Aug. 10, 1926. 1,595,496

T. R. BEGGS

FLUID MOTOR

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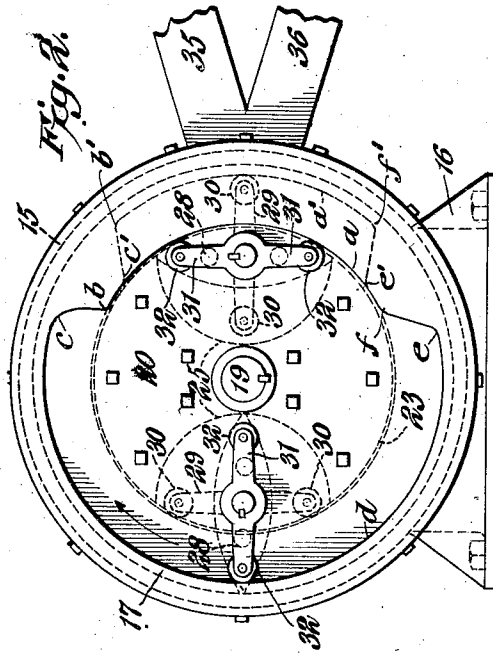


Fig. 2.

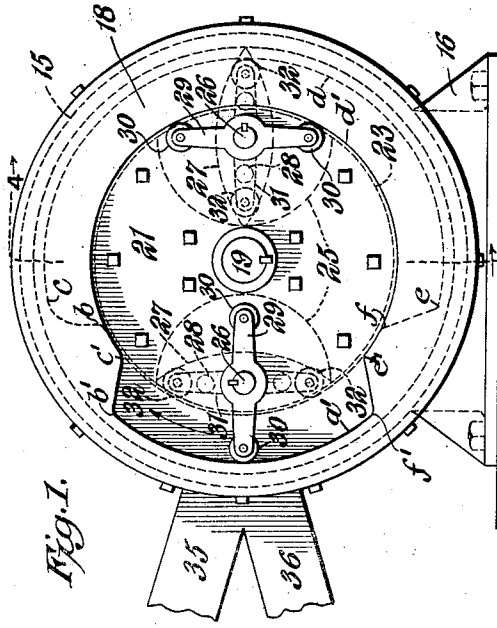


Fig. 1.

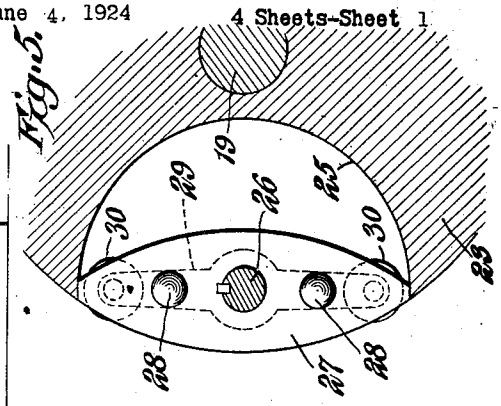


Fig. 5.

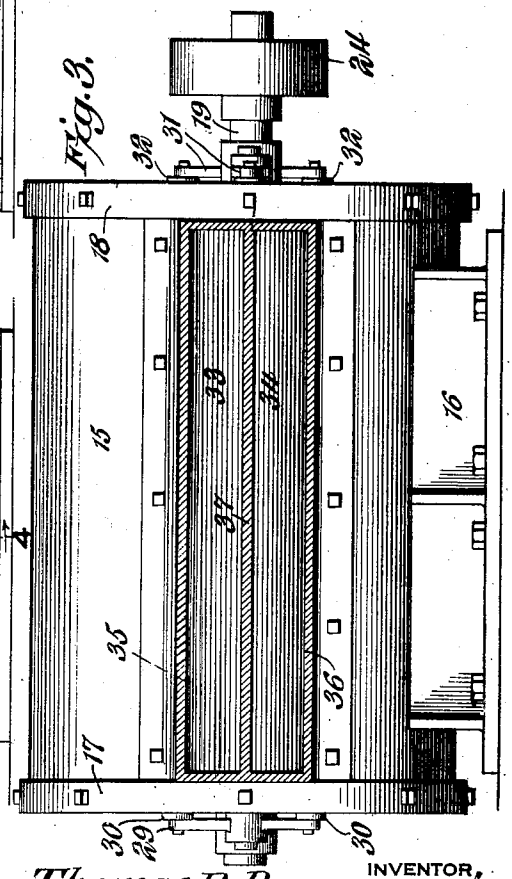


Fig. 3.

WITNESSES

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FLUID MOTOR

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Fig. 6.

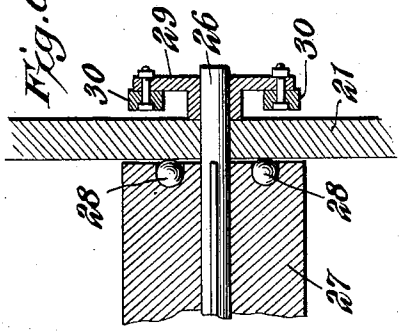


Fig. 4.

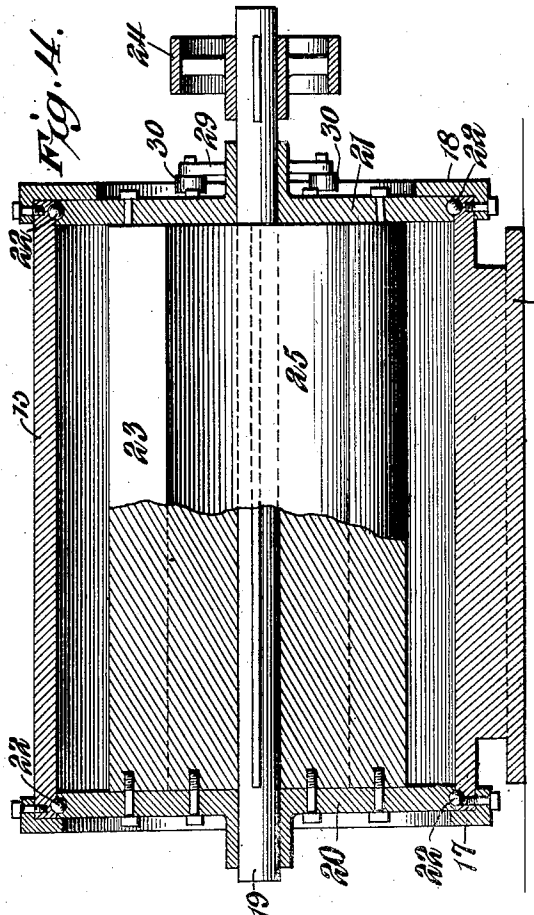


Fig. 8.

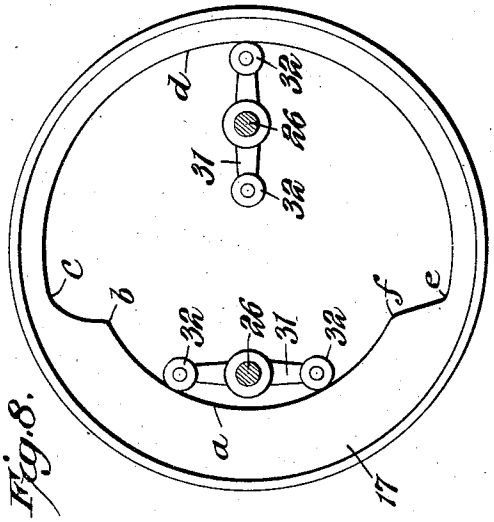
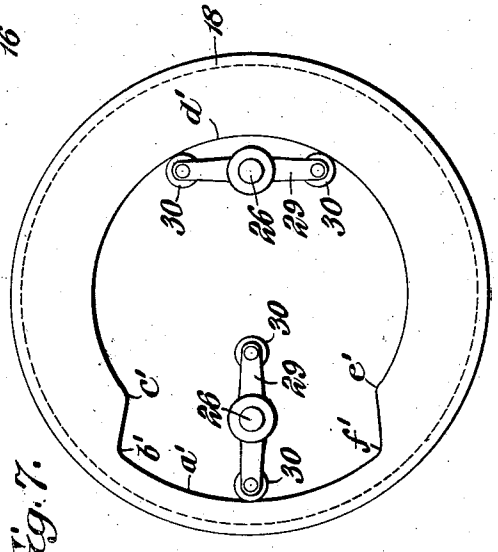


Fig. 7.



WITNESSES

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FLUID MOTOR

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Fig. 10.

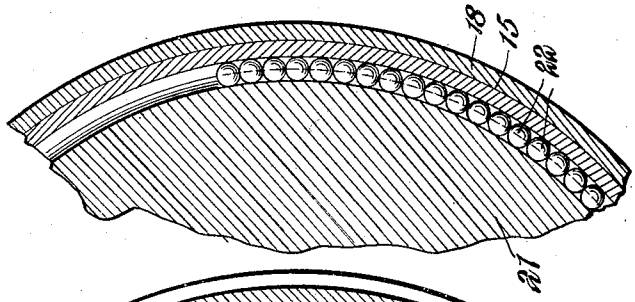
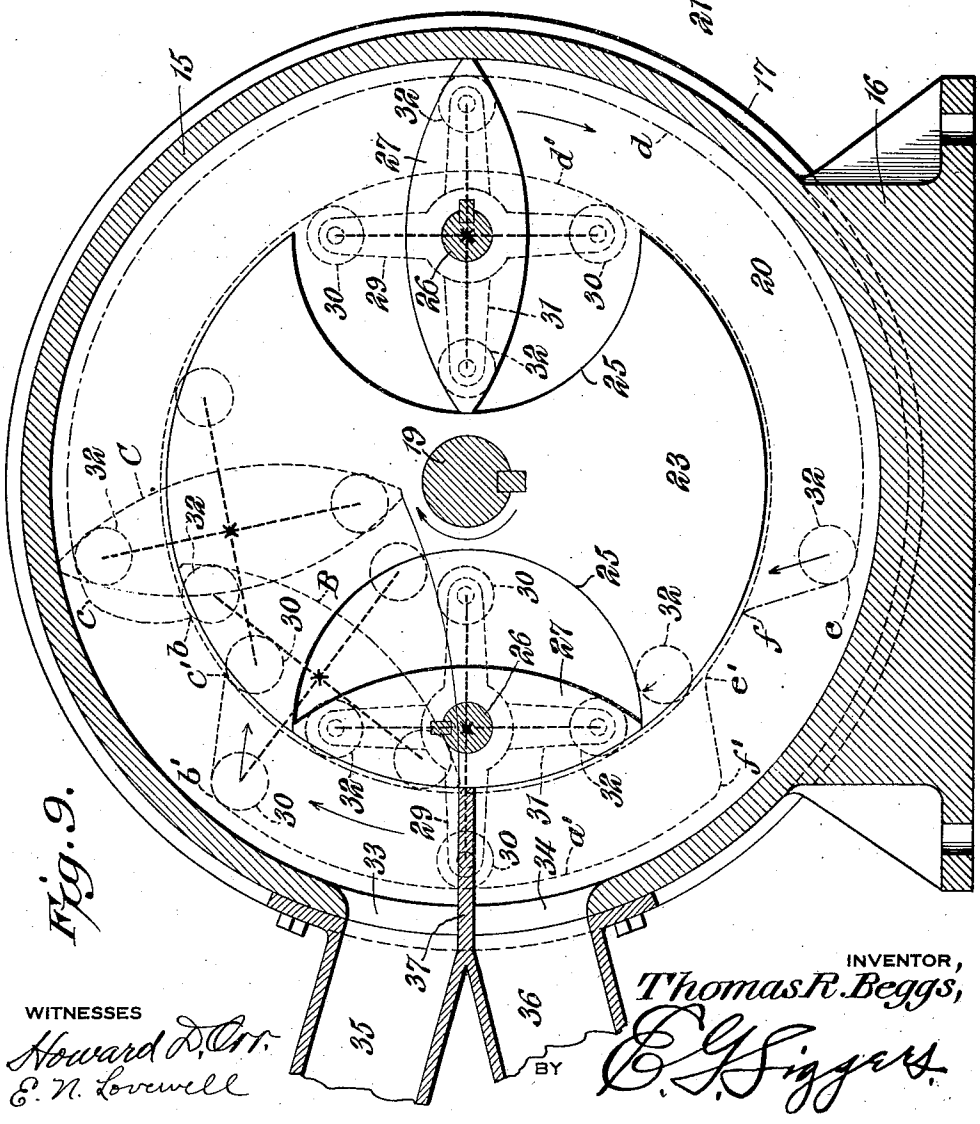


Fig. 9.



WITNESSES

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FLUID MOTOR

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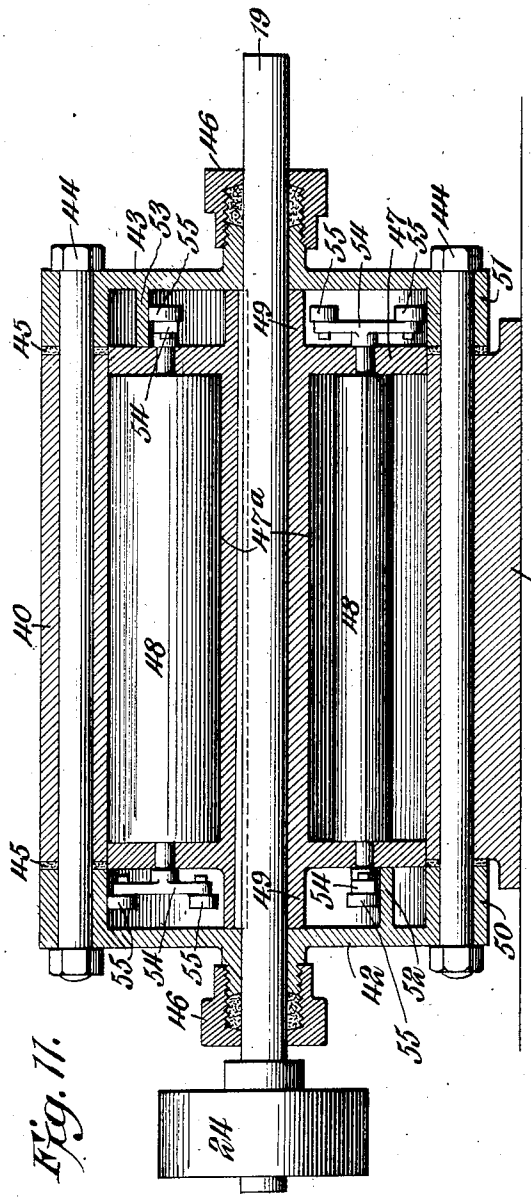


Fig. 11.

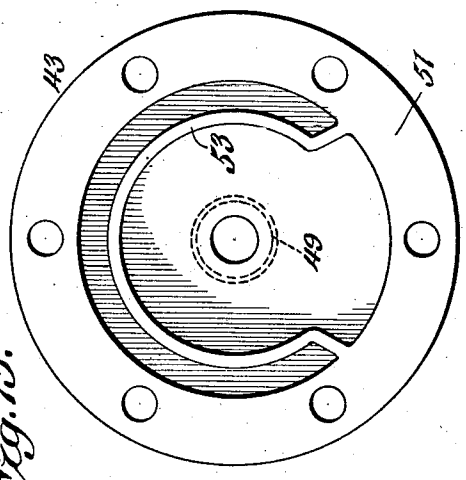


Fig. 13.

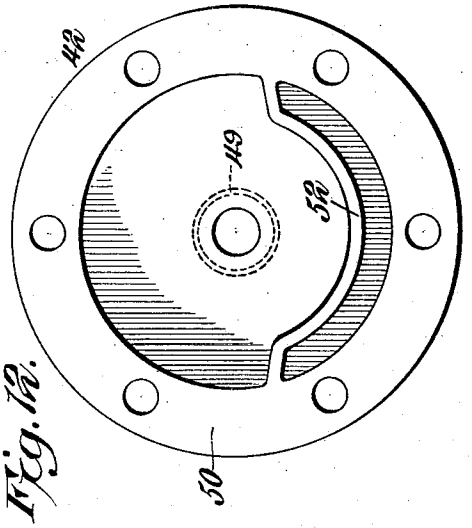


Fig. 12.

WITNESSES

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Patented Aug. 10, 1926. 1,595,496

UNITED STATES PATENT OFFICE.

THOMAS ROBERT BEGGS, OF HARTFORD, CONNECTICUT.

FLUID MOTOR.

Application filed June 4, 1924. Serial No. 717,752.

This invention relates to a fluid motor of the rotary type.

The general object of the invention is to provide a motor, which may be driven by a current created by a difference in pressure between two fluid bodies. It is so constructed that it will operate efficiently and continuously in either direction as long as there is a difference in pressure between the intake and exhaust ports, and the absolute pressure at either end may be either above or below atmospheric pressure. Only a small difference in pressure is necessary for its operation, so that it is particularly adapted to be actuated by pressure generated by the rise and fall of the tide, through the medium of a specially constructed apparatus disclosed in my copending application, Serial Number 717,753, filed of even date herewith. The fundamental principle of the invention is equally well adapted to be utilized for operation by steam pressure.

With the above and other objects in view, which will be more fully explained hereinafter, the invention consists in certain details of construction and combinations of elements, the preferred arrangement of which is illustrated in the accompanying drawings.

In the drawings:

Figure 1 is an elevation of the invention as viewed from one end.

Figure 2 is an elevation as viewed from the opposite end.

Figure 3 is a side elevation of the invention, with the inlet and exhaust passages shown in cross section.

Figure 4 is a vertical section taken substantially in the plane of the motor shaft.

Figure 5 is a fragmentary sectional view, illustrating one of the vanes and its relation to the motor shaft.

Figure 6 is a fragmentary sectional view of one of the vanes, and the means for supporting and shifting the same.

Figure 7 is a detail view of one of the cam tracks by means of which the vanes are guided.

Figure 8 is a detail view of the other cam track by which the vanes are guided.

Figure 9 is a section taken transversely of the motor cylinder, illustrating the various distinctive positions assumed by the vanes during the operation of the motor.

Figure 10 is a fragmentary sectional view illustrating how the cylinder heads are supported for rotation.

Figure 11 is a vertical longitudinal section showing a modified form of the invention, especially adapted for operation by steam.

Figure 12 is a detail view in elevation of one of the cylinder heads shown in Figure 11.

Figure 13 is a similar view of the opposite cylinder head.

The invention, as illustrated in Figures 1 to 10, inclusive, comprises a cylindrical housing 15 formed with a suitable base 16 by which it is supported. Secured to one end of the housing 15 is a flanged retaining ring 17, the interior of which forms a cam track, as illustrated in Figure 8, for a purpose which will subsequently be explained. A similar flanged retaining ring 18 is secured to the opposite end of the cylinder, and its interior forms a cam track of different shape, as illustrated in Figure 7. The main shaft 19 of the motor is supported centrally of cylinder heads 20 and 21, which are rotatably mounted in ball bearings 22 within opposite ends of the cylinder 15, and are secured to a central drum 23, which is keyed to the shaft 19. The motor shaft 19 may be provided with a pulley 24, or other suitable device, for transmitting power.

The drum 23 is in the shape of a cylinder, concentric with and of smaller diameter than the cylindrical housing 15 and has semi-cylindrical recesses 25 formed diametrically opposite each other. Two shafts 26 are rotatably mounted in the cylinder heads 20 and 21, axially of the respective recesses 25. A vane 27 is keyed to each shaft 26, and held against endwise movement by ball bearings 28. Each of the shafts 26 is provided at one end with a cross head 29 having rollers 30, which are guided on the cam track 18, and has at its other end a cross head 31 provided with rollers 32, which ride on the cam track 17. During a portion of the revolution of the vane about the axis of the cylinder, the vane is disposed radially of the cylinder, and its side edges are in contact with the bottom of the recess 25 and the inner surface of the cylindrical housing 15, respectively, so that it presents a surface

against which the incoming fluid may act. During the remaining portion of its revolution, the vane is disposed in the position shown in Figure 5, in which one of its convex faces forms a continuation of the cylindrical surface of the drum 23.

As shown in Figures 3 and 9, the cylindrical housing 15 is formed at one side with ports 33 and 34 extending from end to end of the cylinder, and preferably of considerable width. Either one of these ports may be the inlet port and the other the exhaust port, since the operation of the motor is exactly the same in whichever direction it is rotated. Conduits 35 and 36 are connected to the housing 15, so as to provide passageways for connecting the ports 33 and 34 to any desired source of pressure. The pressures within the passageways 35 and 36 may be either above or below atmospheric pressure, as long as the said pressures are different. A partition 37 separates the ports 33 and 34, and extends radially across the annular space between the inner surface of the housing 15 and the surface of the drum 23.

The operation of the invention will be best understood from a consideration of Figures 7 and 8, taken in connection with Figure 9, wherein several positions of the parts 27, 30 and 32 are indicated by dotted lines. As each shaft 26 passes the partition 37, the rollers 32 are travelling along the portion *a* of the cam track 17, and one of the rollers 30 is travelling along the portion *a'* of the cam track 18. Thus, as the vane 27 passes the partition 37, it is disposed tangentially of the drum 23, so as to permit compressed air or other fluid to pass freely through the port 33, into the space between the drum 23 and the inner wall of the housing 15. The other vane 27, which is now located diametrically opposite to the partition 37 is disposed radially of the drum 23 with its rollers 30 guided on the portion *d'* of the track 18, and with one of the rollers 32 guided on the portion *d* of the track 17. In this position the vane extends completely across the space between the bottom of the recess 25 and the inner wall of the housing 15, and any excess of pressure entering through the port 33 will be exerted against the vane, and cause it to revolve with the drum 23 toward the exhaust port 34. As the drum 23 rotates forwardly, the roller 30, which is travelling along the track portion *a'* reaches the point *b'*, whence it travels inwardly to the point *c'*, while the corresponding roller 32 travels from the point *b* to the point *c*. During this movement, the corresponding vane moves from the position indicated by the dotted lines B to that indicated by the dotted lines C. In this last position, the vane extends across the space between the drum 23 and the inner wall of the housing 15, while the other vane is approaching the position in which its roller 32 rides inwardly on its cam track from the pont *e* to the point *f*, while at the same time, the corresponding roller 30 travels outwardly from the point *e'* to the point *f'*. The arcuate portions *d* and *d'* of the cam tracks extend for somewhat more than a semi-circumference, so that each vane is projected across the space between the drum 23 and the housing 15, before the preceding vane is withdrawn. Thus, the pressure of the fluid is transmitted continuously and uniformly through the vanes to actuate the power shaft 19.

In the modification of the invention illustrated in Figures 11, 12 and 13, which is more especially adapted for steam operation, the cylinder 40 is formed with a supporting base 41, and is provided at its ends with heads 42 and 43 which are firmly secured thereto by bolts 44 extending longitudinally through the cylinder wall and heads, suitable gaskets 45 being provided to prevent leakage. The power shaft 19 is journaled centrally of the heads 42 and 43, and its bearings are provided with suitable packing glands 46. A drum 47 is keyed to the shaft 19, and is provided with pockets 47ª within which are mounted vanes 48, similar to the vanes 27. The drum 47, however, is provided at each end with a boss 49, and the heads 42 and 43 are each provided with corresponding flanges 50 and 51, respectively, which are formed with internal cam tracks 52 and 53, respectively, the vanes 48 being provided at opposite ends with cross heads 54 having rollers 55 which ride along the tracks 52 and 53 in the same manner as the rollers 30 and 32 ride on the tracks 17 and 18.

From the foregoing description, it will be understood that the cross sectional area of the ports 33 and 34 and the surface of the vanes 27 and 48 is comparatively large, so that a slight difference in pressure will impart considerable force to the power shaft. Only a small pressure, therefore, is necessary, provided that the fluid under pressure is supplied in sufficient volume. It will be apparent that the device will operate in the same manner in either direction, depending only upon which side has the greater pressure. A negative pressure or suction through the exhaust port will be just as effective as a positive pressure through the intake port.

While I have shown and described in detail the preferred construction of the invention, it is apparent that other modifications may be made therein without departing from the fundamental principles of the invention, and it is, therefore, my intention to include all such modifications within the scope of the appended claims.

What is claimed is:

1. In a fluid motor, the combination of a

cylindrical housing, a drum rotatably mounted axially of the housing and of smaller diameter than the interior of the housing and having recesses in its convex surface, vanes mounted for rotation within said recesses, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, means secured to the ends of the vanes and riding on the respective cam tracks as the drum rotates, said tracks being so formed as to project the vanes across the space between the drum and the interior surface of the housing as the drum rotates.

2. In a fluid motor, the combination of a cylindrical housing, a substantially cylindrical drum rotatably mounted within the housing and coaxial therewith, said drum being of smaller diameter than the interior surface of the housing and having semi-cylindrical recesses in opposite sides thereof, vanes having shafts mounted for rotation at the centers of curvature of said recesses, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, means secured to the shafts of the respective vanes and riding on the respective cam tracks as the drum rotates, said tracks being so formed as to project the vanes across the space between the bottoms of said recesses and the interior surface of the housing as the drum rotates.

3. In a fluid motor, the combination of a cylindrical housing having heads rotatable therein, a shaft mounted axially of the heads, a drum keyed to the shaft and secured between the heads, said drum being of smaller diameter than the interior of the housing, retaining rings secured at the ends of the housing and holding said heads and drum against movement longitudinally of said shaft, the interior of each ring forming a cam track, vanes journaled in said heads, and means secured to the ends of the vanes and riding on the respective cam tracks as the drum rotates, said tracks being so formed as to project the vanes across the space between the drum and the interior surface of the housing as the drum rotates.

4. In a fluid motor, the combination of a cylindrical housing having an inlet port and an exhaust port, a drum rotatable within the housing and spaced from the interior surface thereof, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, vanes carried by the drum, and means secured to the ends of the vanes and riding on the respective cam tracks as the drum rotates, said tracks being so formed as to project and maintain the vanes across the space between the drum and interior surface of the housing while the vanes travel between said ports.

5. In a fluid motor, the combination of a cylindrical housing having an inlet port and an exhaust port through its cylindrical wall and extending from end to end thereof, a drum rotatable within the housing and spaced from the interior surface thereof, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, vanes carried by the drum and extending from end to end thereof, and means secured to the ends of the vanes and riding on the respective cam tracks as the drum rotates and operable to project and maintain the vanes across the space between the drum and the interior of the cylindrical wall while the vanes travel between said ports.

6. In a fluid motor, the combination of a rotatable drum, a cylindrical housing coaxial with and of greater diameter than the drum and surrounding the same, said housing having inlet and outlet ports separated by a partition which extends across the space between the drum and housing, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, said drum having recesses in opposite sides thereof, vanes mounted in said recesses, each vane having means secured to opposite ends thereof riding on the respective cam tracks as the drum rotates, said tracks being so formed as to maintain each vane across the space between the drum and the interior of the housing during the major part of its travel and to dispose said vane tangentially of the drum as it passes said partition, the vane when in said tangential position forming with the drum a continuous cylindrical surface in contact with the partition.

7. In a fluid motor, the combination of a cylindrical housing, a drum rotatably mounted axially of the housing and of smaller diameter than the interior of the housing and having recesses in its convex face, shafts journaled in the drum and extending longitudinally across said recesses, vanes carried by the shafts, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, cross heads secured to the ends of said shafts and having rollers at their ends riding on the respective cam tracks as the drum rotates, said tracks being so formed as to project the vanes across the space between the drum and the interior surface of the housing during rotation of said drum.

8. In a fluid motor, the combination of a cylindrical housing, a substantially cylindrical drum rotatably mounted within the

housing and coaxial therewith, said drum being of smaller diameter than the interior of the housing and having semi-cylindrical recesses in opposite sides thereof, shafts journaled in the drum and extending longitudinally across said recesses at the center of curvature thereof, vanes carried by the shafts, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, the shaft of each vane having a cross head secured to each end, rollers carried at the ends of the cross heads and riding on the respective cam tracks to determine the angular positions of said vanes, said tracks being so formed as to project the vanes across the space between the bottoms of said recesses and the interior surface of the housing as the drum rotates.

9. In a fluid motor, the combination of a cylindrical housing having heads rotatable therein at opposite ends thereof, a shaft mounted axially of the heads, a drum keyed to the shaft and secured between the heads, said drum being of smaller diameter than the interior of the housing, shafts journaled in said heads and having vanes secured thereto, retaining rings secured at the ends of the housing and holding the drum and heads against movement endwise of the housing, the interior of each ring forming a cam track, cross heads secured to the shafts of said vanes and having rollers at their ends riding on the respective cam tracks as the drum rotates, said tracks being so formed as to project the vanes across the space between the drum and the interior wall of the housing while the drum rotates.

10. In a fluid motor, the combination of a cylindrical housing having an inlet port and an exhaust port, a drum rotatable within the housing and spaced from the interior surface thereof, shafts rotatably carried by the drum, vanes secured to said shafts, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, cross heads secured to the ends of each shaft and having rollers at their ends riding on the respective cam tracks, said tracks being so formed as to project and maintain the vanes across the drum and interior surface of the housing while said vanes travel between the ports.

11. In a fluid motor, the combination of a cylindrical housing having an inlet port and an exhaust port through its cylindrical wall extending from end to end thereof, a drum rotatable within the housing and spaced from the interior surface thereof, shafts rotatably supported by the drum and having vanes secured thereto extending from end to end of the housing, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, cross heads secured to the ends of each shaft and having rollers at their ends riding on the respective cam tracks to determine the position of the vanes as the drum rotates, said tracks being so formed as to project and maintain the vanes across the space between the drum and the interior of the cylindrical wall while the vanes travel between said ports.

12. In a fluid motor, the combination of a rotatable drum, a cylindrical housing coaxial with and of greater diameter than the drum and surrounding the same, said housing having inlet and outlet ports through its cylindrical wall extending from end to end thereof and separated by a partition which extends across the space between the drum and housing, said drum having substantially semi-cylindrical recesses in opposite sides thereof, shafts journaled in the drum and extending longitudinally of said recesses at the center of curvature thereof, vanes secured to the respective shafts, retaining rings secured at the ends of the housing and holding the drum against endwise movement, the interior of each ring forming a cam track, cross heads secured to the ends of said shafts and having rollers at their ends riding on the respective cam tracks to determine the position of said vanes, said tracks being so shaped as to maintain each vane across the space between the bottom of the respective recess and the interior of the housing during the major part of its travel as the drum rotates, and to dispose said vane tangentially of the drum as it passes said partition, the vane when in the tangential position forming with the drum a continuous cylindrical surface in contact with the partition.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature.

THOMAS ROBERT BEGGS.