F. J. MINER.

PRIME MOVER.

APPLICATION FILED MAR. 12, 1910.

979,323.

Patented Dec. 20, 1910.

2 SHEETS—SHEET 1.

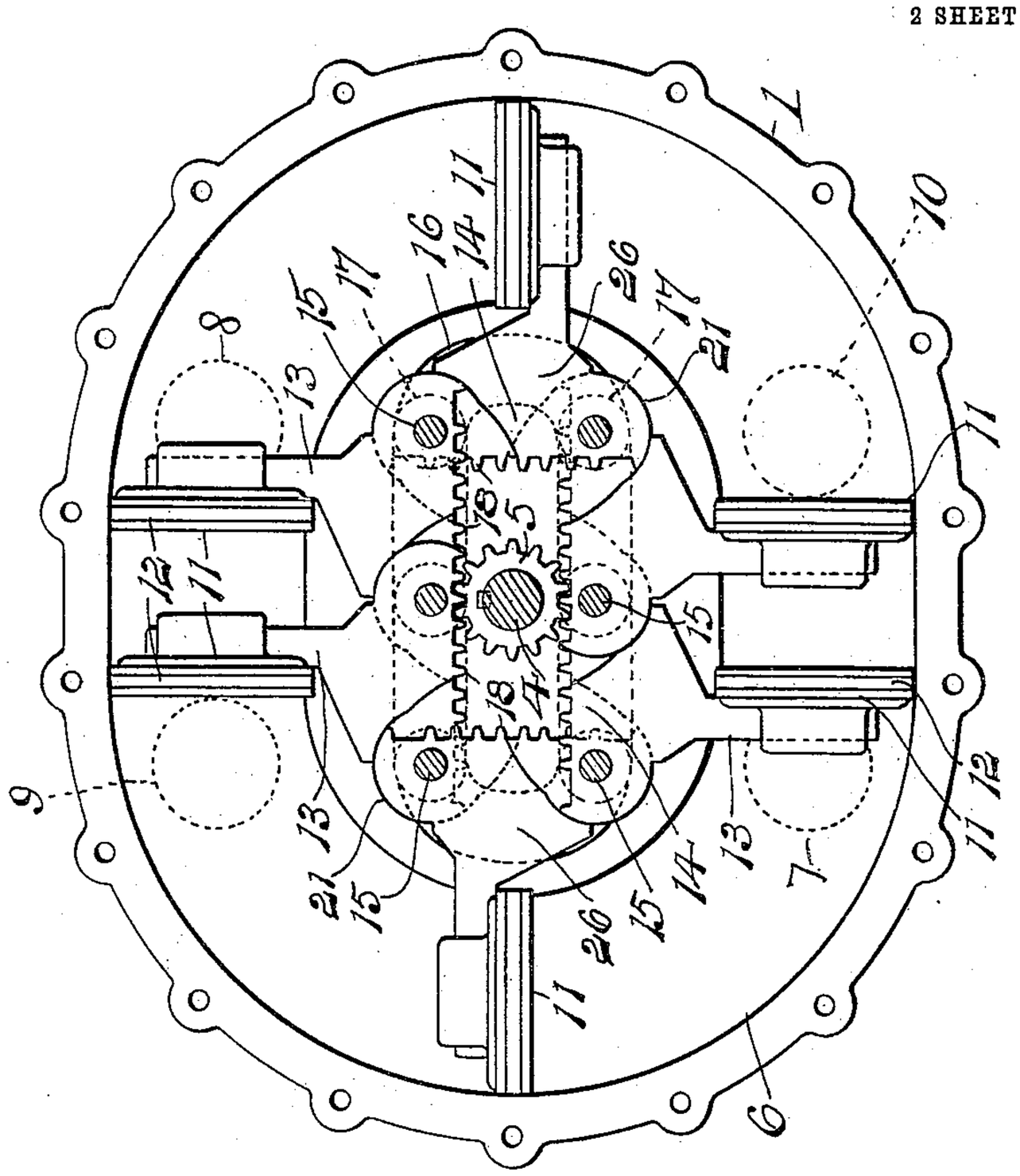

Fig. 1

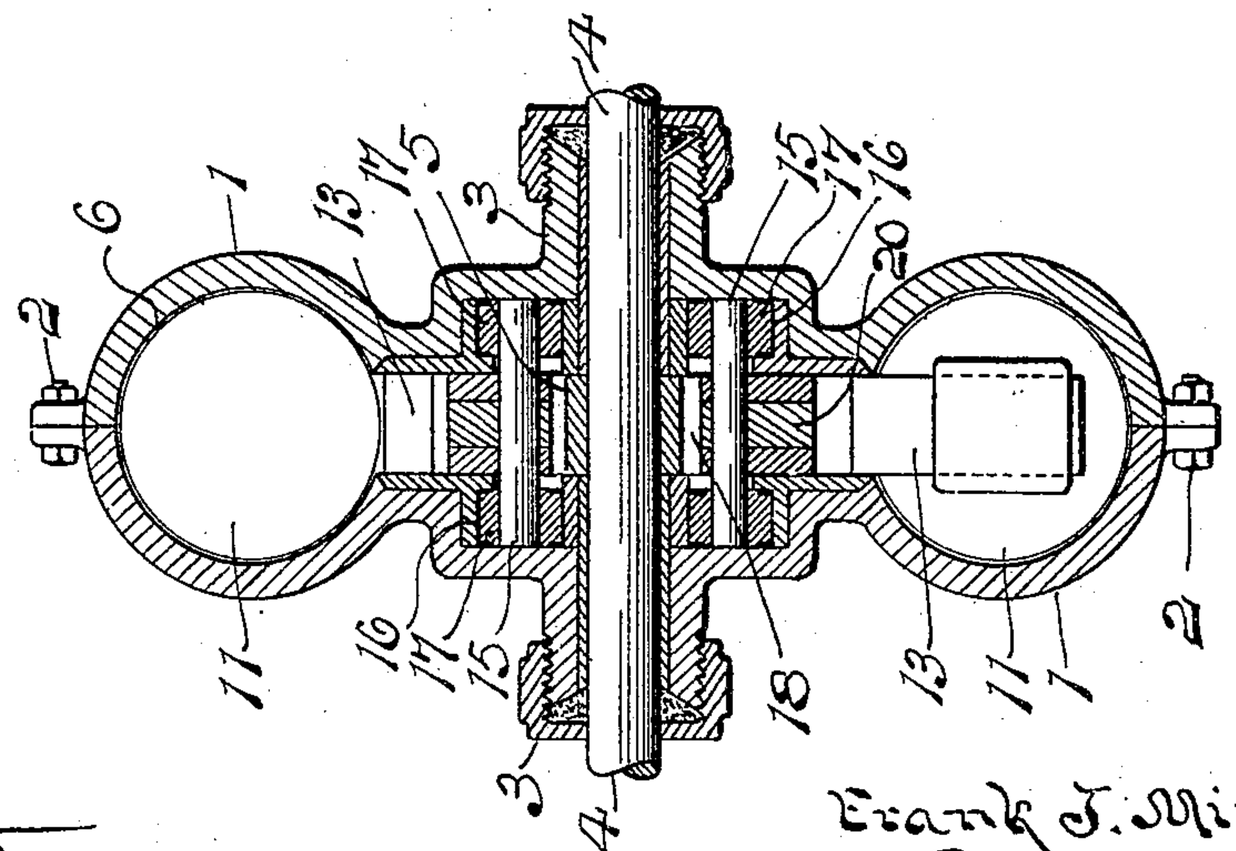

Fig. 2

Witnesses

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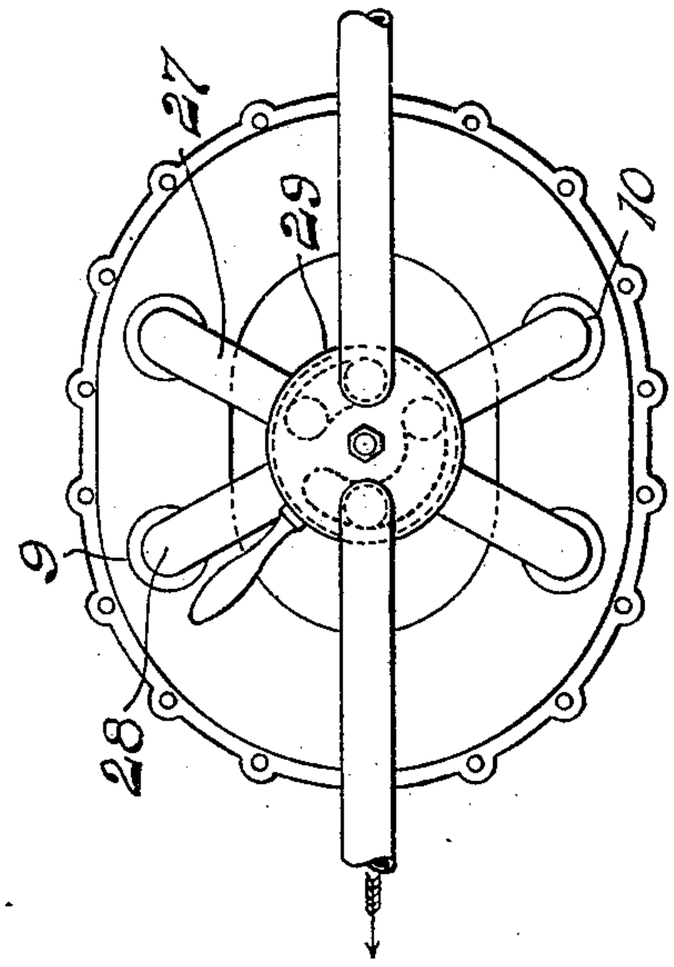

Fig. 5

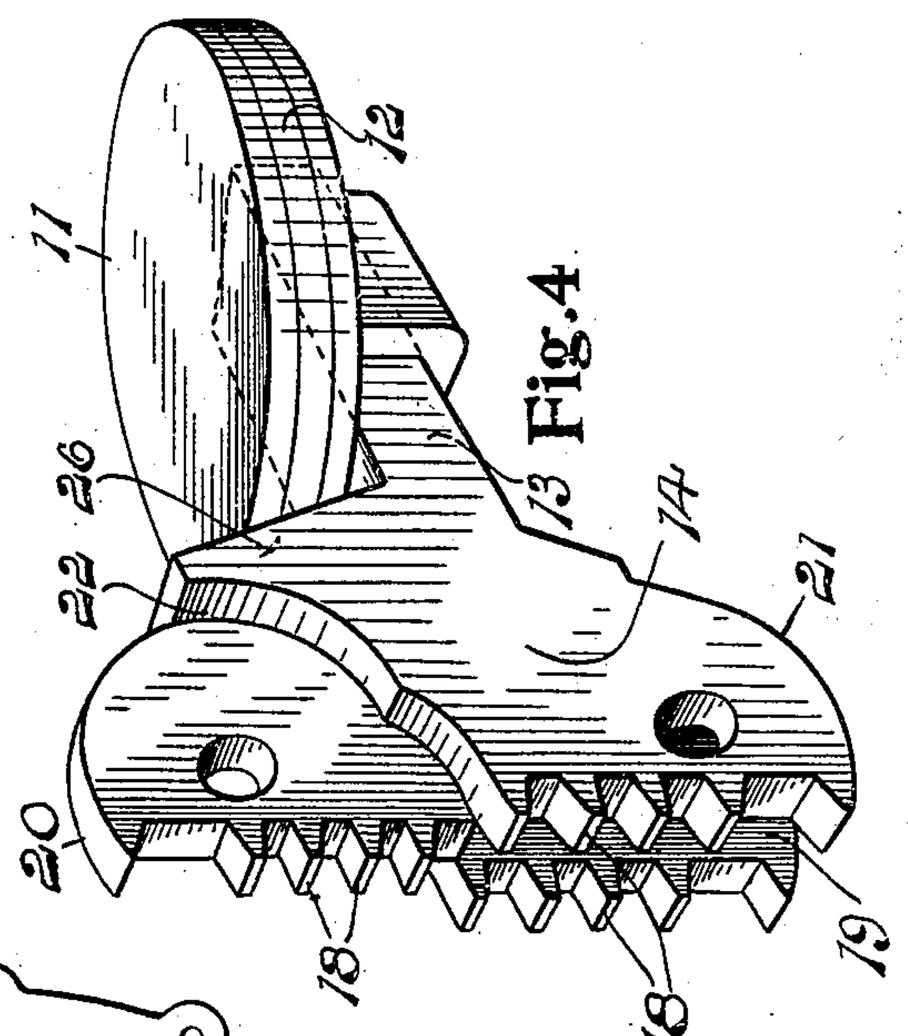

Fig. 4

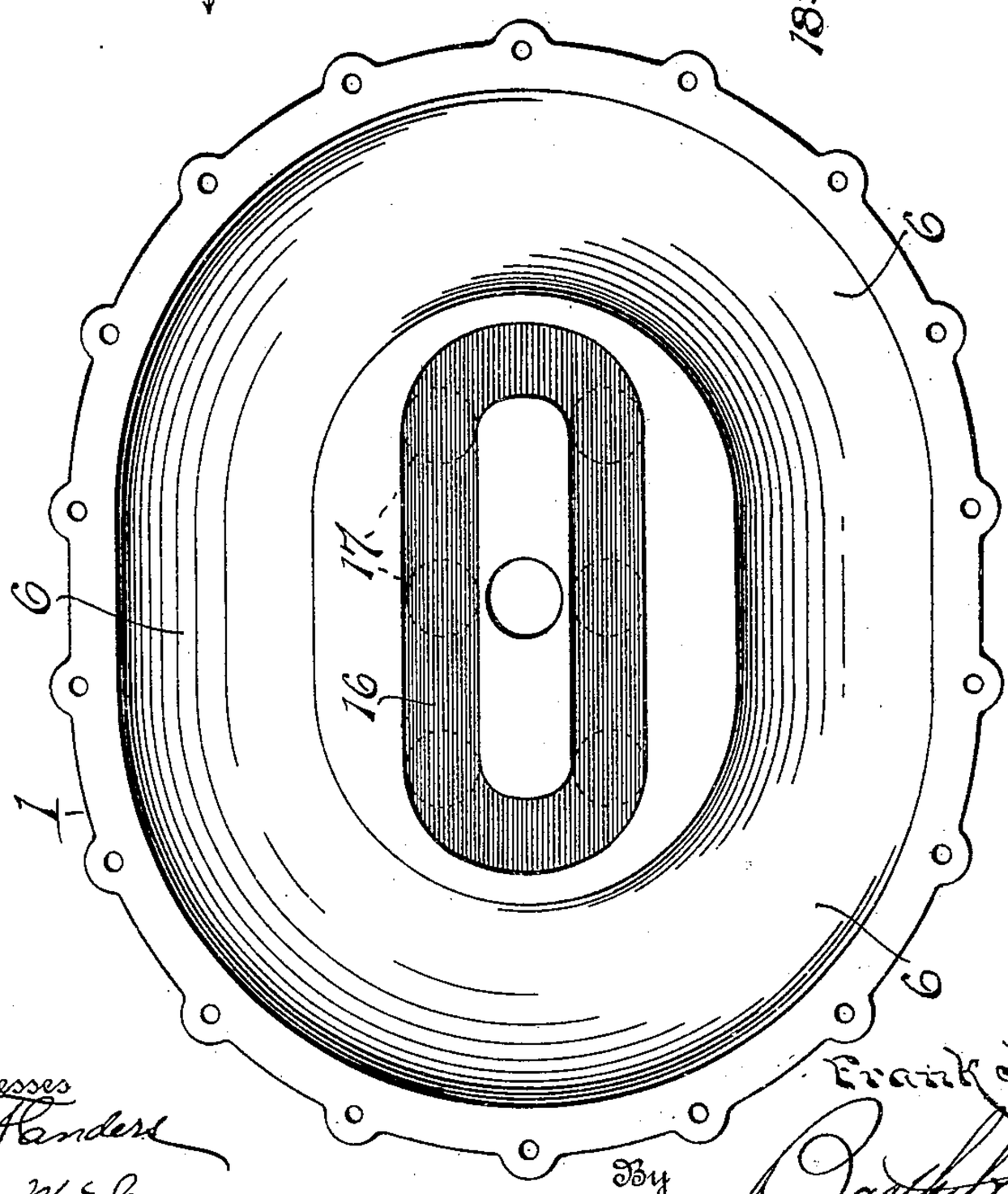

Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

FRANK J. MINER, OF DETROIT, MICHIGAN, ASSIGNOR TO MINER ENGINEERING COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

PRIME MOVER.

979,323. Specification of Letters Patent. **Patented Dec. 20, 1910.**

Application filed March 12, 1910. Serial No. 548,914.

To all whom it may concern:

Be it known that I, FRANK J. MINER, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Prime Movers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a prime mover adapted to be operated by steam or other fluid, of a type wherein driving members revolve continuously around a fixed center.

In general terms, a motor that embodies the invention is formed of a series of members articulated in an endless chain and arranged in a casing in such manner that a series of moving pockets are formed therein each of which expands when it is in communication with an intake port in the casing, under the influence of driving fluid admitted through the ports 7 and 8. This expanding movement moves the members and brings another pocket into register with the intake port. As each expanded pocket approaches an exhaust or outlet port in the casing it is constricted by differential movement in the members. This drives the waste fluid out through the exhaust. The members are propelled by this expanding movement of the pockets, and their motion is communicated to a main shaft from which power is transmitted as desired.

The invention consists in the matters hereinafter set forth, and particularly pointed out in the appended claims.

Referring to the drawings, Figure 1 is a longitudinal section through a device embodying the invention; Fig. 2 a transverse section; Fig. 3 an inner face view of one half of the casing; Fig. 4 a perspective view of one of the abutments and its stem and rock portion; and Fig. 5 is an elevation of the device showing the inlet and exhaust pipes.

As herein shown in preferred form, a casing 1 of two oppositely disposed sections secured by marginal bolts or screws 2 or other suitable means has central alined bearings 3 in which a main shaft 4 is journaled. A pinion 5 is keyed or otherwise secured to this shaft. A chamber 6, that is preferably circular in cross section is formed in the casing concentric with the main shaft 4. In contour the chamber is substantially an ellipse with a pair of diametrically opposite straight sections. A pair of oppositely disposed inlet ports open into this chamber through the side of the casing each close to an end of a straight section, and outlet ports 9 and 10 are provided at alternate corresponding points in the casing. A series of propeller blades or abutments 11 are articulated in an endless chain sweeping this chamber. Expansion rings 12 on the abutment peripheries form a close joint with the chamber wall. Each abutment is secured on the outer end of an inwardly extending stem 13 with a base 14 that is at right angles to the plane of the abutment. These bases are pivotally connected at their ends as by pins 15 in an endless chain. Cam paths 16 formed in the chamber walls around the pinion 5 are engaged by these bases in such manner that the abutments are held substantially perpendicular to the wall at all points in their path of travel.

As a preferable detail of construction friction rolls 17 on the ends of the pivot pins engage the cam paths. The disposition of the cam paths, friction rolls, and abutment bases is such that the latter form continuous parallel rack bars on opposite sides of the pinion 5 when the abutment bases are traversing the straight sections of the cam paths. Rack teeth 18 are formed on the bars to mesh with the pinion 5 as the bases pass it. To insure rigidity one end of each base has a longitudinal slot 19 that is engaged by a corresponding tongue 20 of the adjacent link. Convex shoulders 21 on the slotted end of each base have their centers of curvature coincident with the axis of the adjacent pivot pin 15 and mate with similarly curved tenon shoulders 22 on the tongue end of each base to form a tight joint and prevent the leakage of steam therethrough when one of the bases is forced by the cam paths to assume a position at right angles to the base which is in mesh with the pinion 5. The shank has wings 26 to reinforce the rack and to carry the abutting tenon shoulders into such overlapping relation that a substantially steam tight joint is formed that prevents egression of steam or like propelling fluid from the abutment chamber. The inlet ports are connected by a header 27 through which steam or like other expansible fluid under pressure is admitted to the casing, and the exhaust ports are like

wise in communication with a common outlet fitting 28.

In operation, each pair of abutments are in closest proximity and in parallel relation when they are traversing the straight sections of the chamber. At this point, any pressure between them does not separate them or alter their relative position, as both pivot rolls of each are on the straight track and cannot move transversely. Each abutment as it leaves the straight section of the chamber uncovers an inlet port so that propelling fluid under pressure is forced into the space or chamber between this abutment and the following one. As the forward abutment is free to swing around the curved portion of the cam path and chamber because its forward pin roll can move transversely to the straight track, the expansion of the chambers under pressure propels this blade forward at a greater angular velocity than the following blade which in turn uncovers the port of the succeeding chamber and is likewise forced around the curved end of the chamber, so that the movement forward of the articulated members is practically continuous and unresisted, while the angular relation of the blades between which pressure is exerted prevents retrogade movement. As each abutment passes the exhaust port it is retarded in its angular movement and moves with less velocity than the following blade which thereby forces the fluid out of the chamber into the exhaust port. This same cycle of movement is repeated as each abutment sweeps over the second inlet port and around the other end of the casing so that each blade may be given two impulses for each revolution it makes around the chamber. By admitting steam, air, water or gas to the exhaust ports and connecting the other ports with the exhaust, reversal of direction is readily obtained. This reversal may be accomplished by any suitable two-way valve of conventional type connecting the fitting and the header. This is indicated diagrammatically in Fig. 5 wherein such a valve 29 for shifting the port connections is indicated.

The feature of the invention is the construction of the series of pockets which are successively expanded by the fluid entering them from the inlet ports in such manner that the pocket-forming members or linked abutments are propelled around the casing and while the construction herein shown is preferable, any arrangement of parts which accomplishes this result may be used. Any fluid under pressure, air, water steam or gas may be used as an operating medium.

Obviously, changes in the details of construction may be made without departing from the spirit of the invention and I do not care to limit myself to any particular form or arrangement of parts.

What I claim as my invention is:—

1. In a prime mover, a casing, and members therein articulated together in an endless series revoluble in the casing with which they form pockets, the members being adapted to move differentially to successively expand each pocket, and being propelled by the expansion of the pockets under pressure of fluid admitted thereto.

2. In a prime mover, a casing having ports, revoluble members therein articulated in an endless revoluble series to form a plurality of pockets successively communicating with the ports and adapted to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches the succeeding port, the members being propelled by the successive expansion of the pockets resulting from the pressure of fluid admitted thereto through the ports.

3. In a prime mover, a casing having ports, members therein articulated together in an endless revoluble series to form a plurality of pockets successively communicating with the ports, and means adapted to cause the members to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches the succeeding port, the members being propelled by the successive expansion of the pockets from the pressure of fluid entering them from the ports.

4. In a prime mover, a casing having ports, members therein articulated together in an endless revoluble series that form a plurality of pockets successively communicating with the ports and adapted to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches the succeeding port, and means adapted to connect the ports severally with a source of supply of fluid under pressure, the members being propelled by the successive expansion of the pockets due to the pressure of their contents.

5. In a prime mover, a casing having ports, and members therein articulated together in an endless revoluble series that form a plurality of pockets successively communicating with one of the ports, and adapted to move differentially to expand each pocket as it is in register with said port, and to contract it as it reaches the succeeding port, the ports being adapted to admit expansible fluid to each contracted pocket at a point where the pressure of the fluid expands the pocket and propels the members toward said succeeding port.

6. In a prime mover, a casing having ports, a series of revoluble members articulated together therein to form a plurality of pockets successively communicating with the ports and adapted to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches a

succeeding port, and means to direct fluid under pressure through any port into a contracted pocket, the members being propelled by the successive expansions of the pockets resulting from the pressure of their contents.

7. In a prime mover, a casing having ports, and a series of revoluble members articulated together therein to form a plurality of pockets successively communicating with the ports and engaged by cam paths in the casing to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches a succeeding port, the members being propelled by the successive expansion of the pockets resulting from expansion of fluid under pressure admitted through the ports.

8 In a prime mover, a casing having ports, a series of revoluble members articulated therein and arranged to form a plurality of pockets successively communicating with the ports and engaged by cam paths in the casing to move differentially to expand each pocket as it is in register in one port and to contract it as it reaches the succeeding port, and adjustable means to direct fluid under pressure to any port in register with a contracted chamber, the members being propelled by the successive expansion of the pockets resulting from the pressure of their contents.

9. In a prime mover, a casing having ports, a main shaft journaled therein, a series of revoluble members articulated together in the casing around the shaft to form a plurality of pockets successively communicating with the ports and adapted to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches the succeeding port, and a gear on the shaft that meshes with rack teeth on the members, the members being propelled by the successive expansion of the pockets under pressure of fluid entering them through the ports.

10. In a prime mover, a casing having ports, a main shaft journaled therein, a gear on the main shaft, a series of revoluble members adapted to mesh with the gear articulated together in the casing around the gear to form a plurality of pockets successively communicating with the ports and engaged by cam paths in the casing to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches a succeeding port and constrained by the cam paths to mesh with the gear, the members being propelled by the successive expansion of the pockets from the pressure of fluid admitted thereto from the ports.

11. In a prime mover, a casing having ports, a gear rotatably secured therein, a series of revoluble members provided with gear teeth adapted to mesh with the gear, means articulating the members in an endless chain around the gear to form a plurality of pockets with the casing successively communicating with the ports, and means adapted to constrain the members to form a continuous rack meshing with the gear and to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches the succeeding port, the members being propelled by the successive expansion of the pockets resulting from pressure of fluid admitted thereto through the ports.

12. In a prime mover, a casing having ports, a gear centrally rotatable in the casing, a series of revoluble members articulated in the casing around the gear and provided with rack teeth, the casing coacting with the members to form a plurality of pockets successively communicating with the ports, and constraining the members to move differentially to expand each pocket as it is in register with one port and to contract it before it reaches the succeeding port, the members forming a continuous rack meshing with the gear, the members being propelled by the successive expansion of the pockets resulting from the pressure of fluid admitted thereto through the ports.

13. In a prime mover, a casing having ports, a gear journaled in the casing at substantially the transverse axial center of a continuous cam path in the casing wall and of a chamber in the casing substantially concentric with the cam path, a series of revoluble members articulated in an endless chain engaged by the cam path to form a plurality of pockets in the chamber successively communicating with the ports and to move differentially to expand each pocket as it is in register with one port and to contract it as it reaches the succeeding port, the faces of the members adjacent the gear being provided with rack teeth that are constrained to mesh with the gear by the cam paths, the members being propelled by the successive expansion of the pockets resulting from pressure of fluid introduced thereto through the ports.

14. In a prime mover, a casing having ports, and a gear centrally journaled in the casing at substantially the transverse axial center of cam paths and of a chamber in the casing substantially concentric with the cam paths, a series of abutments arranged to form a plurality of pockets in the chamber successively communicating with the ports and provided with bases engaged by the cam paths, the bases and cam paths coacting to move the abutments differentially to expand each pocket as it is in register with one port and to contract it as it reaches the succeeding port, rack teeth on the bases, the bases forming a continuous rack, and a driving gear in mesh with the rack, the members being propelled by the successive expansion

of the contracted pockets resulting from pressure of fluid introduced thereto.

15. In a prime mover, a casing having ports, a gear rotatable in the casing, a series of revoluble members articulated together in an endless chain around the gear and arranged to form a plurality of pockets in a chamber that is substantially concentric with the gear and provided with toothed bases that are engaged by continuous cam paths in the casing substantially concentric with the chamber to form oppositely disposed parallel rack bars in mesh with the gear, the cam paths constraining the members to move differentially to expand each pocket as it is in register with one port and to contract as it reaches the succeeding port, and the members being propelled by the successive expansion of the pockets from pressure of fluid admitted thereto.

16. In a prime mover, a casing, and differentially movable members articulated together in an endless series that form with the casing a revoluble series of pockets capable of expanding successively whereby the members are propelled.

17. In a prime mover, a casing, a gear therein, an endless catenary rack meshing with the gear and members on the rack forming with the casing a series of chambers, the rack and members being revoluble around the gear with variable angular velocity whereby the chambers expand successively and propel the rack.

18. In a prime mover, a casing, a gear rotatable in the casing, abutments forming a series of pockets in a chamber in the casing around the gear concentric with a continuous cam path in the casing, each abutment having a base extended in a plane transverse to the abutment plane, rack teeth on the base meshing with the gear, a tongue on one end of each base entering a corresponding slot in the adjacent base, and a pivot pin connecting each tongue with the adjacent base and entering the cam path.

19. In a prime mover, a casing, a gear rotatable in the casing, abutments forming a series of pockets in a chamber in the casing around the gear concentric with a continuous cam path in the casing, each abutment having a base extended in a plane transverse to the abutment plane, rack teeth on the base meshing with the gear, a tongue on one end of each base entering a corresponding slot in the adjacent base, and a pivot pin connecting each tongue with the adjacent base and entering the cam path, and the tongues forming curved tenon shoulders on the bases and the bases having end faces contacting with the shoulders in all positions of the abutments.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK J. MINER.

Witnesses:

OTTO F. BARTHEL,

LEWIS E. FLANDERS.