No. 682,385. Patented Sept. 10, 1901.

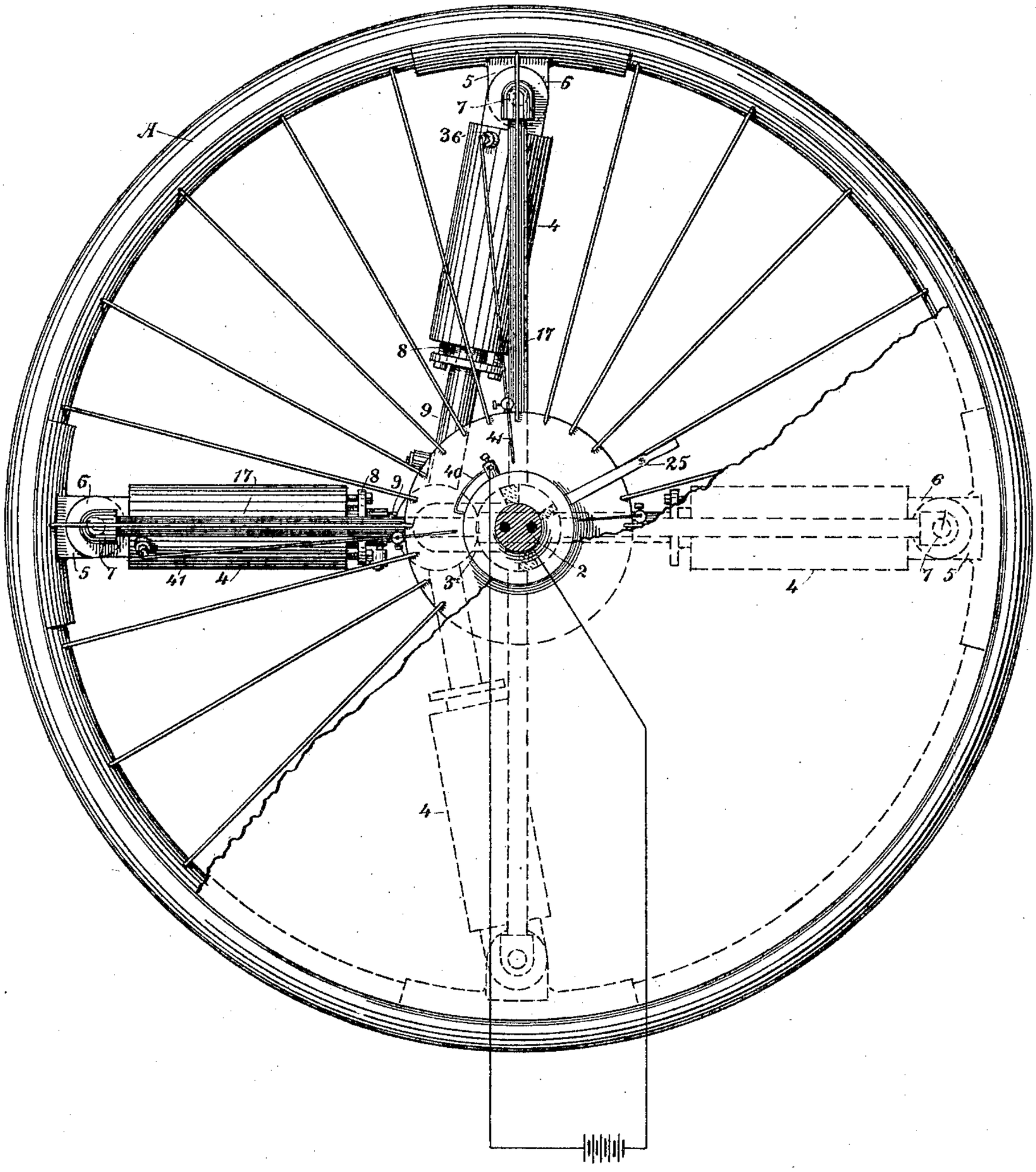
J. D. McFARLAND, JR.

ROTARY EXPLOSIVE ENGINE.

(Application filed Dec. 4, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

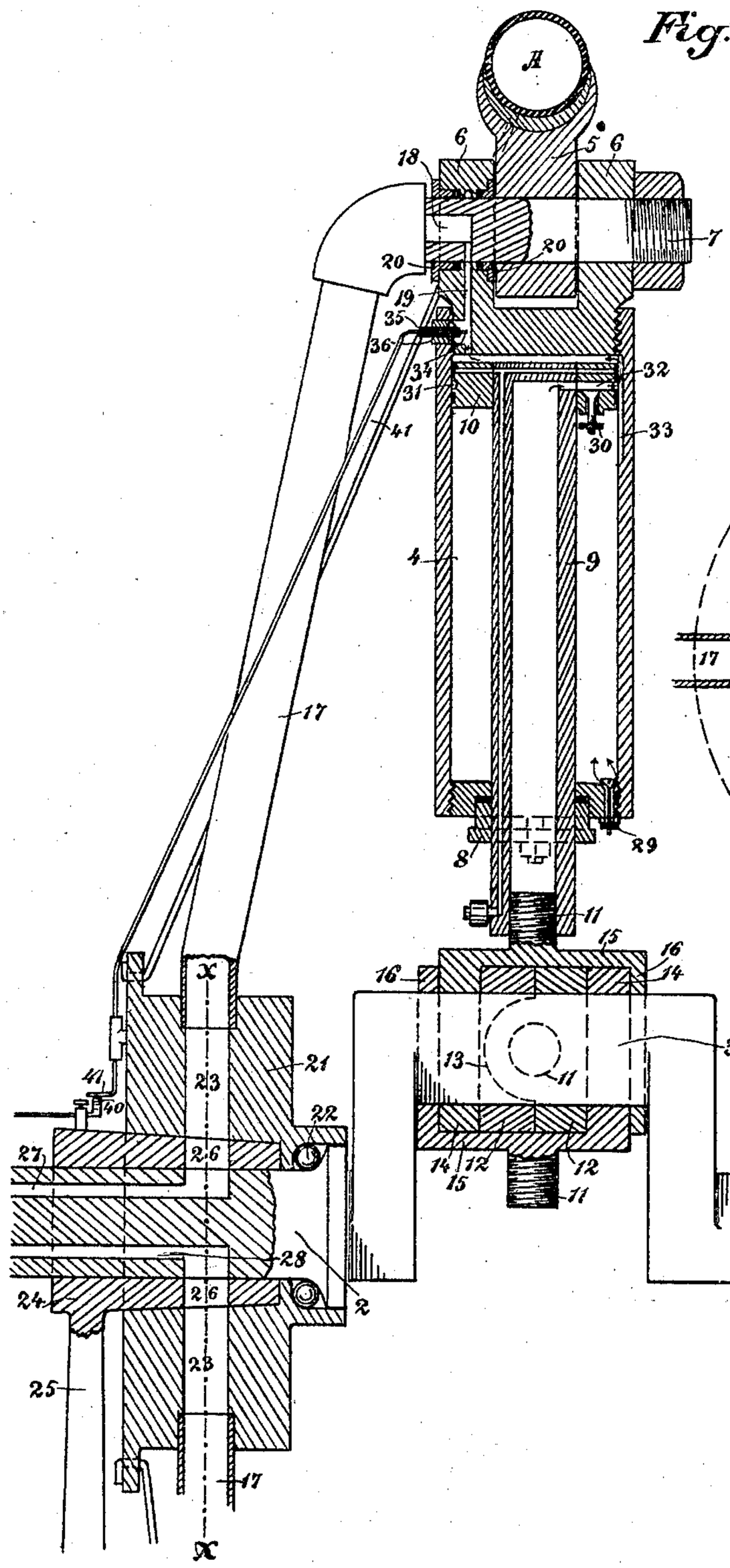
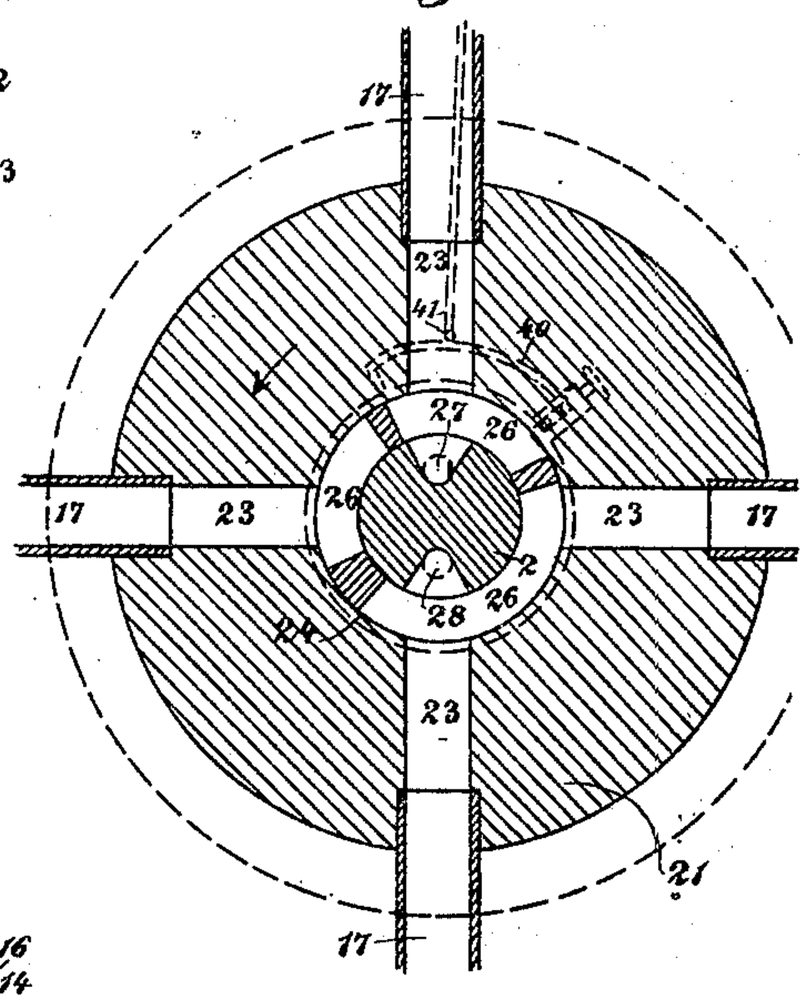


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

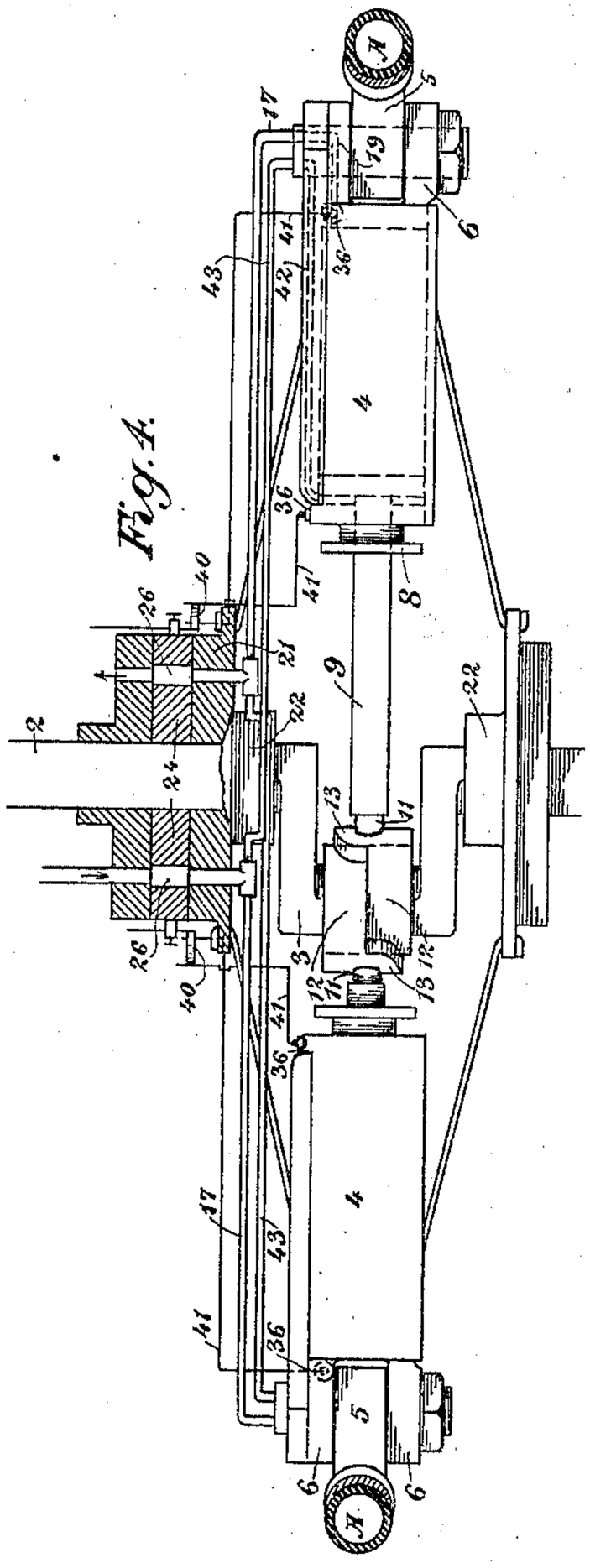

Fig. 4.

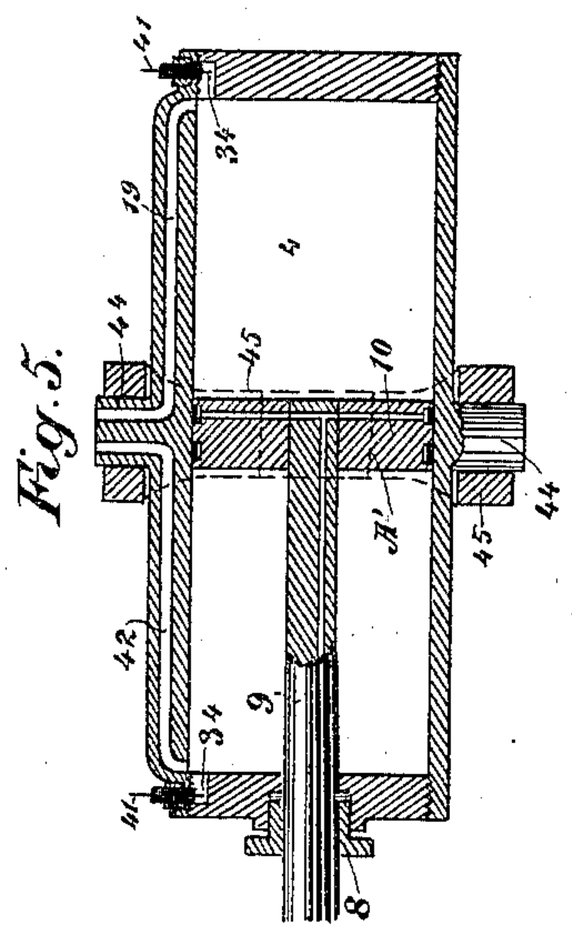

Fig. 5.

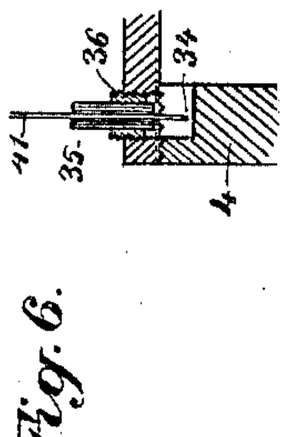

Fig. 6.

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UNITED STATES PATENT OFFICE.

JAMES D. McFARLAND, JR., OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF TO JOHN BRUCKMAN, OF SAME PLACE.

ROTARY EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 682,385, dated September 10, 1901.

Application filed December 4, 1900. Serial No. 38,665. (No model.)

To all whom it may concern:

Be it known that I, JAMES D. MCFARLAND, Jr., a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Rotary Explosive-Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in rotary engines, and is especially designed to allow the use of an explosive gas or vapor in the propulsion of such an engine.

It consists in details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a general view of the engines and connections. Fig. 2 is a longitudinal section through one of the engines. Fig. 3 is a section through the reversing device on line *x x* of Fig. 2. Fig. 4 shows the arrangement of parts for double-acting engines. Fig. 5 is a section through a double-acting engine, showing the latter supported by trunnions from the center. Fig. 6 is a detail of the sparking device.

The object of my invention is to provide an explosive or gas engine comprising a plurality of cylinders having the outer ends connected with the interior of a wheel-rim and the piston-rods from the inner ends connecting with a stationary crank or point of support which is out of the center of the wheel, so that impulse delivered through the cylinders and pistons will act to rotate the wheel.

The device is especially designed for use in propelling vehicles, but may also be used for rotating any wheel or shaft.

As here shown, A is the wheel-rim.

2 is a fixed shaft having a cranked portion 3, which is out of the center of the wheel and to which the piston-rods are connected, as will be hereinafter described.

The cylinders 4 (of which four are here shown) are connected with the wheel-rim A by lugs 5, projecting radially inward from the inner periphery of the rim, and there are two corresponding lugs 6 projecting from the outer ends of the cylinders. Through these lugs a pin 7 passes and is suitably secured, forming the pivot about which the cylinders oscillate. The inner ends of the cylinders have stuffing-boxes, as at 8, through which the hollow piston-rods 9 pass. Interior to the cylinder is the piston 10. The piston-rods are connected with the crank 3 by short pins or extensions 11, which are screwed into the ends of the piston-rods 9 and are connected with sleeves, which are turnable upon the cranked portion. In order to make the four connections with the crank and at the same time maintain the piston-rods in the same plane of operation, the connection is made as follows: One pair of the piston-rods or their connecting-pins 11 are fixed to sleeves 12, which are turnable side by side upon the crank-pin and have projecting lugs 13, each overlapping the other ring, so that with this overlap they are brought into line with the two opposite piston-rods and the connecting-pins 11. The other pair of piston-rods standing at right angles with these must necessarily connect with rings 14, which are mounted upon the crank-pin exterior to the rings 12, and consequently at a considerable distance apart. These rings have extensions 15 of such length parallel with the shaft as to extend over the rings 12 and the ring 14 at the opposite end. At this end they are provided with a flange or collar 16, which also encircles the shaft and forms a support for the extended arm 15. These arms stand at right angles with the projections 13 of the first-mentioned rings and extend entirely across the rings 12, as plainly shown in Fig. 2. The other pair of piston-rods is then connected centrally with these arms 15, and thus all of the piston-rods are in the same plane of operation, so that it is not necessary to set the cylinders out of line or to make offsets to form the proper connections.

In order to supply the explosive gas for the operation of this engine, I have shown a pipe 17 for each cylinder, and this pipe extends from the controlling inlet-valves, which are located centrally of the wheel, to the outer end of the cylinder, where it connects with the pivot-pin 7, upon which the cylinders oscillate. This pin is bored out to a certain distance, so that it makes an open connection with the pipe 17, as at 18. From this passage 18 a passage 19 passes through one of the cylinder-lugs 6 and through the cyl-

inder-head to the interior. A stuffing-box 20 incloses the pin 7, so as to form a tight joint at the end through which the propelling medium is received. The medium may be supplied to the pipe 17 either through flat disks fitted upon the shaft and having passages made therethrough for inlet and exhaust or, as I prefer to make the apparatus, by means of a disk 21, having a ball or other suitable antifrictional bearing upon the shaft 2, as at 22. This disk has holes bored radially into it, as at 23, and the pipes 17 connect with these holes. The interior of the disk is bored tapering from the outer face toward the bearing, and within this taper bore is fitted a correspondingly tapered or conical plug 24. This plug is provided with a handle, as 25, by which it may be turned with relation to the disk 21 to reverse the engine. Passages are made through the plug, as at 26, and these connect with passages 27 and 28, bored longitudinally within the axle 2. One of these passages serves as an inlet and the other as an exhaust passage, and as the wheel rotates, so as to bring the passages of the disk 21 successively into communication with the inlet-passages, each cylinder will receive an impelling charge, and correspondingly when the impulse has been given and the exhaust is to take place the passages will be brought into line with the exhaust-passage of the plug, so that the operation may be continued.

The engines may be made either double or single acting. When made so as to receive the impulse from the outer end of the cylinder and forming what is known as a "two-cycle engine," the piston 10 being connected, as previously described, with the hollow piston-rod 9 may either be impelled by a charge of gas or vapor, which is introduced through the pipe 17 in a condition for immediate explosion, or the gas may be introduced through the pipe 17 and a charge of air afterward introduced and mixed with the gas to render it explosive. For this latter purpose I have shown an inwardly-opening valve 29 at the inner end of the cylinder and a corresponding valve 30 opening inwardly through the piston 10 and connecting with an annular channel 31, made around the periphery of the piston between its packing-rings. When the piston moves toward the outer end of the cylinder, the valve 29 will open inwardly, allowing air to be drawn into the inner end of the cylinder. When the piston moves back, the air will be forced through the valve 30 into the annular channel 31 and thence into the hollow space of the piston-rod 9 through a passage 32, which connects the annular channel with the interior of the piston. This air thus compressed acts to close the valve 30 and retain the compressed air in place when the piston commences to move toward the outer end of the cylinder, and it is thus retained until the piston arrives at a point near the outer end of its stroke, when the annular channel 31 coincides with a groove or channel 33, which is formed in the inner surface of the cylinder and has a sufficient length to allow the compressed air within the piston-rod and the channel to escape through the passage 33 into the rear end of the cylinder, where it drives out the burned gases, and as the piston advances on its return stroke mixes with the gas that will be drawn in as supply-pipe passes over gas-supply port in disk. Then the mixture is in condition for explosion. This explosion is effected in the usual manner by any suitable igniter. In the present case I have shown the igniting-points 34 passing through an insulator 35, which is carried by a screw-plug 36, fitting an opening in the side of the cylinder and opposite to the passage 19, through which the gas is admitted, so that when the piston arrives at a position where its supply of impelling fluid is cut off by dividing-wall in disk or cone the contact may be made and the explosion effected. Various devices may be employed for this purpose. I have here shown one of the wires of a battery or source of electrical energy connecting with the point 34 and the other connecting directly with the cylinder. The distance between the point 34 and the opposing point or side of the chamber in which the point is located is sufficient to produce the proper spark when connection is made. This connection is made and broken by means of a curved arm 40, carried by a stationary part of the central portion of the wheel, while the other arm connecting with the opposite pole of the battery is carried by the other member, so that as the wheel revolves these parts 40 and 41 are brought into contact and the contact broken, so as to produce the spark at the instant when the charge in each cylinder is in the proper condition for explosion.

If it is desired to make the engine double-acting, the piston-rod 9 may be a solid rod. The cylinder will in this case have a passage 42, connecting the opposite ends, and in addition to the pipe connection 17, which communicates through the passage 19 through the outer end of the cylinder, there will be another supply-pipe 43, connecting with this passage 42 and thence with the inner end of the cylinder. The explosive compound in this case will be brought to the cylinders in a properly-mixed condition, and it is only necessary to allow it to enter the cylinder and to provide an igniting wire or point at each end with the means for igniting the charge. In Fig. 5 I have shown the cylinder supported in the center by trunnions 44 from a loop 45 in the rim of a wheel A, one of these trunnions forming the connection between the passages 19 and 42 and the pipes 17 and 43.

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

1. A rotary engine including a revoluble wheel, a central crank-shaft the crank where-

of is eccentrically located with relation to the wheel-center, cylinders having their outer ends pivoted to the wheel-rim, pistons movable in the cylinders and piston-rods connecting the pistons with said crank, said shaft having inlet and exhaust passages made in it, a plug fitting the shaft and having passages communicating with said inlet and exhaust passages, and passages connecting the inlet and exhaust passages with the cylinders, an igniting mechanism, and means for making and breaking contact to explode the gas charges.

2. A rotary engine consisting of a revoluble wheel, and a fixed central shaft having a crank eccentric to itself, cylinders having the outer ends pivoted in the wheel-rim, pistons movable therein and piston-rods connecting with the fixed crank, disks forming the wheel-hubs, passages made through the disks and pipes connecting said passages with the outer ends of the cylinders, inlet and exhaust passages made in the shaft, and a tapering plug fitting between the shaft and the hub and having passages through which inlet and exhaust communications are established with the cylinders.

3. The combination in a rotary engine of a wheel, a fixed crank-shaft upon which it is revoluble, cylinders pivotally secured to the rim of the wheel, and the inner ends of the piston-rods connected with the crank eccentric to the main shaft, inlet and exhaust passages made through the main shaft, corresponding passages made through the wheel-hub, a plug fitting between the shaft and the hub having passages therethrough adapted to register with those of the shaft and the hub, a lever by which said plug may be turned to change the relative positions of the passages and reverse the rotation of the engine, and pipes connecting the wheel-hub passages with the outer ends of the cylinders to admit the propelling medium thereto.

4. The combination in a rotary gas-engine of a revoluble wheel, a crank-shaft, a plurality of cylinders having their outer ends pivoted to the rim of said wheel, and the piston-rods of said cylinders connected with the crank formed in said shaft, passages through the shaft and through the wheel-hub, pipes connecting the passages in the wheel-hub with the outer ends of the cylinders, said connection being made through the pivot-pins about which the cylinders oscillate.

5. The combination in a rotary gas-engine of a revoluble wheel, a crank-shaft, a plurality of cylinders having their outer ends pivoted to the rim of said wheel, and the piston-rods of said cylinders connected with the crank formed in said shaft, passages through the shaft and through the wheel-hub, pipes connecting the passages in the wheel-hub with the outer ends of the cylinders, and a valve interposed between the shaft and the wheel-hub having passages therethrough, and means for moving said valve to reverse the rotation of the wheel.

6. The combination in a rotary gas-engine of a revoluble wheel, a crank-shaft, a plurality of cylinders having their outer ends pivoted to the rim of said wheel, and the piston-rods of said cylinders connected with the crank formed in said shaft, passages through the shaft and through the wheel-hub, pipes connecting the passages in the wheel-hub with the outer ends of the cylinders, said connection being made through the pivot-pins about which the cylinders oscillate, electric igniting-wires, and means for making and breaking the contact consisting of a member carried by the wheel-hub, with which one of the wires is connected, said member making and breaking contact with the other wire during the revolution of the wheel.

In witness whereof I have hereunto set my hand.

JAMES D. McFARLAND, Jr.

Witnesses:
S. H. Nourse,
Chas. E. Townsend.