No. 696,251. Patented Mar. 25, 1902.

J. D. McFARLAND, JR.

REVOLVING CYLINDER EXPLOSIVE ENGINE.

(Application filed Apr. 13, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

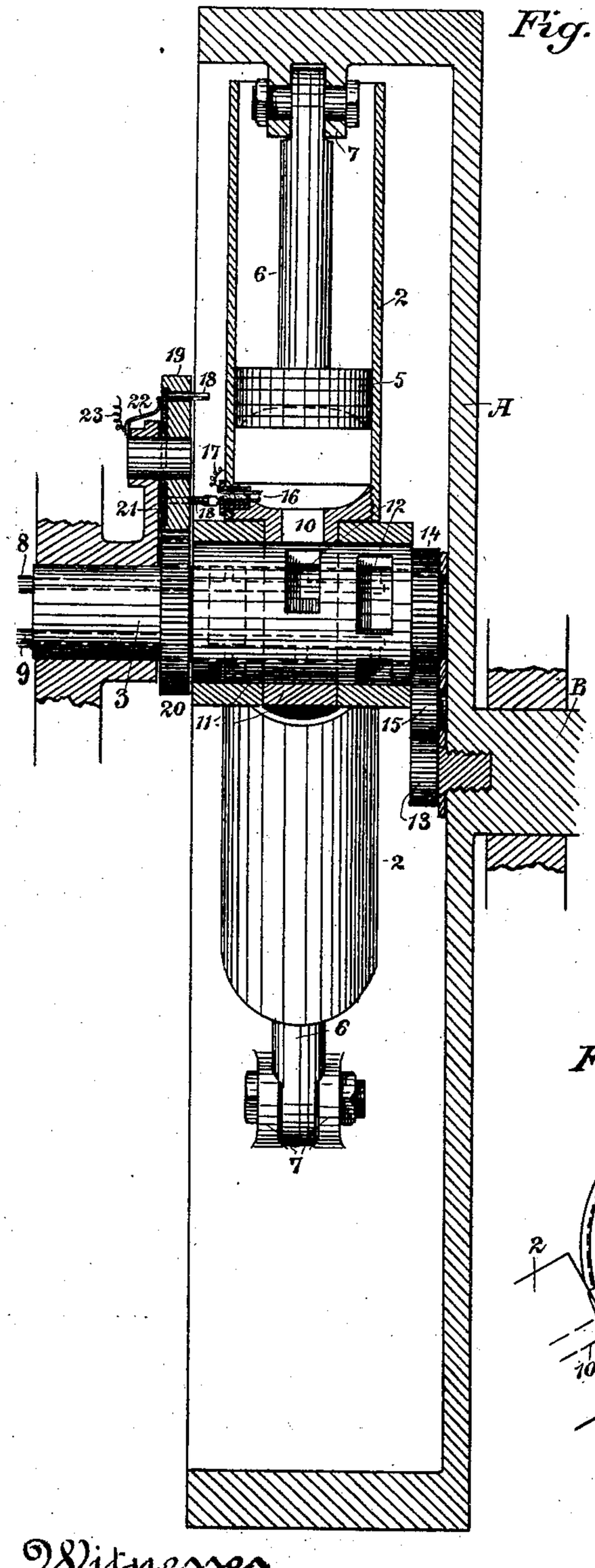

Fig. 2.

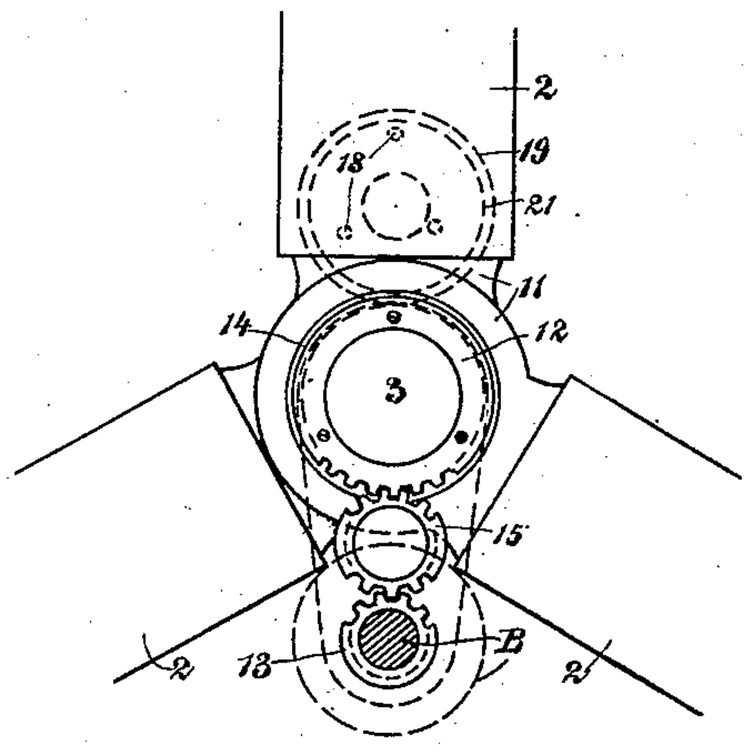

Fig. 3.

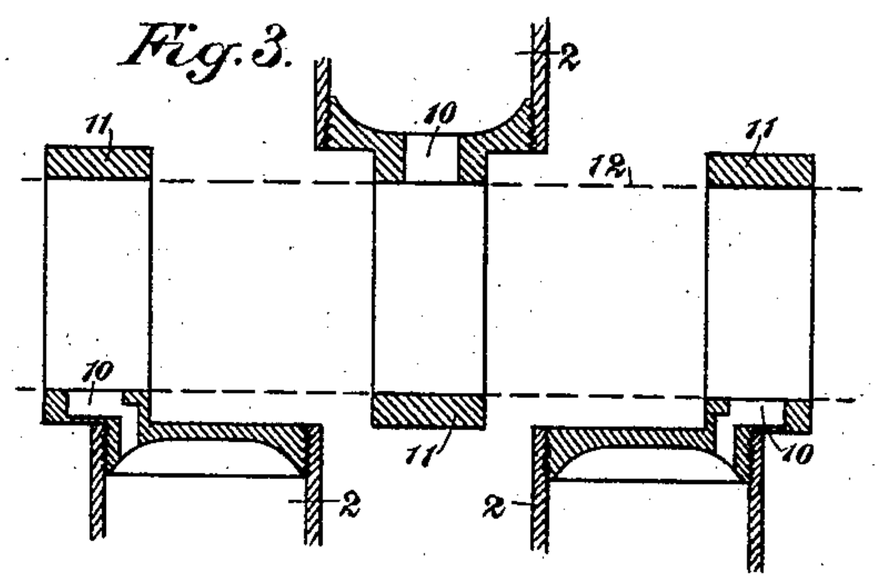

Fig. 4.

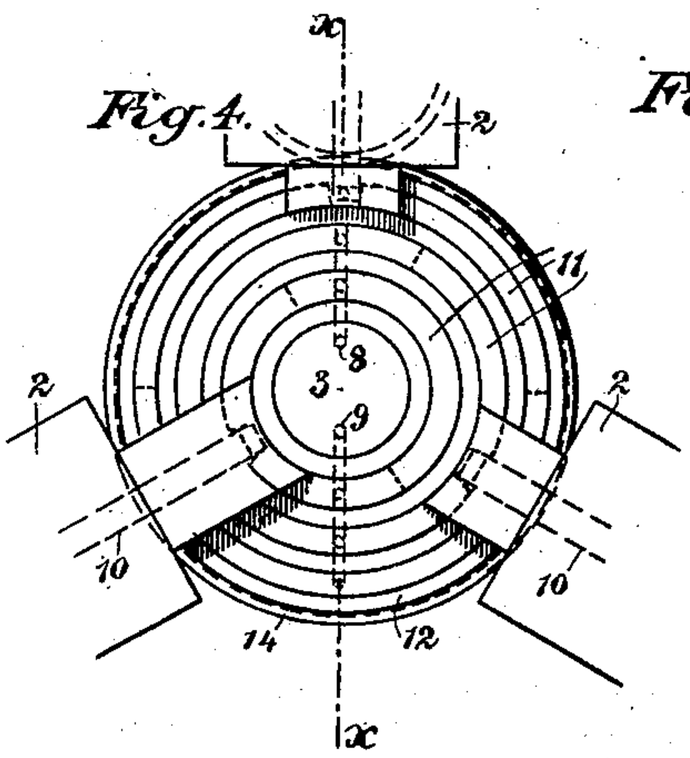

Fig. 5.

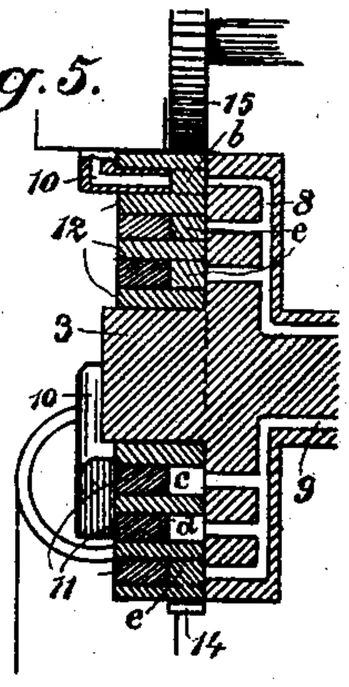

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Fig. 6.

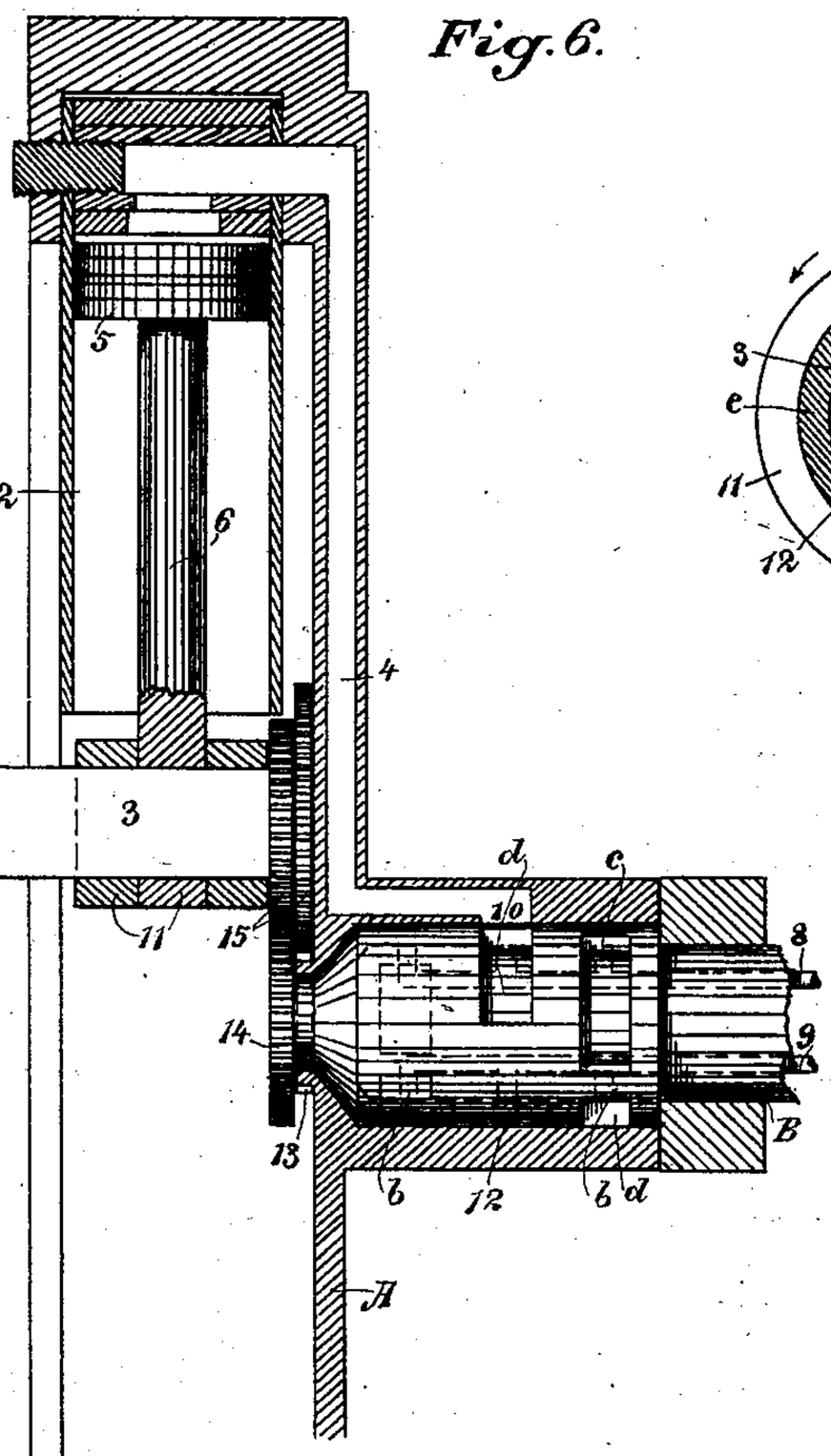


Fig. 7.

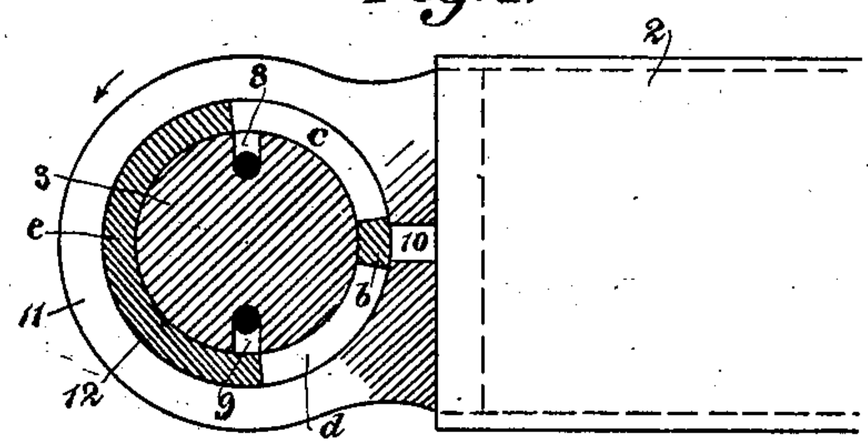


Fig. 8.

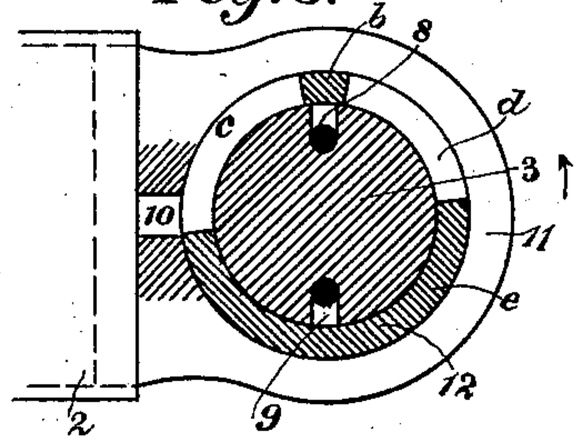


Fig. 9.

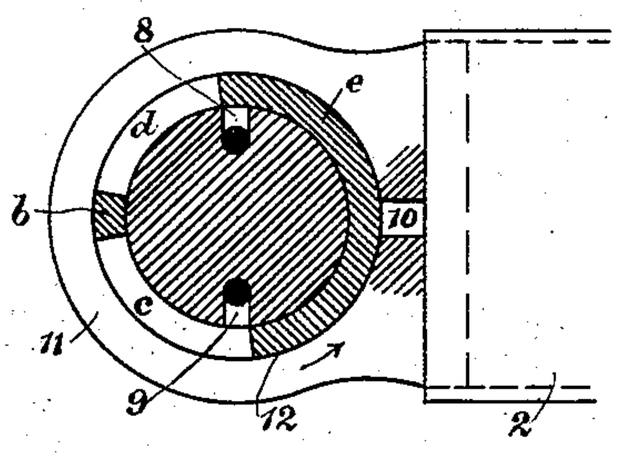
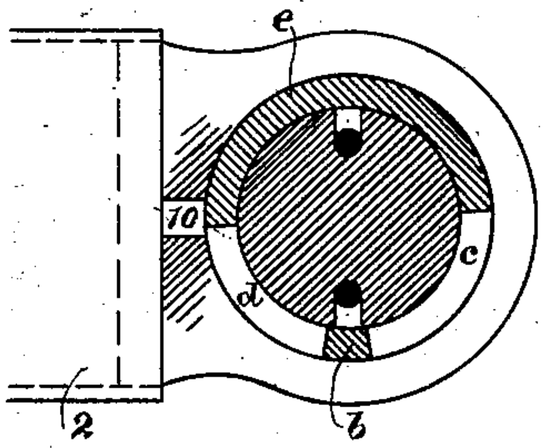


Fig. 10.



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UNITED STATES PATENT OFFICE.

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

REVOLVING-CYLINDER EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 696,251, dated March 25, 1902.

Application filed April 13, 1901. Serial No. 55,643. (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 Revolving-Cylinder Explosive-Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an engine in which cylinders are mounted radially with relation to an axis, said cylinders being suspended within a wheel or rim which is revoluble about another axis to which the first-named is eccentric, whereby the revolution of the cylinders and wheel causes the reciprocation of pistons within the cylinders.

My invention consists of the parts and the constructions and combinations of parts which I will hereinafter describe and claim.

Figure 1 is a sectional elevation of the wheel-rim and part of its axis, showing the cylinders and connected mechanism. Fig. 2 is an end view showing relative position of inner ends of cylinders and gears. Fig. 3 is a diagrammatic sectional view showing relation of cylinders and their ports. Fig. 4 is an end view, and Fig. 5 is a vertical section through *x x* of Fig. 4, showing the valve-ports and connecting-passages through contacting disks. Fig. 6 is a view similar to Fig. 1, showing the position of the cylinder reversed with relation to its center of revolution. Figs. 7, 8, 9, and 10 are sections illustrating the positions of the cylinders and inlet-valves at different points in their revolution.

A is a wheel or rim mounted and turnable with a shaft B, which is suitably journaled so that, as shown in the present case, the wheel is turnable exterior to the journal-bearing at one end.

2 represents cylinders carried within the wheel-rim and revoluble with it. These cylinders may be either set with the open ends toward the rim of the wheel and the end into which the propelling medium is received adjacent to the axis with which they are connected, as at 11, or they may be reversed and having the end which receives the impulse adjacent to the periphery of the rim and the opposite end adjacent to the crank or shaft, with which the piston-rods are connected by rings around the shaft. In the first construction the propelling medium is admitted directly through the shaft with which the cylinders are connected and through ports 10, made in rings 11, surrounding the shaft and connected with the inner ends of the cylinders. The inlet and exhaust are controlled by sleeves or valves turnable between the shaft and the ring. In the construction shown in Fig. 6 the propelling medium is admitted through the bearing-shaft B and transmitted to the outer end of the cylinder through a port, as at 4, and similar connecting-rings and valves. The valve mechanism and operating devices which are the features of my present invention are essentially the same in operation in both constructions.

As shown in Fig. 1, the piston 5 has a piston-rod 6, which is hinged between lugs, as at 7, formed or fixed to the inner periphery of the rim of the wheel A. The shaft 3, with which the inner ends of the cylinders connect, is eccentric to the shaft B, and by their movement around that shaft when the wheel revolves the cylinders, which are connected directly with it, will be alternately moved toward and away from the wheel-rim, thus causing the pistons to reciprocate within the cylinders at each revolution of the wheel. Steam and exhaust passages 8 and 9 extend through the shaft 3 and connect with ports 10, formed in rings 11, to which each cylinder is connected.

The arrangement of the rings and their ports is well shown in the diagrammatic Fig. 3, in which the port of the central cylinder of 3 opens directly into the end of the cylinder from the center of the ring. The port 10 of the left-hand ring opens at the extreme left side of its cylinder, and the port of the right-hand cylinder opens into the extreme right side of said cylinder. This allows the cylinders to stand in the same plane of revolution, while the three rings lie side by side upon the shaft, and by this arrangement of the cylinders the impelling effect is applied

in a single plane instead of the more irregular action which would take place if the cylinders were set out of line with each other.

When an explosive vapor is employed as the impelling medium in such an engine, it is necessary to first admit the gas while the piston is moving outwardly from the acting end of the cylinder, then to close the ports, so that the gas can be properly compressed previous to the explosion, and to then produce a spark to ignite the compressed gas. The valves 12 have their ports *c* and *d* so made with relation to each other and to the inlet-passages that they may be revolved to first admit the gas through the open port *c*, then a closed portion or body *e* is brought in line with the cylinder-port 10 and remains in that position during the compression and explosion, and finally another open port *d* is brought into line with the port 10 to allow the waste products to be expelled by the next return of the piston. The relative positions of these ports are well shown in Figs. 7 to 10, inclusive, each of which shows a half-revolution of the cylinder with relation to the ports. The closed portion of the cylinder-ring is shown at 11. The inlet-opening is shown at 10. In order to produce the proper relative movements of the cylinders and the controlling valve-rings 12, which are turnable upon the shaft, I have shown a train of intermeshing gears.

13 is a pinion carried by the shaft B, and 14 is a gear-wheel fixed to the valve. This gear is twice the size of the gear 13 and is connected therewith by an intermediate pinion, as at 15. The gear 14 is connected with the valve 12 so that it is revolved upon the shaft 3, and the consequent rotation of the valve is one-half as fast as the rotation of the cylinders around the shaft 3. The result of this is that when the cylinder, as shown in Fig. 7, has turned until it arrives at a point diametrically opposite, as shown in Fig. 8, the valve will be advanced one-quarter of a revolution, the cylinder having moved one-half, and, as shown in Fig. 8, the inlet-passage 10 has just reached the part *e*, and a further small movement of the cylinder will have brought the inlet-passage of the cylinder into line with this closed portion of the valve, and this allows the gas to be compressed by the return of the piston. As soon as the charge is compressed ignition takes place and the piston is forced to the opposite end of the cylinder. This position is shown in Fig. 9. Fig. 10 shows the position of the cylinder just as the piston commences to return toward the valve-controlled end of the cylinder, and the cylinder-port is then just being brought into line with the exhaust-port *d* of the valve and the passage 9 through the shaft, while the inlet-passage 8 is now covered by the closed portion *e* of the valve. By thus-timed revolutions of the cylinder and the valve two reciprocations of the piston will take place to one revolution of the valve, and the gas can be drawn into the cylinder by an outward stroke, compressed by the inward stroke, ignited, so as to force the piston out again, and finally the next return of the piston will expel the waste gases.

In order to ignite the compressed gas at the proper time, I have shown any usual or well-known form of igniting separated points, as at 16, between which a spark may be made to pass when the electrical circuit is completed through them. One of these points is connected through the wire 17, and an electrical circuit is completed through the other when the point 18 is brought into contact with it. This contact 18 is carried upon a gear-disk 19, which is revoluble by means of a gear upon the valve, as shown at 20. The disk 19 carries an annular contact-plate, as 21, and by means of an elastic brush 22 and a connected conducting-wire 23 the circuit will be completed whenever the point 18 strikes the igniter 16. There are as many of these points 18 carried upon the disk as there are cylinders. In the present case there are three, and these points are at different distances from the center of the disk, as shown plainly in Fig. 2, and the igniters 16 are each so arranged in its cylinder that only the proper pin 18 will strike that igniter, the others by reason of their different radial distances from the center passing it without contact. In this manner the revolution of the disk caused by the gear will be such that the proper pin 18 will complete the circuit through the points 17 and produce a spark at the instant when the piston is at the proper position within the cylinder to make the impulse available for propulsion.

In Figs. 4 and 5 the valve is shown in the form of a flat disk having ports made through it, and it is turned in contact with a similar flat-faced disk, through which the shaft-ports pass. The cylinder-ports 10 connect with the opposite side of the valve and are alternately opened and closed, as previously described, the operation being the same whether the valve is tubular or disk-shaped.

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

1. The combination of a wheel, a shaft upon which it is revoluble, a second shaft eccentric thereto, cylinders supported approximately radial within the wheel and each having a port for the inlet and exhaust of the propelling medium, pistons movable within the cylinders and connected to the wheel whereby the pistons are reciprocated within the cylinders by the revolution of the wheel, inlet-passages through one of said shafts, a valve turnable upon this shaft and having ports to register with those of the cylinders, said ports being so disposed as to admit and exhaust

the propelling medium, and mechanism by which the valves and cylinders are independently turnable.

2. The combination in a revolving-cylinder engine of a wheel and shaft upon which it is revoluble, cylinders supported within the wheel, a second shaft eccentric to the first, pistons within the cylinders and connected with said wheel whereby they are reciprocated within the cylinders as the wheel revolves, a valve turnable upon the shaft having ports connecting with those of the cylinders, inlet and exhaust passages connecting with said ports, gears interposed between the wheel-shaft and the valve whereby the latter is turned in unison with the revolutions of the cylinders and at a different rate of speed.

3. In an engine, the combination of a wheel, a shaft upon which it is revoluble, a second shaft eccentric to the first-named one, cylinders within the wheel and having ports, a valve on said eccentric shaft and having ports to register with those of the cylinders, pistons within the cylinders and connected to said wheel and operated by the revolution of the latter, and gears connecting with said valve and with the center of revolution, said gears being so proportioned that the valve will revolve at one-half the speed of revolution of the cylinders.

4. The combination of a wheel, cylinders within the same, pistons within the cylinders and connected to the rim of the wheel, a shaft upon which the wheel is mounted, a second shaft, eccentric to the first-named one and having a passage through it, a valve on said eccentric shaft and having ports to register with ports in the cylinders, and intermeshing gears for turning the valve upon its shaft at a different rate of speed from that of the cylinders, said valve having closed portions so disposed that the ports are opened for the inlet of the propelling medium and closed by a further revolution, whereby the pistons on their return compress the medium in readiness for ignition.

5. The combination with a revolving-cylinder engine and the wheel within which the cylinders are suspended, of inlet-passages through a stationary shaft, a valve turnable upon said shaft and gears by which it is moved at a different rate of speed from that of the cylinders, ports in the valve connecting with those of the cylinders and so disposed as to admit an explosive propelling medium upon the outward movement of the pistons, said ports being closed to allow the medium to be compressed by the return movement, and remaining closed until it is ignited, and again opened to allow the exhaust of the waste gases.

6. The combination in an explosive revolving-cylinder engine, the wheel within which the cylinders are suspended, and the eccentric shaft through which connection is made with the pistons to reciprocate the latter within the cylinders, of a valve having admission and exhaust ports and closed sections whereby the explosive medium is compressed, igniters carried within each cylinder and contact-points revoluble with relation to the revolutions of the cylinders so as to complete an electrical circuit and explode the gas after its compression.

7. The combination with a revoluble-cylinder engine, of a wheel, cylinders within the same, a shaft upon which the wheel is mounted, a second shaft eccentric to the first-named one and having a passage, pistons within the cylinders and connected to the rim of the wheel, a valve turnable upon the shaft about which the wheel and cylinders are revoluble and having ports for the admission of an explosive medium into the cylinders, gears interposed between the wheel-shaft and the valve and by which the valve is revolved at a different speed from that of the cylinders whereby the ports are opened during the outward movement of the piston and closed on its return so as to compress the gas, igniters carried by the cylinders, and independent circuit-closers with gears whereby they are revolved in unison with the revolutions of the cylinders and valve, so as to explode the gas after compression.

8. The combination with radially-disposed cylinders revoluble about a common center, a shaft eccentric to said center, a wheel containing said cylinders and pistons within the cylinders and connected to said wheel whereby they are reciprocated at each revolution, of a valve with ports adapted to alternately open and close communication between the cylinders and fixed inlet and exhaust ports, and mechanism whereby the valve is rotated at such a rate of speed relative to that of the cylinders as to admit, compress and explode charges of a propelling medium.

In witness whereof I have hereunto set my hand.

JAMES D. McFARLAND, Jr.

Witnesses:
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