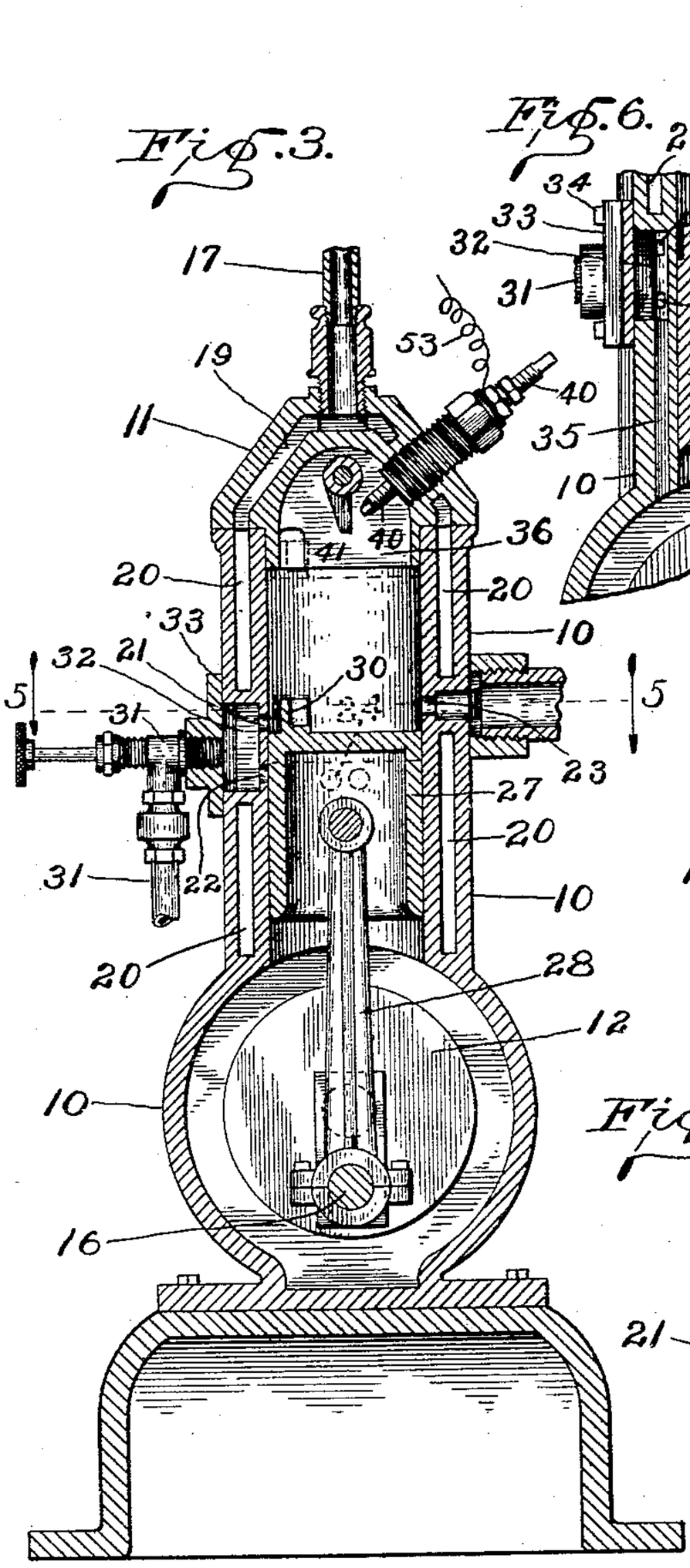


Fig. 4.

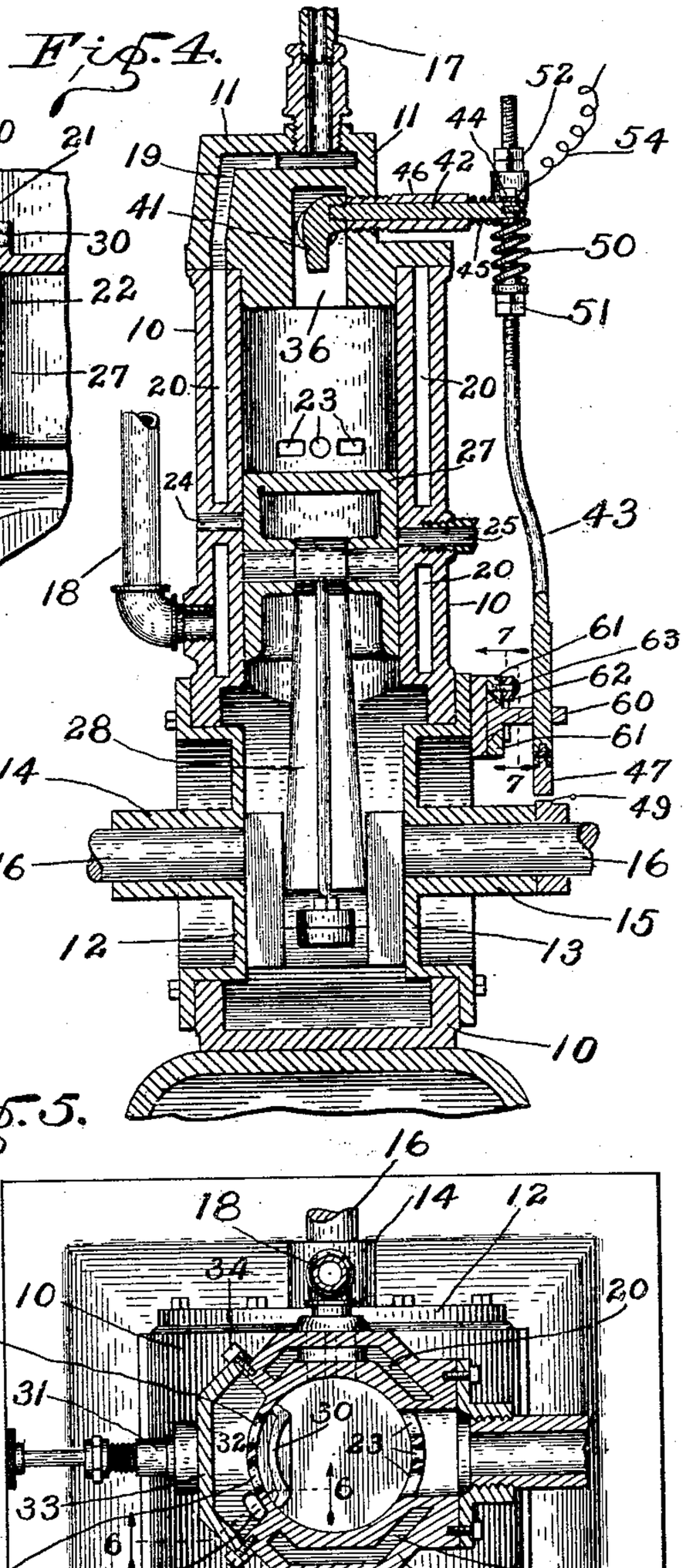
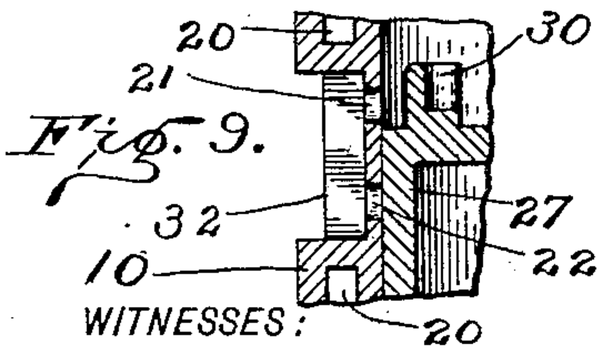


Fig. 6.

Fig. 5.

Fig. 9.



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GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 713,332, dated November 11, 1902.

Application filed September 11, 1901. Serial No. 75,046. (No model.)

To all whom it may concern:

Be it known that I, JOHN MCCOY, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

The leading object of my present invention is to produce a simple and efficient gas-engine of low cost which shall be capable of being used by farmers and others for driving corn-shellers, wood-saws, and such like machines or apparatus, although of course it is capable of use in any situation or for any purpose within its capacity; and it consists in various improvements in the details of construction and arrangement of parts whereby this object is accomplished and a very efficient engine for the purpose is provided, all as will be hereinafter more fully described and claimed.

An engine embodying my invention will first be fully described and the novel features thereof then pointed out in the claims.

Referring to the accompanying drawings, which are made a part hereof, and on which similar reference characters indicate similar parts, Figure 1 is a side elevation of an engine embodying my said invention; Fig. 2, a front elevation thereof, with the connections by means of which the fluid fuel is introduced into the engine removed, the location of the plate in which such connections terminate being indicated by dotted lines; Fig. 3, a central vertical sectional view of such an engine as seen when looking in the direction indicated by the arrows from the dotted line 3 3 in Fig. 2; Fig. 4, a central vertical sectional view thereof, (except the base, which is broken away for want of room,) as seen when looking in the direction indicated by the arrows from the dotted line 4 4 in Fig. 1; Fig. 5, a horizontal sectional view as seen when looking downwardly from the dotted line 5 5 in Fig. 3; Fig. 6, a fragmentary vertical sectional view as seen when looking in the direction indicated by the arrows from the dotted line 6 6 in Fig. 5; Fig. 7, a view, on a somewhat enlarged scale, of the shifter for the sparking device as seen from the dotted line 7 7 in Figs. 4 and 8; Fig. 8, a cross-sectional view of the same device as seen from the dotted line 8 8 in Fig. 7; and Fig. 9, a view similar to a portion of Fig. 3, on a somewhat enlarged scale, showing the inlet-ports and immediately adjacent parts more clearly.

The body of this engine is preferably composed of a main casting 10, a cap or head 11 on the upper end thereof, forming a head to the cylinder, and two flanged plates 12 and 13, closing the sides of the drum-shaped lower end of the engine structure and also preferably forming or supporting the bearings 14 and 15 to the crank-shaft 16. As will be seen, this forms an extremely compact and simple main structure and one requiring a minimum of machine-work to fit it for use. The crank of the engine operates in this drum-shaped portion, which should continuously contain a supply of lubricant by which the crank and crank-shaft bearings are kept lubricated in operation. Said drum-shaped portion also operates as an air-chamber, as will hereinafter more fully appear. Like all gas-engines, the cylinder is "water-jacketed," the water entering usually by the ingress-pipe 17 and escaping by the egress-pipe 18 and occupying the spaces 19 and 20 in the parts 11 and 10 while passing through.

The cylinder portion of the structure 10 contains a series of ingress-ports 21 and 22 for the fluid fuel, a suitable exhaust-port 23, an ingress-opening 24, through which (at the proper time) air is admitted to the chamber in the drum-shaped portion of the structure, and a connection 25 to a suitable lubricator 26, through which a lubricant is delivered to that surface of the piston 27 which comes in contact with the interior of the cylinder. Said piston, by means of its piston-rod 28, operates the crank-shaft 16 and is also so arranged and operated as to serve as the valve to the various ports and inlets. In the drawings the piston is shown at its extreme lowermost position. As will be noticed by an examination of Fig. 3, the exhaust-port 23 is just above the fuel-inlet port 21, so that as the piston descends the exhaust-port is opened just previous to the opening of the fuel-inlet port, and the products of combustion are thus permitted to discharge themselves just before the admission of a fresh charge of fuel. Owing

to the extreme rapidity with which the piston in such an engine moves, especially in the smaller sizes, an additional precaution is necessary to prevent the commingling of the incoming fuel with the escaping products of combustion. I therefore provide on the upper end of the piston 27 a baffle-plate 30, which, as shown in Figs. 3, 5, and 9, forms the inner wall of the small chamber against which the incoming gaseous fuel will strike and be deflected upwardly toward the upper end of the cylinder-cavity while the products of combustion from the previous charge are escaping by way of the exhaust-port at the lower end. As the piston rises in its upward stroke it shuts off above these ports and compresses the gaseous fuel as it rises until the next explosion takes place, as will be presently described. When the piston has reached its uppermost position, its lower end is just above the port 22. This movement of the piston has exhausted the air from the air-chamber, in which the crank runs, sufficiently so that a suction is created through the port 22, which causes a small amount of the fluid fuel to be drawn in from the source of supply through the pipe 31 and discharged into the mixing-chamber 32, which is generally and preferably formed in the structure 10, with a plate 33, in which the fuel-supply apparatus terminates, secured over and forming the outer wall of said chamber. Said plate is shown as held in place by cap-screws 34. This fuel, while it may be any suitable fluid fuel, is commonly gasolene, and as it is drawn in it strikes that portion of the cylinder-shell immediately in front of it at a point between the ports 21 and 22, which cylinder-shell portion is sufficiently highly heated to generate gas therefrom. As the piston descends it compresses the air in the air-chamber (which has been replenished while the piston was in its highest position by the admission of fresh air through the inlet 24) and forces a certain quantity of said air up through the passage-way 35 into the mixing-chamber 32, where it mingles with the gas just previously introduced or generated and forms an explosive compound of the proper character for use in engines of this variety. When the piston descends, this passes into the upper portion of the cylinder, as has already been described, and is forced up and compressed into the combustion-chamber 36 in the cap or head 11, where it is exploded and does its work.

The explosion is caused by the electric igniter composed of the insulated adjustable point 40 and the rocking igniter lever or arm 41. The latter is operated by the rock-shaft 42, which in turn, as best shown in Fig. 1, is operated by the reciprocating rod 43 acting on the arm 44, secured to the outer end of said rock-shaft. As best illustrated in Fig. 4, the rock-shaft is held outwardly by a coiled spring 45, which is interposed between the ends of its bearing 46 and the inner face of the arm 44, while the form of the arm 41 is such as to fit closely against the inner surface of the combustion-chamber 36 and practically form a self-packing joint for the rock-shaft, preventing the escape of any of the gas at this point. The rod 43 has its lower end 47 formed in a separate piece and pivoted to the main body thereof, the parts being united by means of a "jack-knife" joint and the part 47 being normally held back to its open position by means of a spring 48. As best shown in Fig. 1, a cam 49 for operating this rod is secured on the shaft 16, the pivoted end 47 being positioned in the path of said cam. Said cam is so proportioned and arranged as to force said rod upwardly, thus rocking the shaft 42 and holding the arm 41 into forcible contact with the point 40 for a considerable portion of the revolution and then at the proper instant to permit said rod to move in the opposite direction suddenly separating said parts and producing an arc, the resulting spark of which causes the explosion of the gas by which the engine is operated, as will be readily understood. The sudden reverse movement of the rod 43 is produced by the spring 50, which is interposed between a suitable nut or collar 51 thereon and the arm 44. The proper adjustment is effected by means of other adjusting-nuts 52, which are above or on the opposite side of the arm 44 from said spring 50. The electricity to produce the electric arc is brought in from any suitable source of electric energy over a suitable electric circuit, one wire 53 of which is connected to the insulated point 40 and the other of which, 54, is shown as leading from the rock-shaft 42, although as said shaft is not commonly insulated it may lead from any portion of the engine-body desired.

I control the speed of my engine by shifting the position of the sparking device, and thus causing the sparking and explosion to take place at an earlier or later period in the revolution of the engine. The greatest speed is attained when the ignition occurs just before the crank is on center at the highest position, so that the explosion will expend its full force immediately after the center is passed and continue to exert said force from that time until the piston reaches its lowermost position, while a lesser force (and consequently a lesser speed) will be produced if the instant of ignition occurs after the crank has passed its center, and the piston is already descending, the exploded gas in the latter case having, in a sense, to overtake the piston in its downward movement. I have therefore provided a movable lower bearing 60, through which the lower end of the rod 43 will pass. This bearing is mounted in ways 61 and is operated in said ways by a forked lever 62, which is mounted on a pivot 63, and the forks of which embrace an adjacent portion of said bearing 60, as will be readily understood, especially upon an inspection of Figs. 7 and 8.

While the sparker above described is particularly adapted for use with this engine, as

I have especially designed the same therefor, yet it will be understood that any other sparker found suitable may be used.

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

1. The combination, in a gas-engine, of a cylinder, a chamber at one end of said cylinder containing the crank and also forming an air-chamber wherein the air is alternately compressed and exhausted by the piston, a mixing-chamber at one side of the cylinder wherein gas and air are mixed to form the explosive-fuel compound, upper and lower ports leading into the cylinder from said mixing-chamber, a passage-way for air leading from the air-chamber to the mixing-chamber, an exhaust-port, and a piston within the cylinder whose stroke and length are so proportioned that the lower port from the mixing-chamber will be opened when the piston is at its uppermost position and a suction thus created from the air-chamber causing a partial vacuum in the mixing-chamber and thus drawing fluid fuel thereinto, while said lower port will be closed and the upper port opened when said piston is in its lowermost position thus admitting the explosive compound to the cylinder above the piston, substantially as set forth.

2. The combination, in a gas-engine, of a cylinder having duplex inlet-ports upon one side and an exhaust-port upon the other side approximately midway its length, an air-chamber communicating with one end of said cylinder and containing the crank which the piston drives, said piston arranged within said cylinder and adapted also to serve as the valve to said ports, and a mixing-chamber from which the inlet-ports lead, one of said inlet-ports being just above the piston when in its lowermost position and adapted to admit the gaseous fuel into the portion of the cylinder above said piston, and the other being just below said piston when in its uppermost position whereby the suction occasioned by the partial exhaustion of air from the air-chamber is enabled to draw fuel into the mixing-chamber, said exhaust-port being just above the upper inlet-port and thus adapted to discharge just before said upper inlet-port is opened.

3. The combination, in a gas-engine, of a cylinder having two inlet-ports upon one side and an exhaust-port upon another side the upper of said inlet-ports being positioned to open into the chamber above the piston when said piston is in its lowermost position and the other adapted to communicate with the space below the piston when said piston is in its uppermost position, and said piston arranged within the cylinder and provided with a baffle-plate extending up in front of the upper inlet-ports when the latter is open and forming a small receiving-chamber for the fuel gas as it enters from the mixing-chamber and deflecting the same upwardly, substantially as and for the purposes set forth.

4. The combination, in a gas-engine, of a cylinder having inlet and exhaust ports at its sides, an air-chamber with which said cylinder communicates and wherein the movement of the piston tends to create a vacuum on its upward stroke and to compress the air on its downward stroke, a mixing-chamber from which the inlet-ports to the cylinder lead one of said inlet-ports being just above said piston when in its lowermost position and another being just below said piston when in its uppermost position and having a passage-way communicating with said air-chamber through which air is forced to said mixing-chamber on the downward stroke of the piston, and openings through the side of the cylinder leading to the outside below the point to which the lower end of the piston travels in its upward stroke whereby the air in the air-chamber is replenished as it is consumed in the production of the gaseous fuel in the mixing-chamber, substantially as set forth.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 9th day of September, A. D. 1901.

JOHN McCOY. [L. S.]

Witnesses:
CHESTER BRADFORD,
L. H. COLVIN.