No. 870,559. PATENTED NOV. 12, 1907.

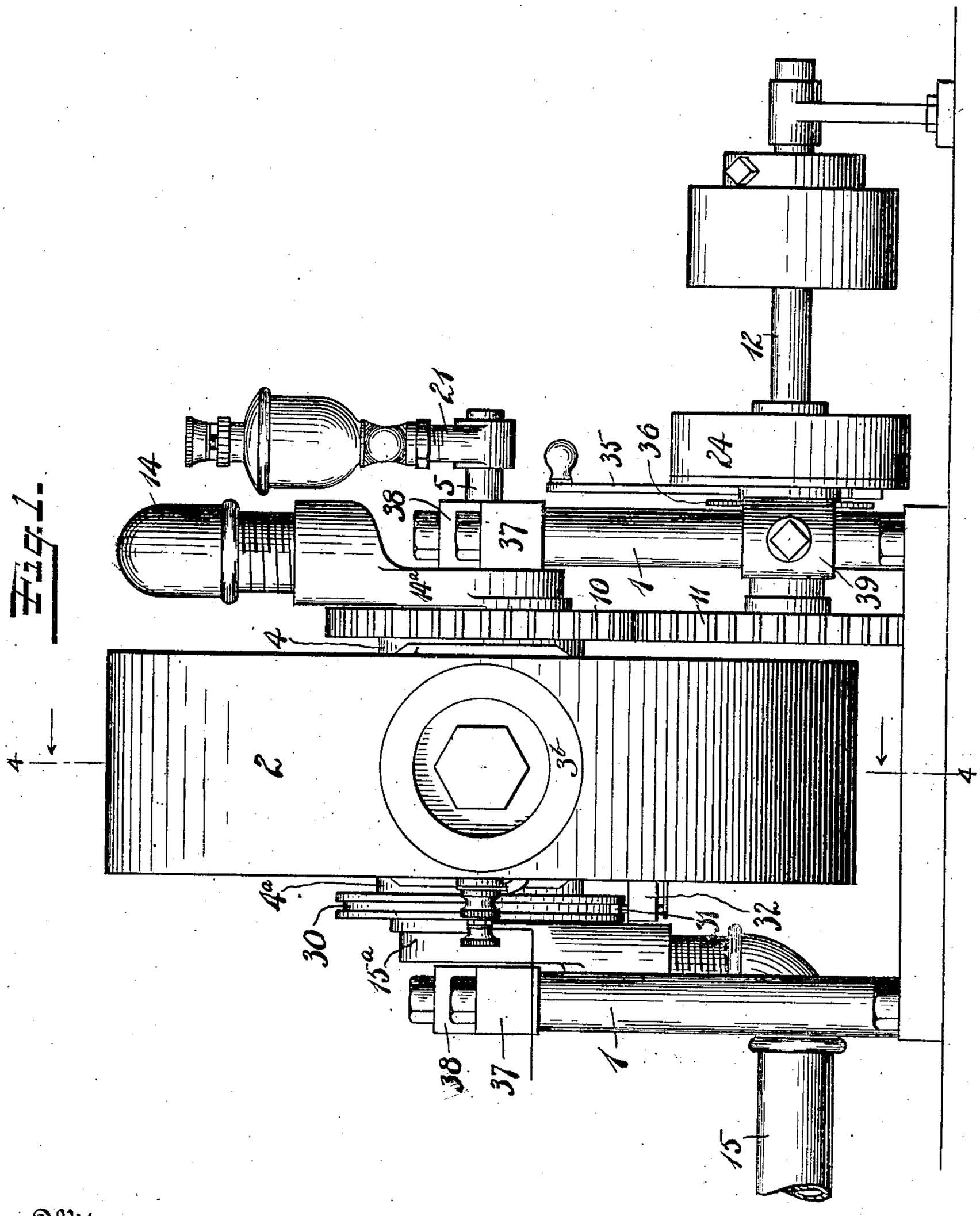
J. J. HOGAN.

GAS ENGINE.

APPLICATION FILED MAY 16, 1906.

8 SHEETS—SHEET 1.

Fig. 1.



Witnesses

Inventor

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By his Attorneys

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8 SHEETS—SHEET 2.

Fig. 2.

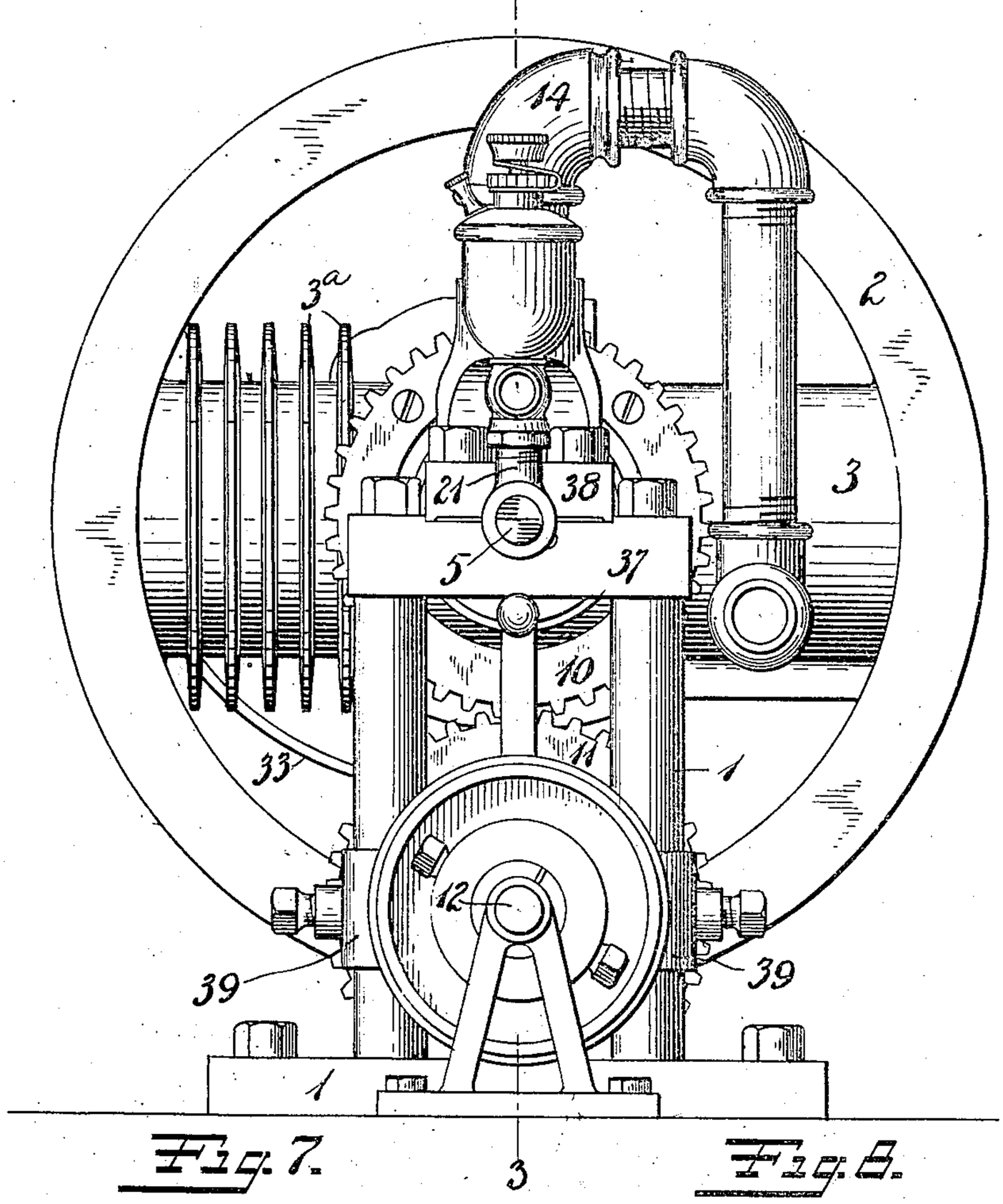


Fig. 7.

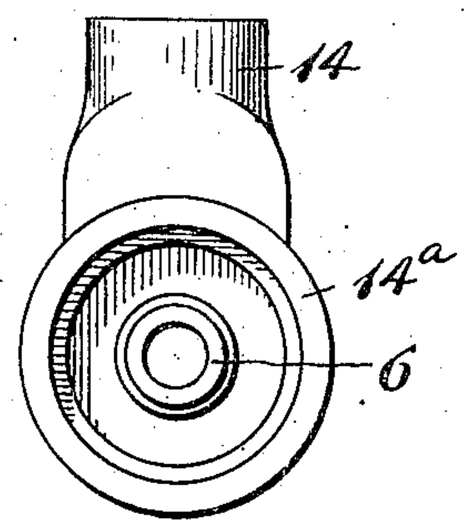
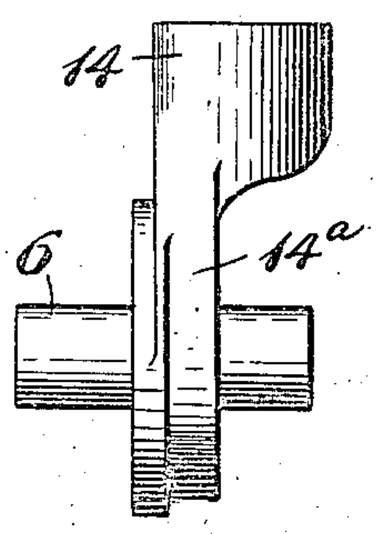


Fig. 8.



Witnesses

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No. 870,559. PATENTED NOV. 12, 1907.

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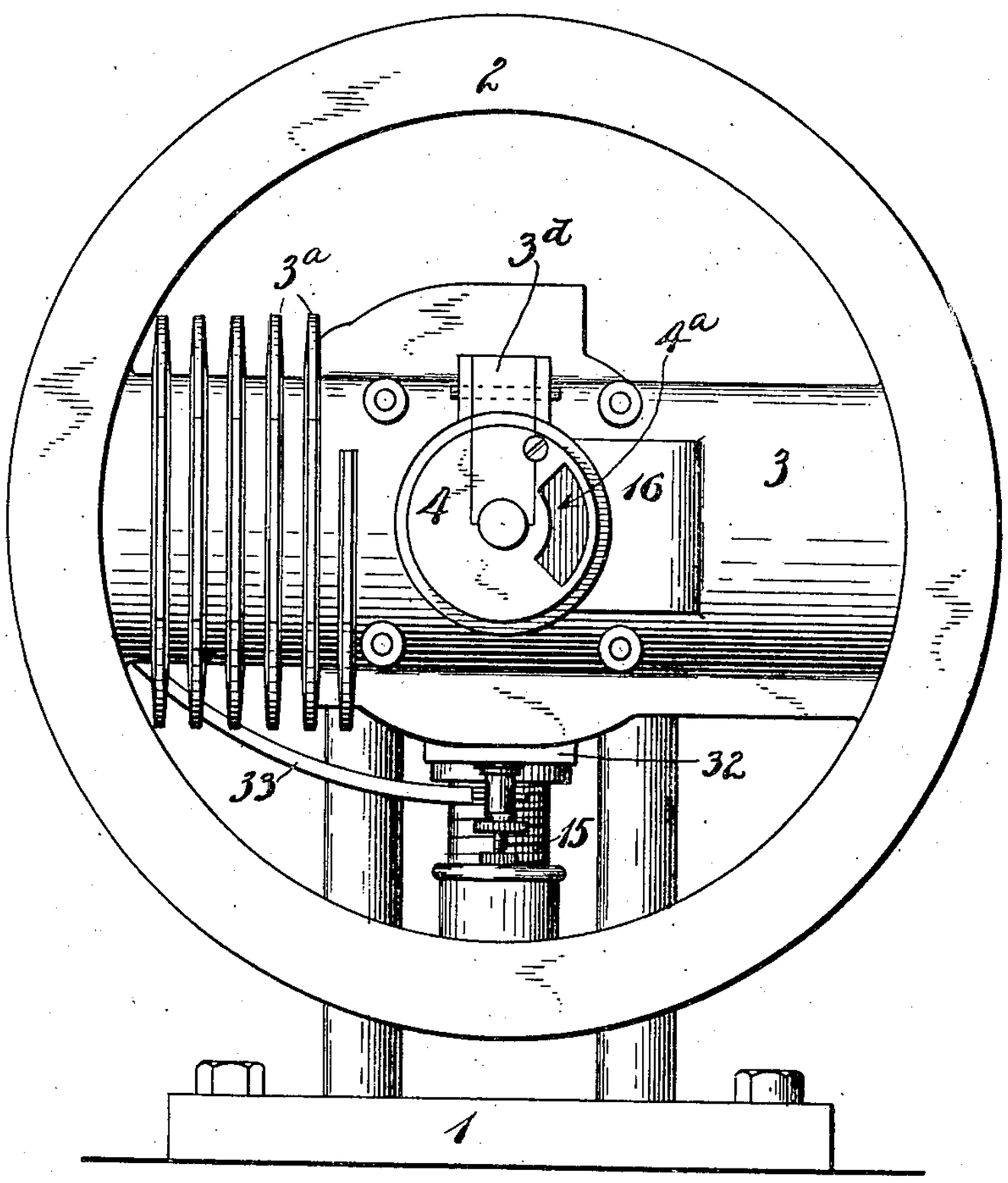
8 SHEETS—SHEET 3.

Fig. 2a



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No. 870,559. PATENTED NOV. 12, 1907.

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GAS ENGINE.

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8 SHEETS—SHEET 4.

Fig. 3.

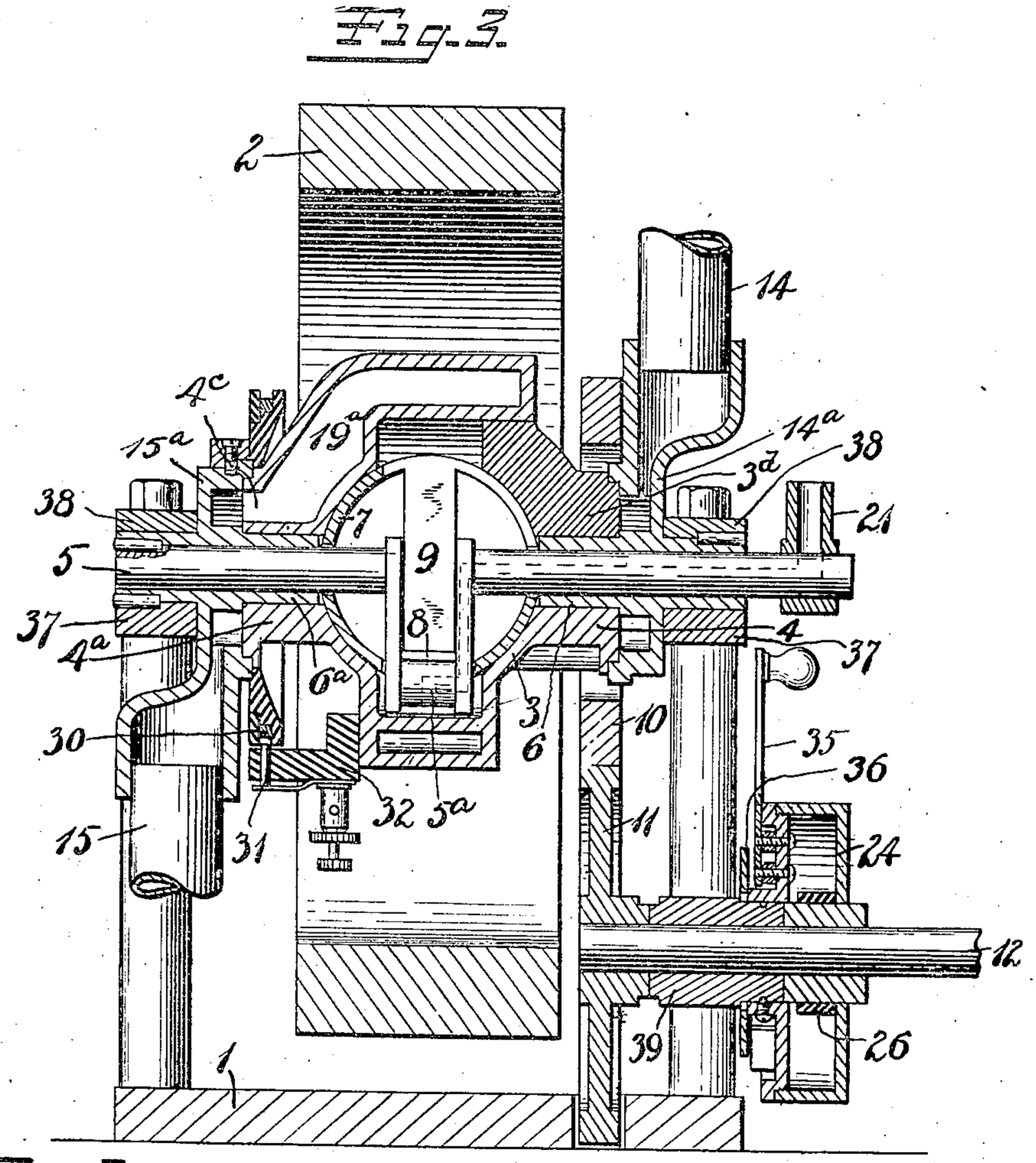


Fig. 9.

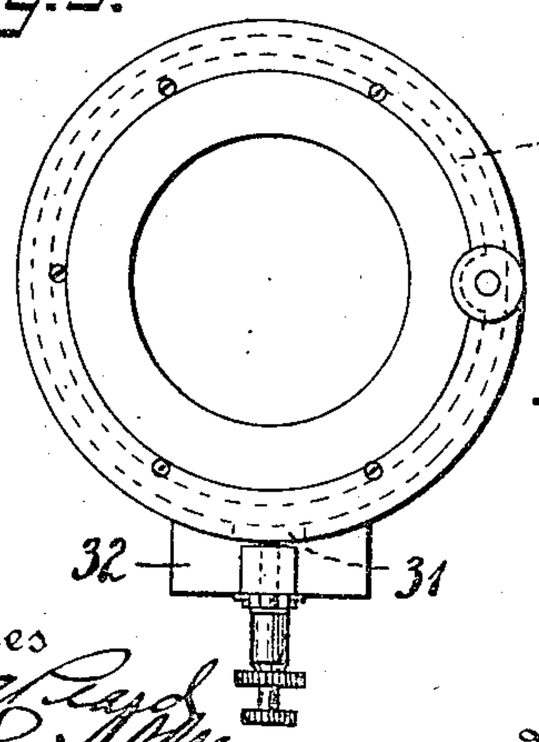


Fig. 11.

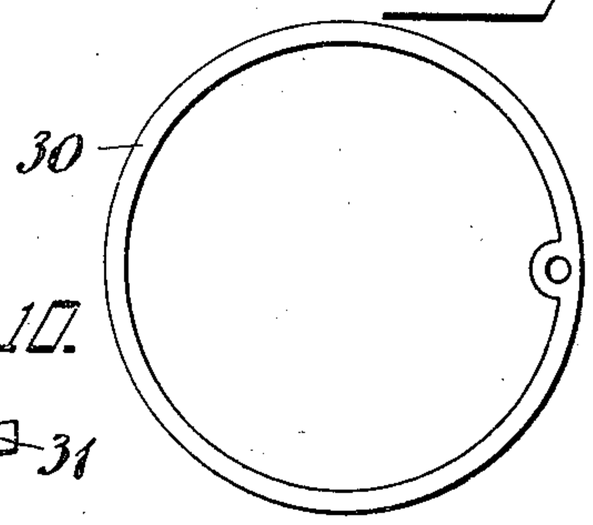
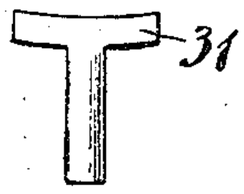


Fig. 10.



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8 SHEETS—SHEET 5.

Fig. 4.

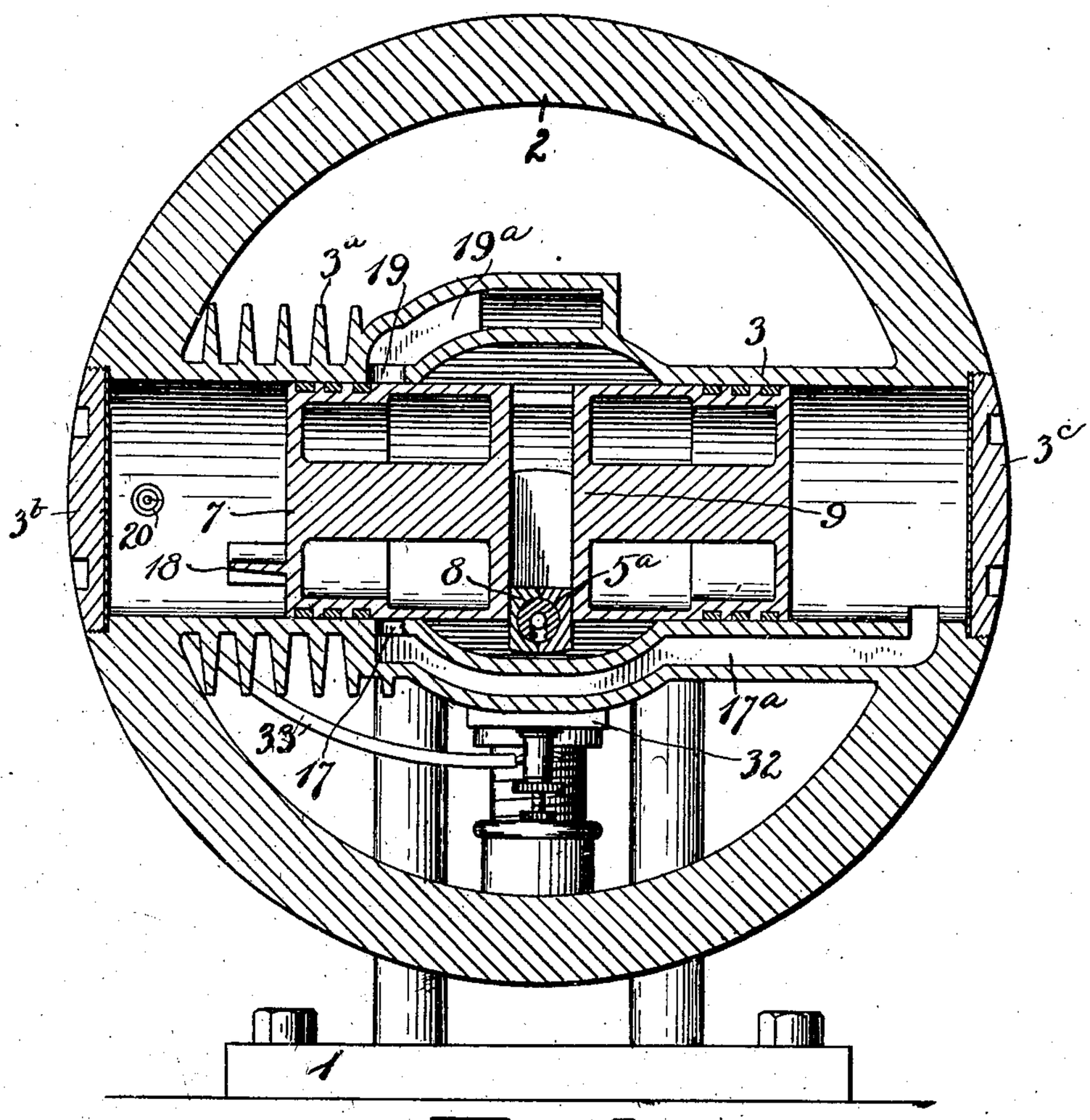
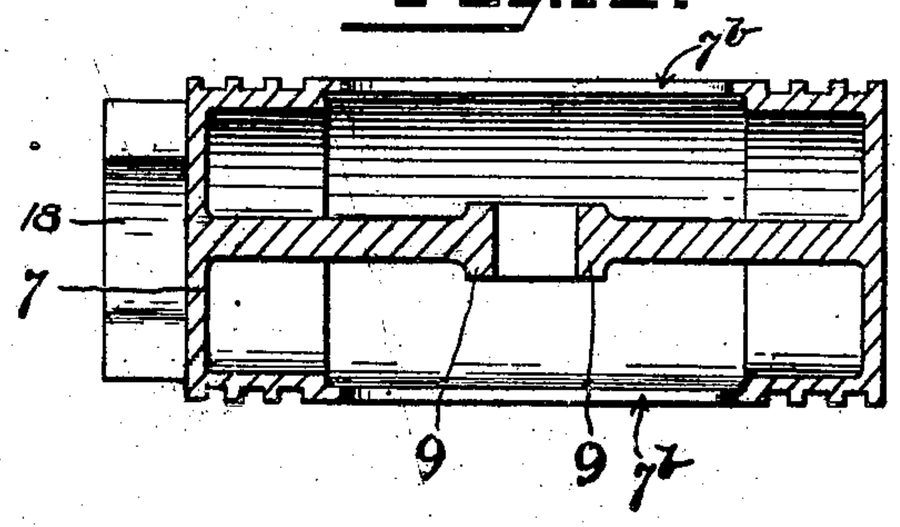


Fig. 12.



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No. 870,559. PATENTED NOV. 12, 1907.

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GAS ENGINE.

APPLICATION FILED MAY 16, 1906.

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Fig. 5.

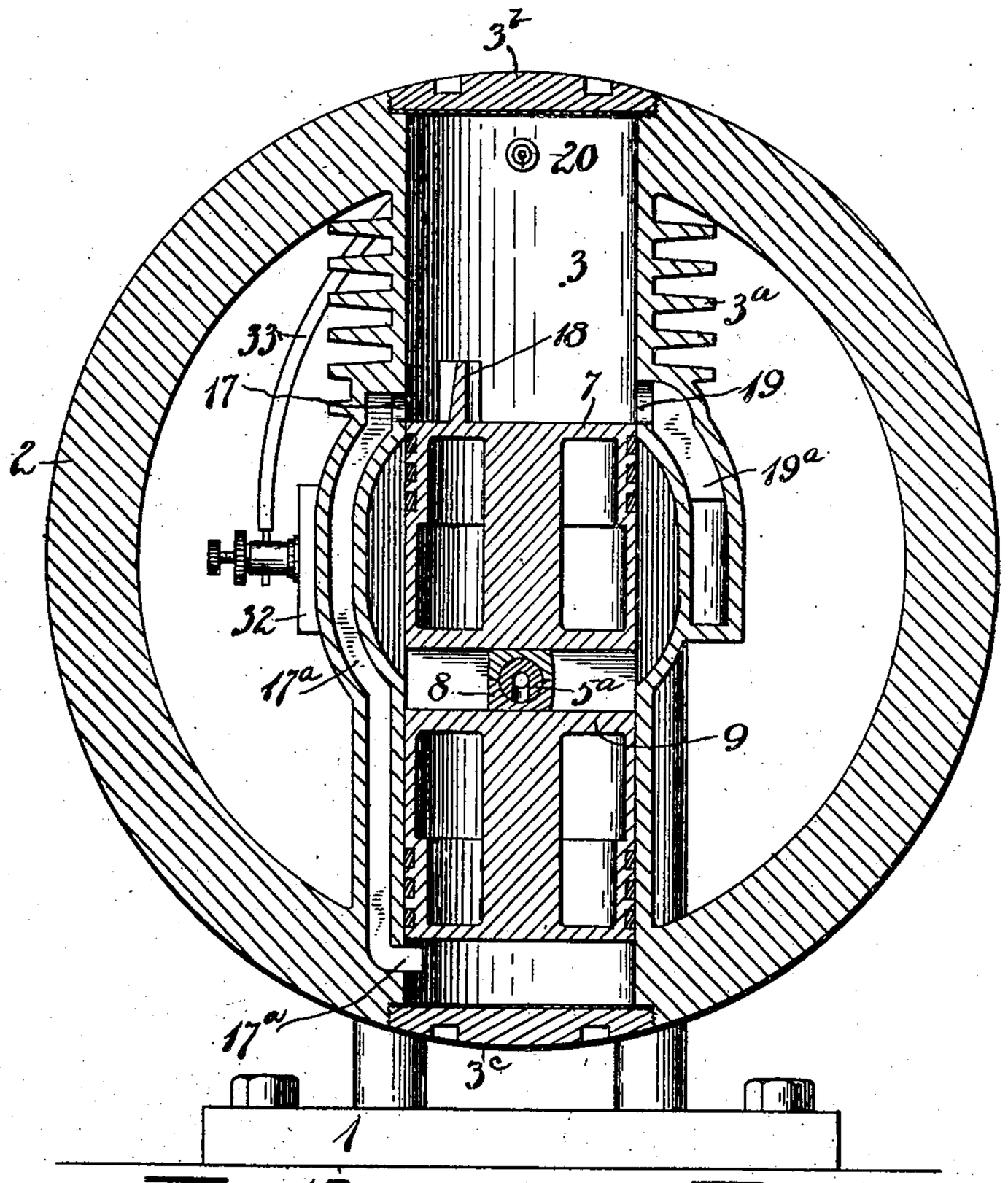
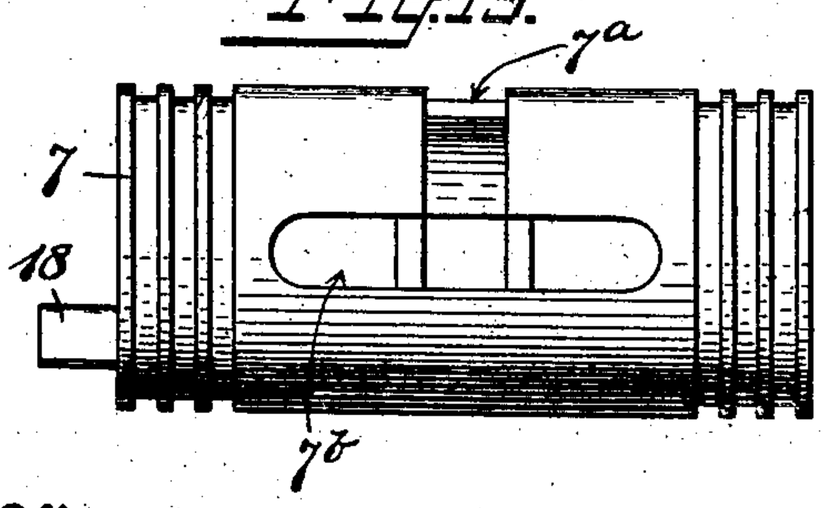
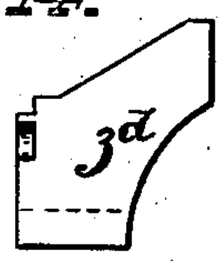


Fig. 13.

Fig. 14.





Witnesses

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No. 870,559. PATENTED NOV. 12, 1907.

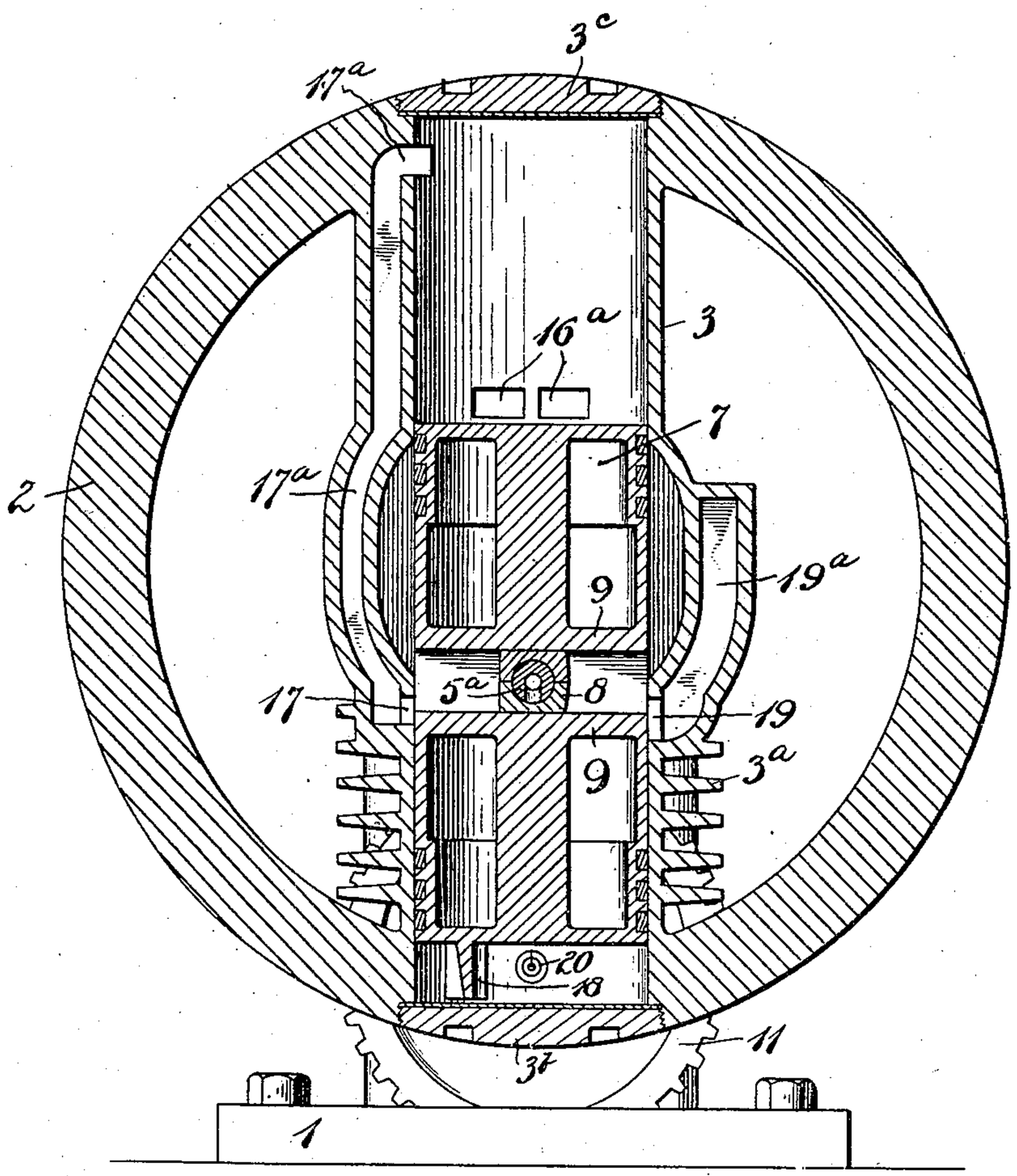
J. J. HOGAN.

GAS ENGINE.

APPLICATION FILED MAY 16, 1906.

8 SHEETS—SHEET 7.

Fig. 6.



Witnesses
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No. 870,559. PATENTED NOV. 12, 1907.

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GAS ENGINE.

APPLICATION FILED MAY 16, 1906.

8 SHEETS—SHEET 8.

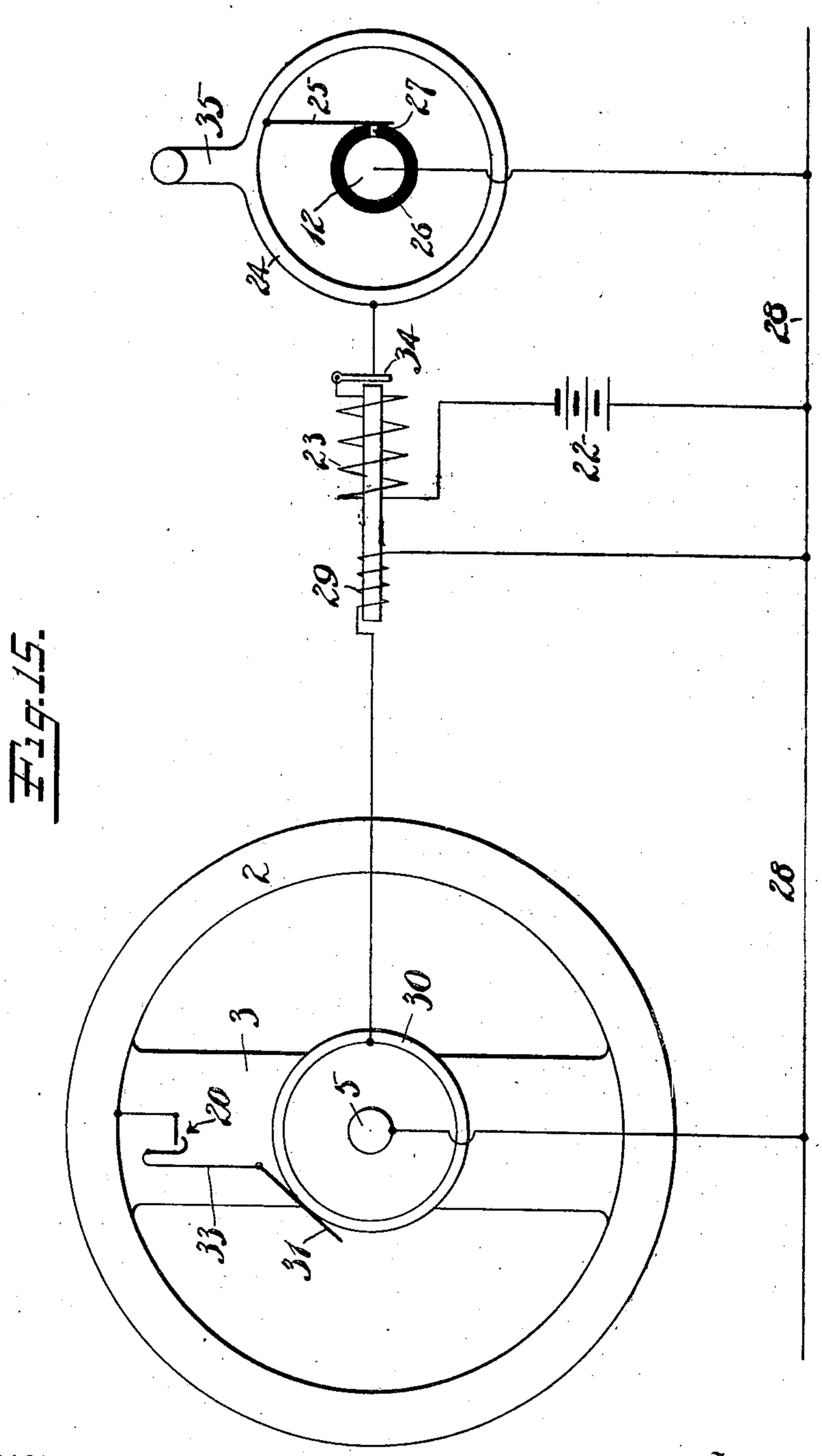

Fig. 15.

Witnesses

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By his Attorneys

UNITED STATES PATENT OFFICE.

JOHN J. HOGAN, OF WEST HAVEN, CONNECTICUT.

GAS-ENGINE.

No. 870,559. Specification of Letters Patent. Patented Nov. 12, 1907.

Application filed May 16, 1906. Serial No. 317,192.

To all whom it may concern:

Be it known that I, JOHN J. HOGAN, a citizen of the United States, residing at West Haven, New Haven county, Connecticut, have invented certain new and useful Improvements in Gas-Engines, of which the following is a full, clear, and exact description.

My invention relates to improvements in internal combustion engines.

The object of the invention is to provide a simple, inexpensive and effective construction. The main parts, to wit, the cylinder, piston and crank, are all contained within the fly wheel. While there is a relative reciprocation between the piston and the ends of the cylinder, nevertheless the operation of the engine is such that shock is absorbed and vibration reduced to a minimum. The crank shaft is stationary, while the cylinder rotates about its axis. In the particular form shown, the engine operates after the manner of a two-cycle engine. By this construction, and because of the perfection of balance, I am enabled to obtain a wide range of flexibility. Other advantages will be apparent to the mechanic skilled in the art, from the following description.

In the accompanying drawing, Figure 1 is a side elevation of my engine. Fig. 2 is an end view thereof looking from right to left. Fig. 2ª is a similar view, certain parts being removed. Fig. 3 is a section on the plane of the line 3—3 of Fig. 2, some of the parts being omitted. Fig. 4 is a section on the plane of the line 4—4 Fig. 1, looking in the direction of the arrows. Fig. 5 is a similar view, the parts being shown in a different position from that indicated in Fig. 4. Fig. 6 is a section on the plane of the line 4—4 Fig. 1, looking in a direction opposite to that of the arrows, certain parts being shown in a different position from that indicated in Fig. 5. Fig. 7 is an end view of an inner end of a detail of construction. Fig. 8 is a side elevation of the same detail. Fig. 9 is an end elevation of an annular contact device used in the spark circuit. Fig. 10 is a relatively enlarged detached view of the contact shoe adapted for use with the contact device shown in Fig. 9. Fig. 11 is a view of the annular contact proper, detached. Fig. 12 is a longitudinal section of the piston shown in Fig. 4, taken on a horizontal plane. Fig. 13 is a side elevation of the piston. Fig. 14 is a detachable portion of the cylinder. Fig. 15 is a diagrammatic view of a circuit.

1 represents a base or frame of any suitable construction, upon which the engine parts are mounted.

2 is the fly wheel.

3 is the cylinder within the fly wheel. This cylinder may be provided with suitable heat radiating flanges 3ª.

3ᵇ—3ᶜ are removable cylinder heads in the fly wheel flange.

The cylinder 3 extends diametrically across and within the fly wheel 2, so as to form in effect a spoke or support for the fly wheel rim or flange. Each hub of the fly wheel is a lateral extension from the center of the cylinder 3 and said hubs are indicated at 4—4ª. The hubs are supported by means of a fixed crank shaft 5, which latter is in turn mounted on the base or frame 1. In the specific form shown in the drawings, the hubs are mounted directly upon two sleeve-like extensions 6—6ª of the gas admission and exhaust heads hereinafter described. These sleeves may be formed of a suitable metal so that in effect they will act as anti-friction bushings for the hubs 4.

5ª is the crank pin of a crank shaft 5.

7 is the piston, suitably fitted to the cylinder 3 and having approximately midway in its length a transverse guide or way extending at right angles to the path of travel of the piston in the cylinder.

8 is an anti-friction box fitted to the crank pin 5ª and likewise to the transverse guide-way in the piston. As shown in Figs. 3, 4 and 6, this guide-way is formed by a web 9 extending longitudinally and vertically in the piston. The width of this web is proper to afford clearance between the cranks on each side of the crank pin 5ª. The walls of the cylinder are internally recessed on opposite sides to afford clearance for the box 8 when the cylinder revolves (Figs. 3 and 4). These recesses may not be provided if the stroke is shorter.

10 is a gear suitably connected to one side of the cylinder 3 or to one of its hubs.

11 is a gear in mesh with the gear 10, and in turn mounted on the driven shaft 12.

In order to assemble the engine, and since the crank is within the piston and of course within the cylinder, I provide a side space in the piston, indicated at 7ª. This space extends transversely of the piston and is of sufficient size to admit of the introduction of the crank. In the adjacent side of the cylinder, there is a removable block 3ᵈ, which may be secured in place in any desired manner. This block may form a part of the hub 4, as well as a part of the cylinder, and when removed it affords an opening to permit the crank to be passed through the wall of the cylinder. In the opposite sides of the piston 7 there are longitudinal recesses, indicated at 7ᵇ Figs. 12 and 13. These recesses are to afford clearance for the crank shaft as the piston moves to and fro.

Without describing the other details of construction, it will be seen, up to this point, that as the fly wheel revolves, it will travel around the axis of the fixed shaft 5. The piston 7 (through its connection with the stationary crank pin 5ª) will be caused to move to and fro in said cylinder. It follows that if power is generated within the cylinder at either end of the piston to drive it away from the adjacent cylinder head, it will in turn (because the crank shaft cannot revolve) cause

the fly wheel to revolve, and it in turn, through suitable connections with the driven shaft 12, will cause the latter to revolve. It is my purpose, therefore, to provide effective means for introducing into one end of the cylinder, which I will term the pumping end a suitable gas, transferring it from this end of the cylinder to the opposite end, which I will term the discharge end and there compressing and igniting it to cause it to expand and impart force against that end of the piston. From the foregoing it will be seen that the piston travels an equal distance on each side of the center, and that the necessity for and unnecessary weight of a connecting rod is eliminated. Because of this fact, vibration is substantially reduced. While it is true that the piston has a relative reciprocating movement in the cylinder, little or no shock occurs on each return of the piston, since when the piston reaches the end of its stroke it is traveling in a curved path.

I will now proceed to describe the means for admitting gas into the cylinder.

14 is the gas supply pipe. 15 is the exhaust pipe. These pipes are provided with annular heads 14^a—15^a which bear against the ends of the hubs 4—4^a respectively and take up lateral motion. The ends of the hubs 4—4 are provided respectively with ports, the admission port in one of these hubs being indicated by the numeral 4^b (see Fig. 2). The hub 4^a on the opposite side of the engine is provided with a similar port 4^c for the exhaust (see Fig. 3). Gas admitted through the pipe 14 enters the port 4^b and goes thence through a passage, the external wall of which is indicated at 16, (Fig. 2^a) and enters the receiving or pumping end of the cylinder through ports 16^a. This occurs when the piston is in the position indicated in Fig. 6. As the fly wheel is revolved, the piston necessarily moves in the cylinder in a direction to cut off said ports 16^a. The gas is then compressed in said receiving end of the cylinder. As the piston continues to move toward the cylinder head 3^c, it finally reaches the position indicated in Fig. 5, in which position the piston uncovers the port 17, which opens into the discharge end of the cylinder. The compressed gas in the receiving end of the cylinder is then free to flow through the transfer passage 17^a into the discharge end of said cylinder.

18 is a baffle plate on the head of the piston on the combustion chamber side. Any inert gases contained in this end of the cylinder at this time will be expelled by the inflowing gas, the burned gas taking a course outwardly through exhaust port 19, passage 19^a, and the port 4^c in the hub 4^a, and thence out through the exhaust pipe head 15^a and exhaust pipe 15. As the fly wheel continues to revolve, the piston will move in a direction to compress the live gas contained within the space between the piston and cylinder-head 3^b. At the proper time, when the gas is under the desired compression, it will be ignited by means of a sparker 20. The gas thereupon expands and forces the piston in an opposite direction. This ignition occurs when the piston stands at, or about, the position indicated in Fig. 6. The time of the spark may be changed from early to late, or vice versa, by the means hereinafter described.

Lubrication is effected as follows. Lubricant is supplied through pipe 21, Fig. 3. It then enters a passage in the shaft 5, and takes a course shown by dotted lines direct to the crank pin 5^a, thence downward and outward to the box 8. The surplus oil, or lubricant, then flows to the walls of the cylinder around the piston and becomes uniformly distributed because of the rotary action of the cylinder. Gravity flow only is required, although pressure feed may be employed, if desired. The crank pin 5^a always being down, the oil flows directly to its destination; thus, it will be seen that, by means of this single lubricating device, practically all of the internal parts may be properly oiled. It will also be seen that surplus oil will work out through the hubs and between said hubs and anti-friction sleeves 6—6^a, so that these end bearings, as well as the others, may be supplied with oil from this single source.

Referring to the diagrammatic view, Fig. 15, the ignition will be seen to occur as follows: 22 is a battery for supplying the necessary current to a primary circuit having the winding 23 of an induction coil. 24 is a shifting ring, or timer, carrying a brush 25. This brush rests against an insulated ring 26 carried by the driven shaft 12 of the engine. 27 is a pin or contact which is in electrical engagement with the shaft 12. This pin projects through the insulated ring 26, or to its surface, so as to be engaged by the brush 25 as the shaft rotates. The shaft 12 and battery 22 are connected through the frame of the machine indicated by ground 28. 29 is the secondary winding of the induction coil, and the same is grounded at one end and at the other connected to the stationary contact ring 30, carried by the frame of the engine concentric with the crank shaft 5. 31 is a spring-pressed contact shoe carried by the rotating cylinder but insulated therefrom by the insulating block 32. This shoe is electrically connected with one terminal of the sparker 20 by the conductor 33 (Fig. 4). The other terminal of the sparker is grounded through the engine. The induction coil (as is customary in such constructions) is provided with a suitable vibrator 34. A current is induced in the secondary and causes a spark to occur in the engine cylinder whenever the primary circuit is completed through contact of the pin 27 with the brush 25. The shaft 12 being geared to rotate at the same speed as the cylinder, it will be noted that the primary circuit is completed between the brush 25 and the pin 27, as just described, once in every two strokes of the piston. The time of the spark depends upon the angular adjustment of the timer 24, which may be shifted by the handle 35. 36 is a ratchet wheel carried by the frame of the engine. Suitable means may be carried by the timer for frictionally engaging this ratchet wheel so as to hold the timer in any one of its adjusted positions.

In the matter of adjustment, in the particular form of the invention shown in the drawings, Figs. 1 and 3, it will be seen that the bearing sleeves 6—6^a are keyed upon the shaft 5 and it in turn is keyed to a bracket 37 which latter is mounted upon the pillars of the frame 1. 38 is a saddle-block which clamps the outer ends of the sleeves 6—6^a respectively, to the bracket 37. By relieving the clamping pressure of the saddle-blocks, end lateral motion of the hubs may be taken up by

adjusting the sleeves 6—6ª endwise. This may be easily and quickly effected. 39 is a bearing for the driven shaft 12 and this may have suitable sliding connections upon the pillars of the frame 1, so that it may be adjusted vertically to effect the proper mesh between the gears 10—11, or, so that by removing the same a new gear may be quickly and easily substituted.

It will be seen that the piston divides the cylinder into two compartments, to wit, a gas receiving compartment and a combustion chamber or power space. The piston acts to control all gas passages by opening or shutting the ports thereof. When the piston moves away from the cylinder head 3ᵉ, it first closes the ports 17—19. As it continues to move, it tends to exhaust the air in that end of the cylinder until when the ports 16ª are uncovered a fresh charge of gas is forced in from the atmospheric pressure without. When the piston moves back and away from the end 3ᵇ of the cylinder, it first closes these ports 16ª, so that gas contained within this receiving end of the cylinder will be compressed until the opposite end of the piston clears the ports 17—19, whereupon this compressed gas in the receiving end of the cylinder is free to flow through the communicating passage 17ª into the combustion chamber to be ignited and burned when said gas contained therein shall have been compressed by the piston as it again moves toward the head 3ᵇ. This action is very simple and effective.

What is claimed is:

1. In combination, a fly wheel, a cylinder extending diametrically across and within said fly wheel, a piston in said cylinder, a fixed crank shaft piercing the walls of said cylinder and said piston, a connection between the crank portion of said shaft and said piston, one end of said cylinder performing the function of the pump and means for supplying gas to the pump end of said cylinder, transferring it to the other end and there igniting the same to cause the cylinder, piston and fly wheel to rotate bodily around said fixed crank shaft.

2. In combination, a fixed crank shaft, a cylinder, hubs on said cylinder, said hubs being supported by said crank shaft, the crank portion of said shaft being between said hubs and within the cylinder, a piston within the cylinder surrounding the crank portion of said shaft, a connection between said crank shaft and said piston, clearance spaces in said piston for said crank and crank shaft, and a fly wheel flange carried by said cylinder one end of said cylinder performing the function of a pump.

3. In combination, a fly wheel, a cylinder extending diametrically thereof and revoluble therewith, one end of said cylinder performing the function of a pump, a piston within said cylinder and extending across the middle portion of the same, hubs on the middle portion of said cylinder and on opposite sides thereof, a stationary crank shaft piercing said hubs, a gas inlet port in one of said hubs, leading to the pump end of said cylinder, a gas transfer passage leading from said end of said cylinder to the other end thereof, and an exhaust passage leading from the latter end of said cylinder to the other hub, a gas inlet head bearing against the hub having the gas inlet port, and an exhaust head bearing against the hub having the exhaust port therein.

4. In combination, a stationary shaft, a cylinder having hubs midway in its length and on opposite sides thereof, said cylinder being supported by said shaft, a piston in said cylinder, the cylinder at one end of said piston performing the function of a pump, a stationary crank on said shaft, said crank being arranged within said cylinder and piston, a gas admission passage leading from one of said cylinder hubs to the pump end of said cylinder, a communicating or gas transfer passage leading from this end of said cylinder to the other end of said cylinder, and an exhaust passage leading from the last named end of said cylinder to an exhaust port in the other cylinder hub.

5. In combination, a stationary crank shaft, a cylinder revolubly supported thereby on opposite sides of the crank portion thereof, a fly wheel flange carried by said cylinder, a piston within said cylinder and extending across the center line of said crank shaft, the cylinder at one end of said piston performing the function of a pump, means for causing said piston to travel an equal distance on each side of said center line, a connection between the crank portion of said shaft and said piston, and means for supplying gas to the pump end of the cylinder and transferring said gas to the opposite end of said cylinder, and means for igniting the gas at the desired time, and discharging the burned gases therefrom.

6. In combination, a stationary crank shaft, a cylinder supported thereby and rotatable about the axis thereof, a hub on each side of said cylinder, a piston separating and spacing the two ends of said cylinder, one end of said cylinder performing the function of a pump, an inlet gas passage leading through one of said hubs to the pump end of the cylinder, said passage being open when the piston is near the opposite end of the cylinder, a gas transfer passage leading from the pump end of the cylinder to the opposite end, said passage being open when the piston is near the pump end of said cylinder, and an exhaust passage leading from the power end of said cylinder outwardly through the other hub, said exhaust passage being open simultaneously with said transfer passage, and a connection between said piston and said crank shaft, and means for igniting the gas at the proper time in that end of said cylinder opposite to the pump end.

7. In combination, a stationary crank shaft, a crank fixed on said shaft, a single piston directly connected to the crank portion of said shaft, a cylinder surrounding said piston, and acting at one end as a pump, hubs on said cylinders and passages through said hubs, one of said passages leading to the pump end of the cylinder for the admission of gas, the other passage leading from the other end of said cylinder to the other hub for exhausting burned gas, a gas transfer passage independent of the first two passages leading from the space at one end of the cylinder to the space at the other end of the cylinder, the opening and closing of all of said passages being controllable by said piston.

8. In combination, a stationary crank shaft, a cylinder rotatably supported thereby, one end of said cylinder acting as a pump, a portion of one side of said cylinder being removable to permit of the introduction into said cylinder of the crank portion of said crank shaft, a piston within said cylinder, an opening in the side of said piston to permit said crank shaft to be inserted into the same, and longitudinal openings in opposite sides of the piston to afford clearance for the opposite ends of the shaft adjacent to the crank, admission, transfer, and exhaust passages, all controlled by said piston.

9. In combination, a piston, a central web therein, a transverse guide-way formed in said web, a fixed crank shaft projecting through said piston, the crank pin of said crank shaft operating in said way when the engine is in motion, a cylinder surrounding said piston and crank, one end of said cylinder acting as a pump, an admission passage leading thereto, and a discharge passage leading from the other end of said cylinder, said cylinder being rotatably mounted on said shaft.

10. In combination, a piston, a transverse guide-way formed in said piston, a fixed crank shaft projecting through said piston, the crank pin of said crank shaft operating in said way when the engine is in motion, a cylinder revolubly mounted transversely of its axis, said piston serving to pump gas through one end of said cylinder to the other end when said engine is in motion.

11. In combination, a stationary crank shaft, a cylinder having central hubs on opposite sides transversely to its axis and supported by said shaft, a piston within said fly wheel and operatively connected with the crank portion of said shaft, said piston dividing said cylinder into two compartments, one a gas receiving compartment or pump chamber, the other a gas burning compartment or combustion chamber, means for admitting gas into the pump

chamber when the cylinder is at one angle relatively to the shaft, means for transferring the gas contained in said pump chamber to the combustion chamber when the cylinder is at another angle relatively to the shaft, and means for igniting the gas contained within the combustion chamber when the cylinder stands at or about the first mentioned angle.

12. In combination, a fly-wheel, a cylinder extending diametrically across said fly-wheel, a piston in said cylinder, a fixed crank shaft piercing the walls of said cylinder and said piston, a connection between the crank portion of said shaft and said piston, hub bearings on the cylinder supported on said shaft, said piston operating in conjunction with said cylinder as the latter is rotated to pump fluid into one end of said cylinder and discharge it from the other end of said cylinder, an admission passage leading to the pump end of said cylinder, a transfer passage leading from the pump end of said cylinder to the discharge end thereof, and an exhaust passage leading from the discharge end of said cylinder.

13. In combination, a fly-wheel, a cylinder extending diametrically across the same and revoluble therewith, a piston within said cylinder and extending across the middle portion of the same and dividing said cylinder to form a pump chamber at one end and a discharge chamber at the opposite end, hubs on the middle portion of said cylinder and on opposite sides thereof, a stationary crank shaft supporting said hubs, an operative connection between the crank portion of said shaft and said piston to permit the piston to reciprocate relatively to the cylinder as the latter is revolved, an inlet leading to the pump end of said cylinder, a transfer passage leading from the pump end of said cylinder to the discharge end thereof, and a discharge passage leading from the latter end of said cylinder.

14. In combination, a fly-wheel, a cylinder extending diametrically across the same and revoluble therewith, a piston within said cylinder and extending across the middle portion of the same and dividing said cylinder to form a pump chamber at one end and a discharge chamber at the opposite end, hubs on the middle portion of said cylinder and on opposite sides thereof, a stationary crank shaft supporting said hubs, an operative connection between the crank portion of said shaft and said piston to permit the piston to reciprocate relatively to the cylinder as the latter is revolved, an inlet leading to the pump end of said cylinder, a transfer passage leading from the pump end of said cylinder to the discharge end thereof, and a discharge passage leading from the latter end of said cylinder, the inlet passage leading through one hub, the discharge passage leading through the opposite hub.

15. In combination, a piston, a transverse guide-way in said piston, a fixed crank shaft projecting through said piston, the crank pin of said crank shaft operated in said way when the engine is in motion, a cylinder revolubly mounted transversely of its axis, a pump chamber, a combustion chamber, a gas transfer port leading from one to the other, and inlet and exhaust ports therefor respectively.

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