

No. 668,451.

Patented Feb. 19, 1901.

J. D. MCFARLAND, JR.
REVOLVING CYLINDER ENGINE.

(No Model.)

(Application filed July 24, 1900.)

3 Sheets—Sheet 1.

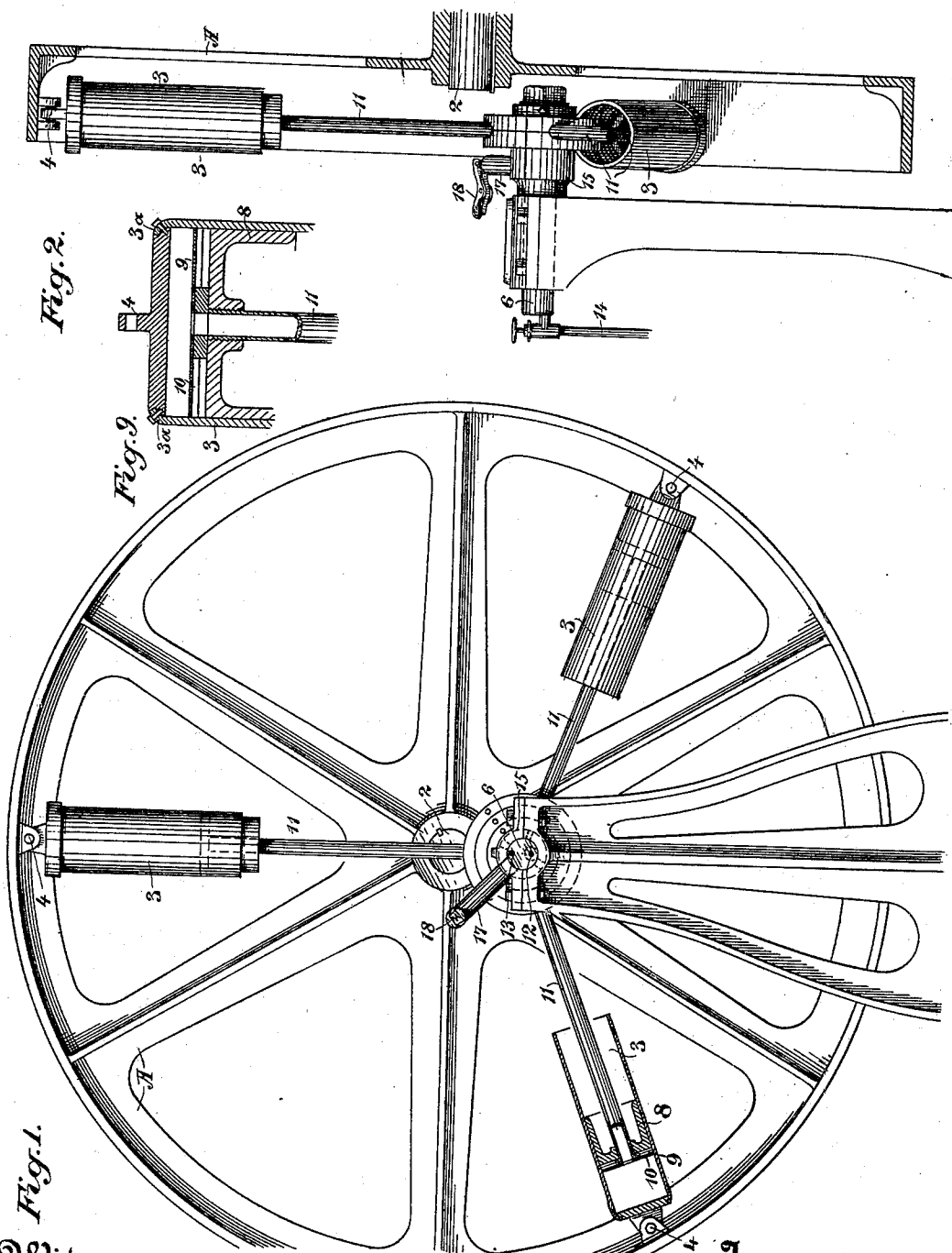


Fig. 1.
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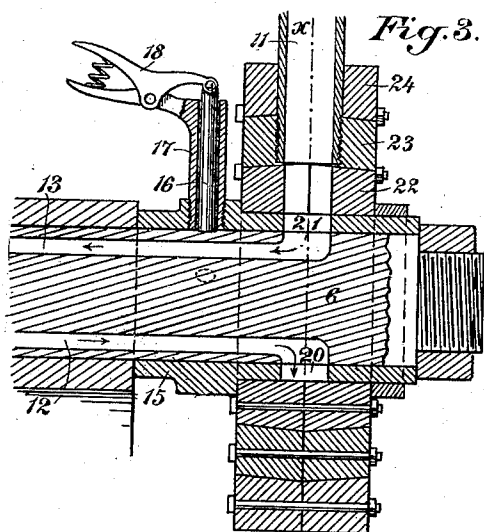


Fig. 3.

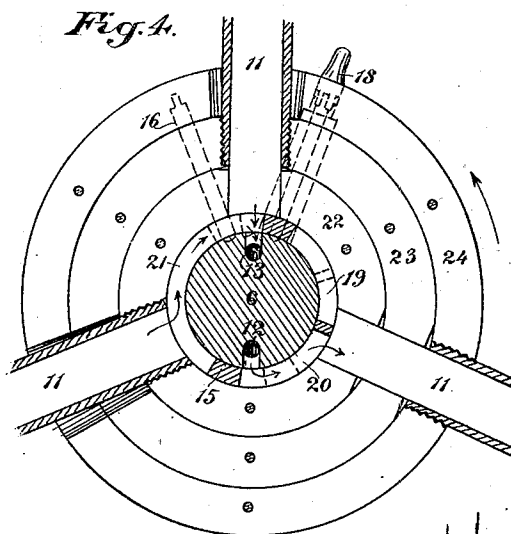


Fig. 4.

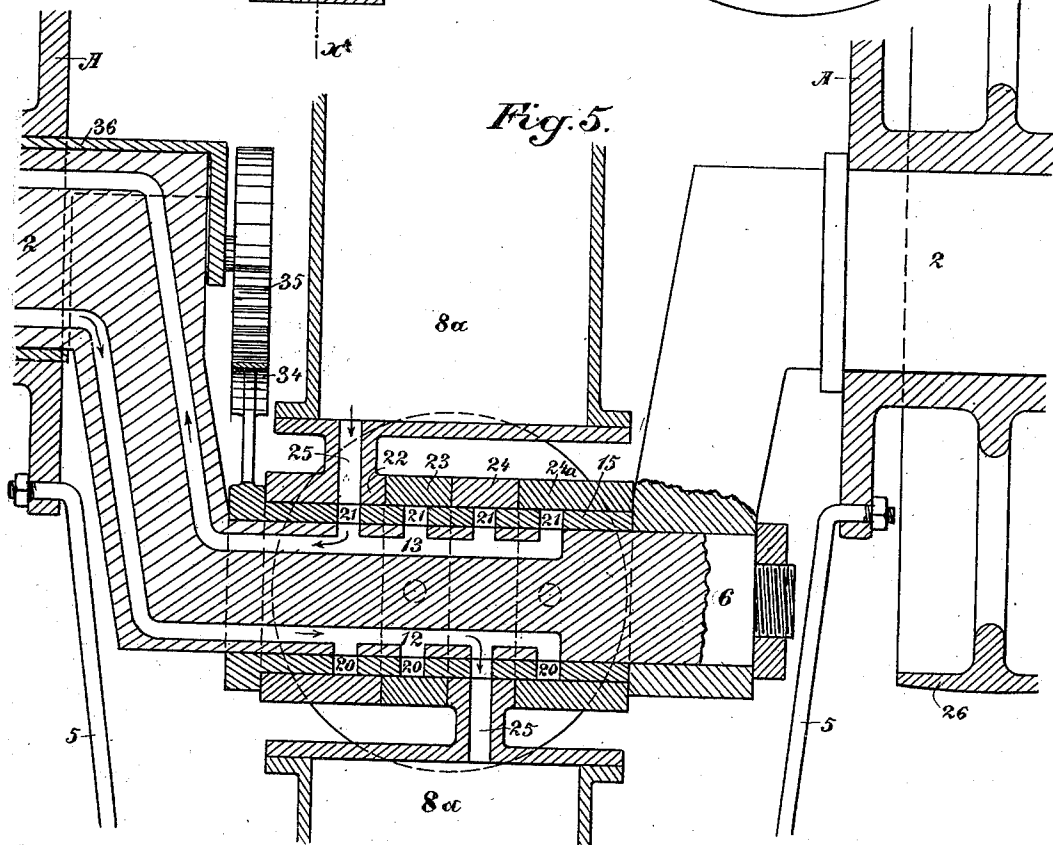


Fig. 5.

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Fig. 7.

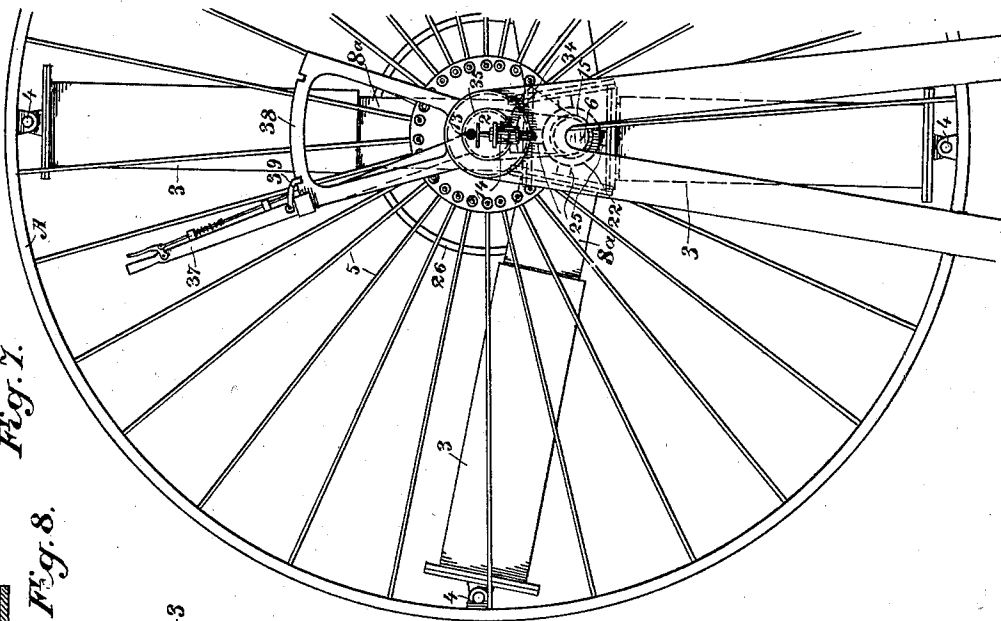


Fig. 8.

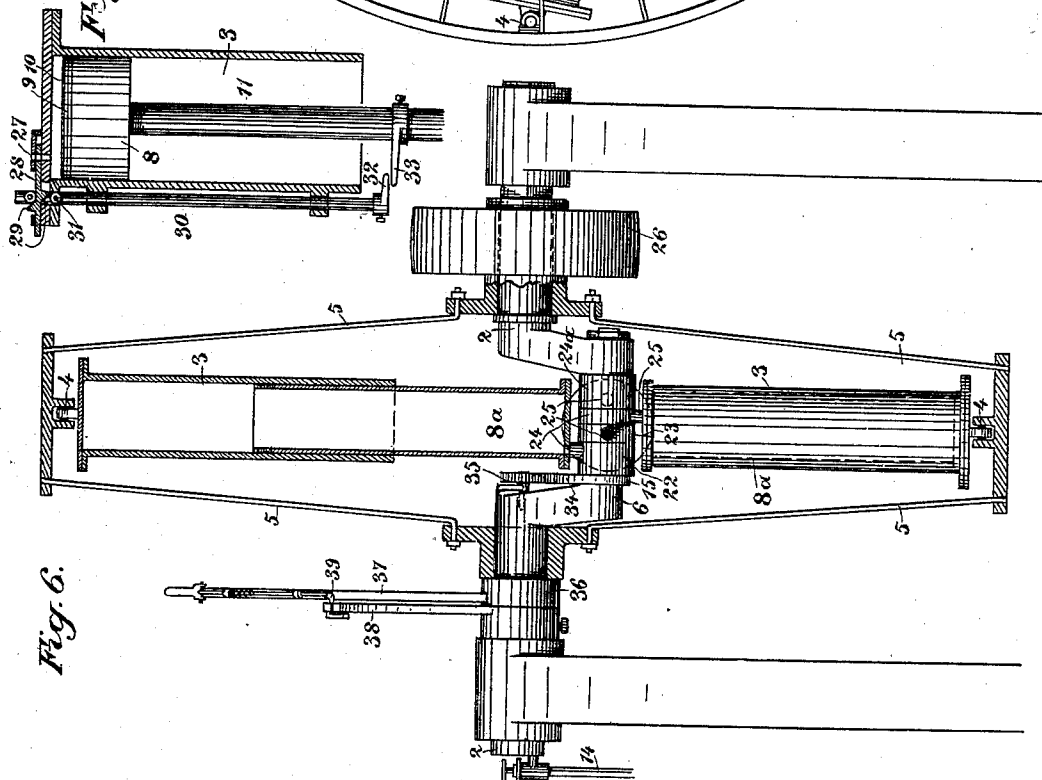


Fig. 6.

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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.

REVOLVING-CYLINDER ENGINE.

SPECIFICATION forming part of Letters Patent No. 668,451, dated February 19, 1901.

Application filed July 24, 1900. Serial No. 24,734. (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 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 about which they are revoluble, and the piston-rods of said cylinders are connected with a second shaft, which is eccentrically placed with relation to the first-named shaft, whereby a reciprocation of the pistons in the cylinders is produced by their revolution around the two centers.

My invention consists also in the novel means for regulating the admission of steam, reversing the direction of revolution, and in details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a side elevation, and Fig. 2 is a vertical section, of the apparatus, showing the cylinders connected with the wheel-rim at one side of the wheel-spokes. Fig. 3 is a vertical section in the plane of the axis, showing the inlet and exhaust passages in the shaft and the connected rings. Fig. 4 is a section transverse to the axis, taken through *xx* of Fig. 3. Fig. 5 is an enlarged section in which the axis of revolution of the cylinders and of connections with the pistons are connected together by cranks. Fig. 6 is a sectional view showing two cylinders with this form of connection. Fig. 7 is a side elevation of the same. Fig. 8 is a sectional view of one cylinder, showing the modified form of exhaust. Fig. 9 is a sectional detail of the outer end of one of the cylinders 3.

The object of my invention is to apply the pressure of steam, compressed air, or other fluid medium through cylinders, which are suspended in a revolubly-journaled wheel or rim, and pistons slidable in said cylinders, the inner ends of which pistons are connected with a second shaft, which is located eccentrically to the first-named shaft and through which and through hollow piston-rods the

fluid under pressure is admitted to the rear of the pistons, so as to impel the cylinders and the rims in which they are suspended and cause them to revolve around their common center of support.

A is a wheel or support for the cylinders. This wheel is journaled and turnable upon a shaft or center 2.

3 represents the cylinders, of which there may be one or more. These cylinders are suspended from the wheel-rim, as shown at 4, and the inner ends extend approximately radial toward the center of the wheel.

I have hereshown two forms of wheel. In Figs. 1 and 2 the wheel is what is termed a "solid" wheel, having the rim projecting sufficiently to one side of the sides to provide space for the cylinders on that side. The other form is illustrated in Figs. 6 and 7. In this case the cylinders are centrally connected with the rim, and there are two sets of spokes 5, extending to the shaft exterior to the plane of the cylinders. In Figs. 1 and 2 the shaft 2 terminates at the hub of the wheel. In Figs. 6 and 7 the shaft is shown as journaled upon each side of the wheel, the ends being connected by a crank portion, to be hereinafter described. In the construction shown in Figs. 1 and 2 the shaft 6, to which the piston-rods connect, is out of line with the shaft 2 and is supported from the opposite side, while in Figs. 6 and 7 this shaft forms the crank portion intermediate of the parts 2. The operation of the two devices is essentially similar in both cases, with such modifications of structure as would be obvious to any mechanic.

As shown in Fig. 1, the cylinders 3 have pistons 8 movable within them and fitted with any suitable packing-rings as 9, with an exterior metal plate or disk 10, between which and the outer end of the piston the disks 9 are fitted, and these serve to make a sufficiently tight joint under the pressure of the propelling fluid. The upper ends of the cylinders are curved inwardly and form joints with the cylinder-heads, as at 3^a, and secured by bolts *b*. The piston-rods 11 are hollow and extend to the eccentrically-located shaft 6, through which they receive the fluid which impels them, and upon which are fitted the

intervening rings and sleeve by which the direction of revolution of the engine may be reversed. The eccentricity of the shaft 6 determines the length of stroke of the pistons within the cylinders. This shaft is made with an inlet-passage 12 and an outlet or exhaust passage 13, which extend into the shaft from the end and upon opposite sides thereof. The fluid under pressure is delivered into the inlet-passage through a pipe 14 with a suitable controlling-valve, as shown in Figs. 2 and 6, and the exhaust may be similarly connected, if desired.

Surrounding the shaft 6 in the plane of the cylinders and extending a sufficient distance beyond is a sleeve 15, which is turnable upon the shaft. The shaft has indentations made in it at proper points and a pin 16 slidable through a tube or guide 17. By means of a spring-pressed lever 18 this pin may be disengaged from one socket, so that the sleeve may be turned upon the shaft and the pin allowed to engage with another socket, and this change of position serves to reverse the movement of the engine. The sleeve 15 has slots made in it, as at 19, 20, and 21, as shown plainly in Fig. 4. The slot 21 registers with the point where the exhaust from the cylinders is to take place, so that as each of the hollow piston-rods 11 arrives in line with this slot the pistons, beginning to move outwardly, will discharge the fluid by which they have been impelled through the piston-rods and through this slot and the discharge-passage 13 in the shaft. The other passages 19 and 20 are separated from the exhaust-passage and from each other by suitable ribs or diaphragms, and either one or the other of these passages or slots is brought into line with the supply-passage 12 of the shaft, so that when one is in position to receive the fluid under pressure the other will be cut off therefrom and the engine can be revolved in one direction. The change in the position of the sleeve 15, as before described, will cut off the first-named slot from the inlet-passage and connect the other one with it, when the revolution of the engine will be in the opposite direction. This is all effected, as previously stated, by the movement of the lever 18 and the sleeve 15. Exterior to this sleeve 15 is a series of two-part rings 22, 23, and 24. These rings may be arranged side by side, as shown in Fig. 5, or they may be arranged concentrically, one outside the other, as shown in Figs. 3 and 4. As shown in Figs. 3 and 4, the piston-rods 11 connect through these rings with the slots or passages in the sleeve 15, and as the rings 22, 23, and 24 revolve in unison with the revolution of the cylinders and the wheels the open ends of these connecting-passages are brought into line with the slots 19, 20, or 21 of the sleeve at the proper instant to receive and exhaust the propelling medium. When arranged concentrically, as shown in Figs. 3 and 4, the rings are preferably convex and concave on their contiguous

faces, so that they will maintain their proper position with relation to each other, and the halves are secured together by bolts, as plainly shown in Fig. 3. When arranged as shown in Fig. 5, these rings are fitted side by side upon the sleeve 15, and in this construction the passages through which communication is had with the cylinders are made through the sleeve 15 in such positions as to communicate directly with the cylinders.

The pistons, as shown in Fig. 6, are in the form of cylinders, as at 8^a, which telescope into the cylinders 3, being packed so as to form a tight joint. These pistons 8^a are hollow and are connected directly with the passages through the rings by short tubular connections, as at 25, Fig. 5. These connections are here shown as being cast or formed directly with the ring-section and the head of the hollow piston with which they are designed to communicate. Thus the connecting-passage 25 for one cylinder will be close to one side of the piston-head. The next one will be in line with the ring 23, through which it communicates with the passages in the shaft, and the next one with the next ring, and so on throughout the series.

The operation of the engine will then be as follows: The reversing-sleeve 15, being set with the engine to turn in the desired direction and the fluid under pressure being admitted through the passage 12, will pass through the slot 19 or 20, which is in the proper position to receive it when the cylinders stand in such position with relation to the eccentric or crank shaft 6 that power may be applied by the pressure within the cylinder to impel the wheel or rim which carries the cylinders. Thus, as shown in Figs. 1 or 7, when the piston is at the outer end of its stroke, the cylinder having been brought to a point where it is nearest to the shaft 6 and after passing a center line drawn through the shafts 2 and 6, the pressure will act to force the cylinder away from the central point of support; but as the wheel upon which it is carried is journaled at a point out of line with the one through which pressure is exerted there will be a resolution of the force which will act to revolve the wheel and the cylinders around the axis of support. When the cylinder has reached a point at its greatest distance from the shaft 6, the piston will then have traveled the length of its stroke, and after passing the dead-center at this side the piston begins to approach the outer end of the cylinder again. At this instant the exhaust-passage will be in communication with the cylinder through the slot 21 of the reversing-sleeve, and the fluid under pressure is allowed to escape. Each cylinder successively passes through these operations, and the sum of their impulses constitutes the power which can be applied.

The power may be applied through a pulley mounted upon the hub or otherwise connected with the wheel, as at 26.

In some cases it may be desirable to exhaust directly from the outer end of the cylinder instead of through a passage, as at 13. In this case the exhaust-port is made, as at 27, through the outer end of the cylinder and is controlled by a slide-valve 28. This slide-valve is movable to alternately open and close the exhaust-port by any suitable means. I have here shown it provided with inclined surfaces, as at 29, one above and the other below, and a vertically-slidable rod 30 carries upon it rollers 31, one of which engages the upper incline and the other the lower one. At the lower end of the rod 30 is a projecting arm 32, and the piston-rod 11 has a cam or arm 33 adjustably secured to it at such a point that when the piston has reached the outer end of its travel and is ready to receive fluid under pressure the lower roller 31 engages the lower beveled incline 29 and acts to force the slide so as to close the exhaust-opening 27. When the piston has reached the lower end of its stroke, the bottom of the piston itself may contact with the arm 32, and pulling the rod 30 down the upper roller will contact with the upper beveled surface on the slide 28 and move it so as to open the exhaust preparatory to the movement of the piston toward the outer end of the cylinder.

When the shaft is cranked so as to connect with the shaft 6, as shown in Figs. 5, 6, and 7, the means for adjusting the sleeve 15 is slightly varied mechanically on account of the changed positions of the parts. In this case the sleeve has a segmental rack 34, carried and turnable with it, and this is engaged by a pinion 35, which is turnable in unison with a sleeve 36, which is loosely fitted upon the shaft 2. This sleeve has a lever-arm at 37 and a holding rack or segment 38, with which a spring-pressed pawl 39, carried by the lever-arm, engages. This is a simple mechanical equivalent for the device described at 16, 17, and 18, as shown at Figs. 3 and 4, the result of its operation being precisely the same in either case.

The contraction of the outer ends of the cylinders, with the heads fitted thereto like covers, forms a strong resistant to any interior pressure or strain caused by their attachment to the wheel-rim and comparatively small uniting-bolts are necessary.

The connections 4 may, if desired, be formed with the cylinder heads or covers.

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

1. In an engine, the combination with a wheel journaled and revoluble about a shaft, of cylinders suspended in the same vertical plane from the inside of the wheel-rim and having pistons reciprocating therein, hollow piston-rods extending toward the center of the wheel, and connecting with and turnable about a fixed shaft eccentric to the first shaft, said pistons having connections varyingly eccentric with the cylinders, and means for

admitting the propelling medium to the cylinders.

2. In an engine, the combination with a wheel journaled and revoluble about a shaft, of cylinders suspended in the same vertical plane from the inside of the wheel-rim, said cylinders opening inwardly and having pistons reciprocating therein, hollow piston-rods having short connections varyingly eccentric with the cylinders and connecting with respective movable concentric rings upon a shaft eccentric to the first shaft, passages in this shaft and through the rings by which the propelling medium is admitted and discharged automatically through the revolution of the apparatus, and means for regulating the admission of this propelling medium.

3. The combination in an engine of a plurality of radially-disposed cylinders in the same plane, suspended at their outer ends from the inside of the rim of a wheel, said wheel journaled and turnable upon a fixed shaft, pistons reciprocating within the cylinders and having hollow piston-rods eccentric of their respective pistons, said piston-rods being connected varyingly eccentric with the cylinders and connecting with rings upon a fixed shaft eccentric of the first shaft, and means for admitting and controlling the propelling medium through the second shaft and the rings to the cylinders and for discharging it therefrom.

4. The combination in an engine of a wheel turnable upon a fixed shaft, cylinders suspended from their outer ends within the wheel and from the rim of the wheel, said cylinders in the same vertical plane, the part of the shaft within the wheel eccentric of the part of the shaft carrying the wheel, pistons reciprocating within the cylinders and having hollow piston-rods eccentric of their respective pistons, rings upon the eccentric portion of the shaft and the piston-rods connected therewith, and means for admitting and discharging the propelling medium through one end of the shaft to and from the cylinders.

5. In an engine, radially-disposed cylinders with inclosing revoluble rim, cylinder-like pistons reciprocating and telescoping in these cylinders, hollow piston-rods having short connections varyingly eccentric with the cylinders and connecting the outer headed ends of the pistons with an eccentrically-located source of supply whereby the propelling medium under pressure is delivered behind the pistons.

6. An engine having its cylinders pivotally hung at their outer ends from the inside of the rim of a wheel, pistons reciprocable in these cylinders, hollow piston-rods with openings through to the rear of the pistons, connections between the opposite ends of the piston-rods and a shaft eccentrically disposed in regard to the axis of the wheel, said rods connecting with rings upon this shaft, and a sleeve interposed between the rings and the shaft, a tube upon one end of the sleeve in which a

pin is slidable and by which the sleeve is locked where desired upon the shaft and the admission of the propelling medium to the cylinders governed.

- 5 7. In an engine having radially-disposed cylinders whose outer ends are connected to inclosing revoluble rim, pistons with hollow rods connecting with an eccentrically-located source of supply whereby the propelling medium under pressure is delivered behind the
10 pistons, an exhaust-valve in the outer end or head of each cylinder, consisting of a port, an exterior slide-valve covering the same, inclined surfaces on each side of the end of the
15 slide projecting beyond the edge of the cylinder, a rod having rollers engaging these inclined surfaces and said rod having connection with the piston-rod whereby the valve is

adapted to be opened and closed automatically through the reciprocation of the piston.

8. In an engine, radially-disposed cylinders with pistons and hollow piston-rods connecting with a source of supply eccentric to the center about which the cylinders are revoluble, said cylinders having their outer ends contracted, and cylinder heads or covers fitting therein, as shown, said heads having the attachments 4 by which they are connected with the rims.

In witness whereof I have hereunto set my hand.

JAMES D. MCFARLAND, JR.

Witnesses:

S. H. NOURSE,
CHAS. E. TOWNSEND.