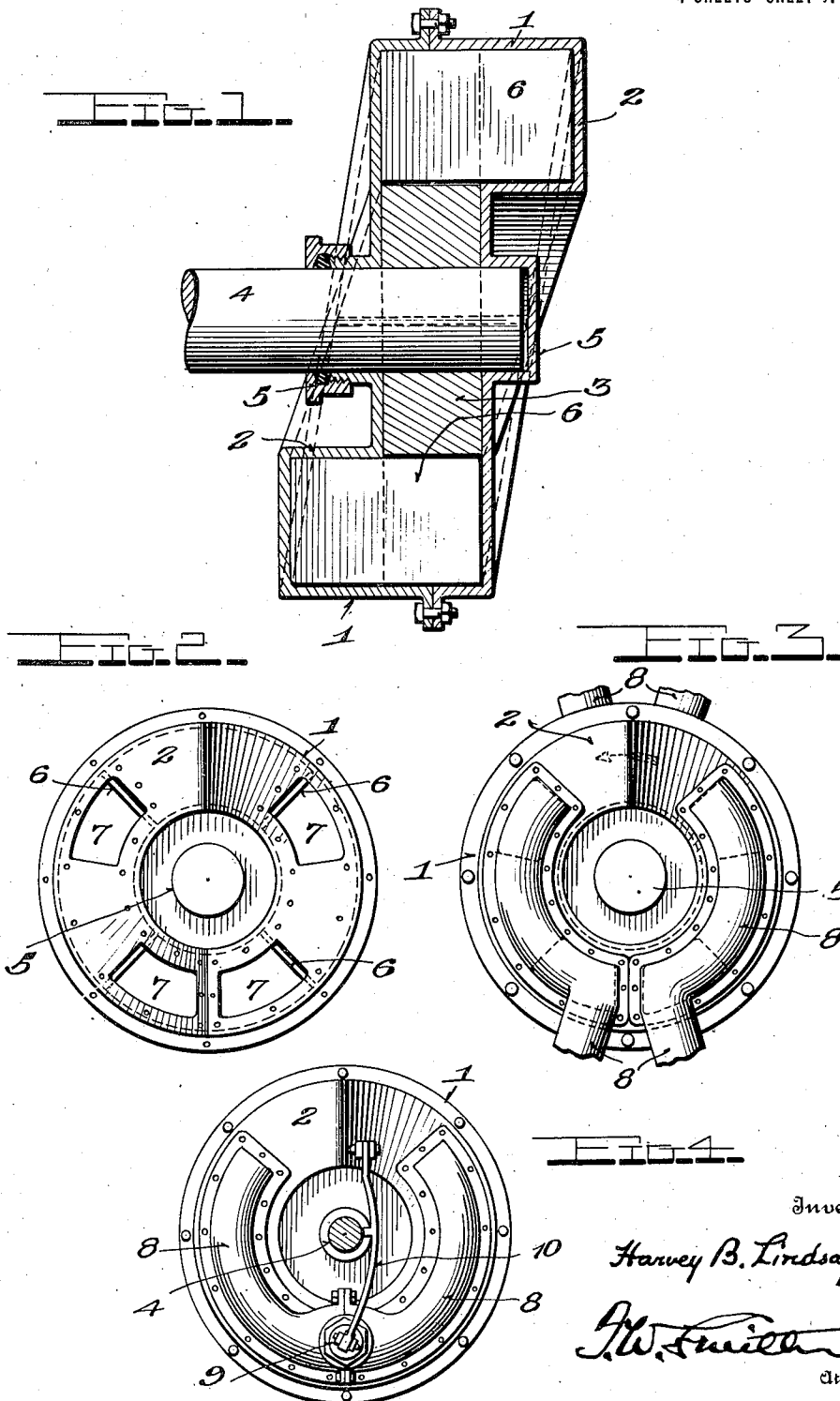


H. B. LINDSAY.
PUMP.
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1,377,210.

Patented May 10, 1921.
4 SHEETS—SHEET 1.



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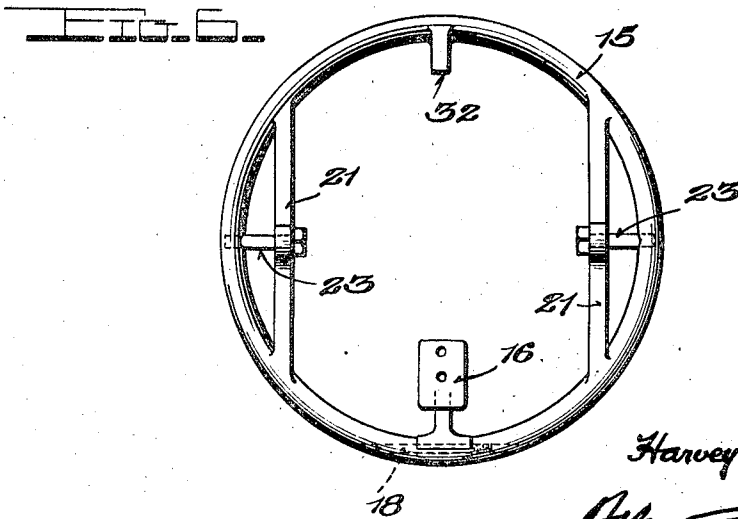
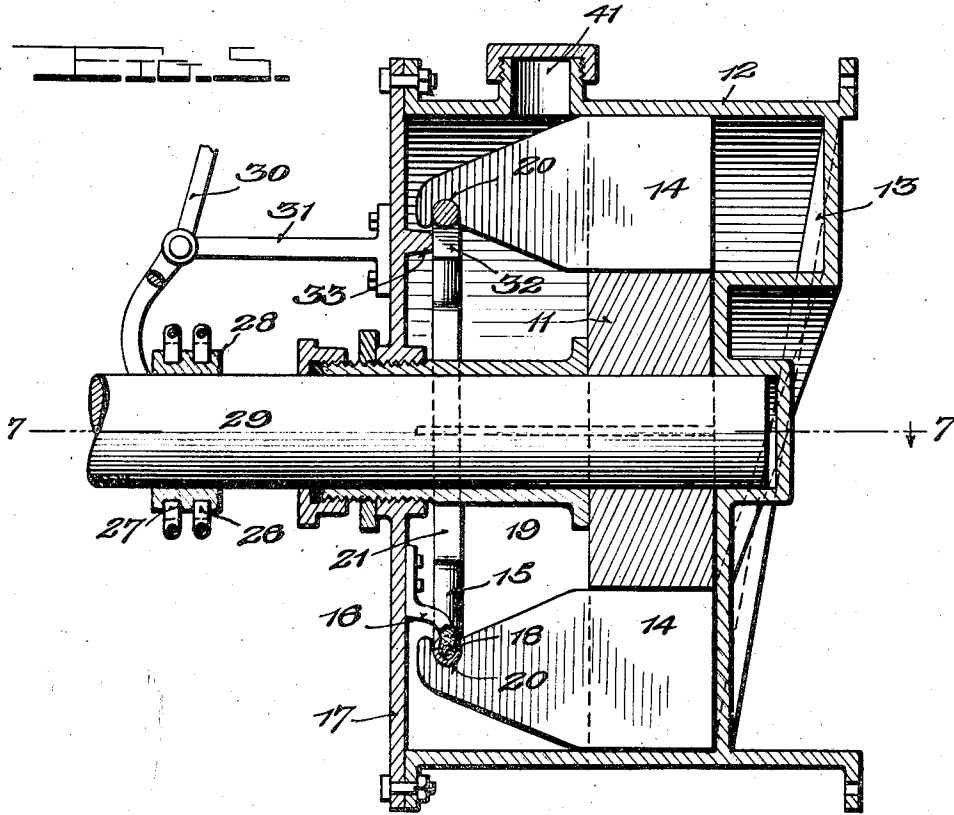
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4 SHEETS—SHEET 2.



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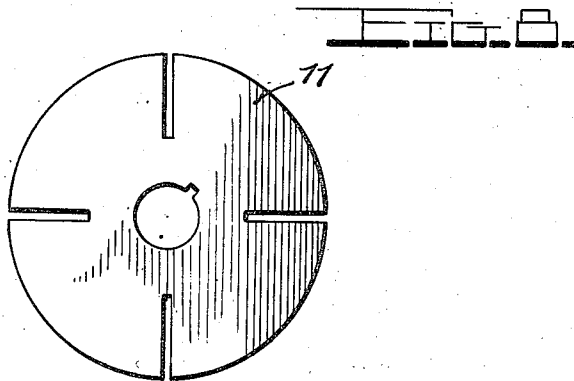
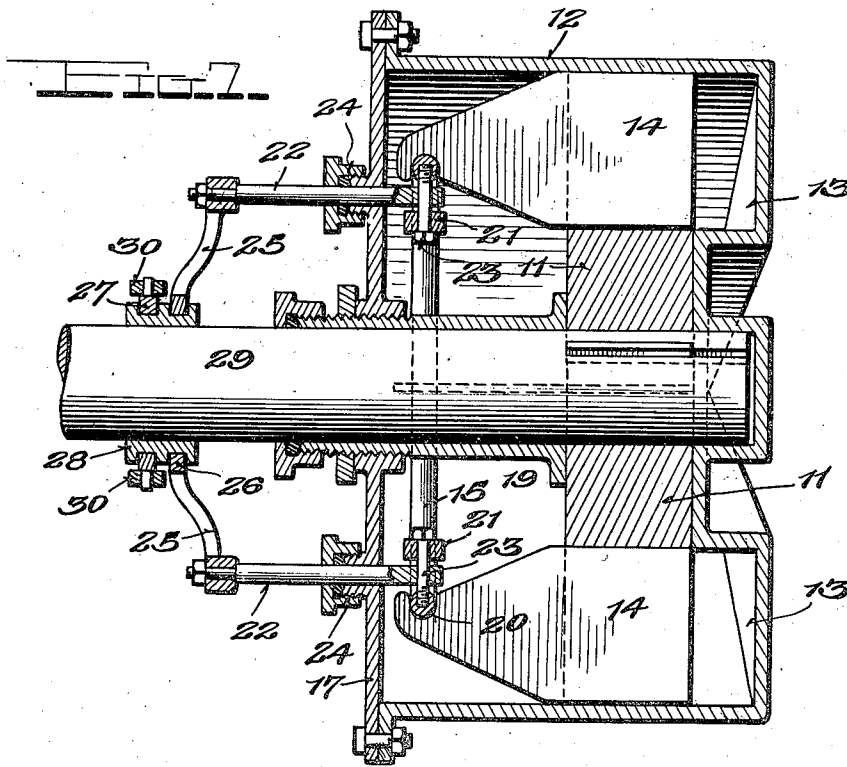
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4 SHEETS—SHEET 3.



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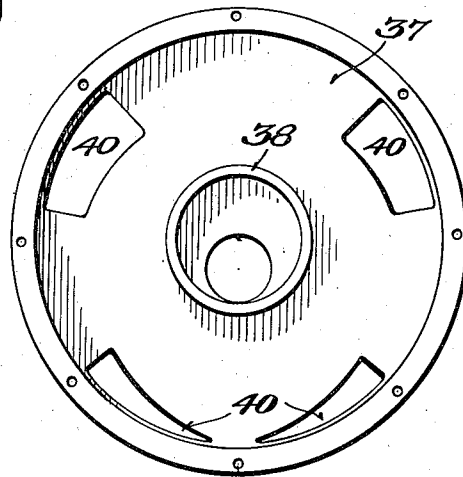
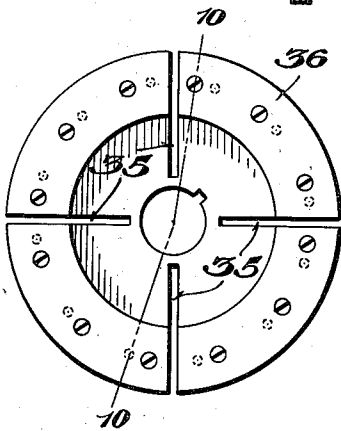
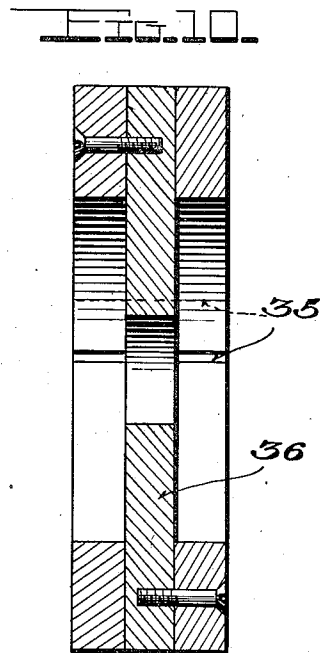
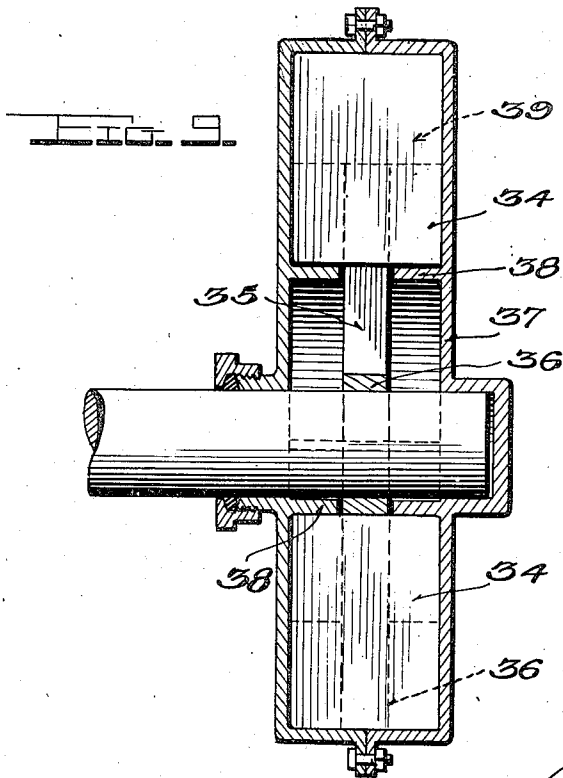
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1,377,210.

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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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PUMP.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HARVEY B. LINDSAY, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain new and useful improvements in pumps, and among other objects the invention has to simplify the structure and improve the vane control.

The invention is also applicable to clutches, brakes, or the like or similar devices, employing rotary blades moving in a body of liquid.

The invention further resides in a construction wherein the vanes are movable in an axial direction so that their control is facilitated and the action of centrifugal force against the control is avoided.

Further, the invention resides in a compact structure entirely lacking of springs and embodying but few moving parts, and also in the features of construction and the arrangements and combinations of parts hereinafter described and claimed, reference being had to the accompanying drawings wherein:

Figure 1 is a transverse section through the improved liquid clutch, brake or pump structure;

Fig. 2 is a side elevation thereof;

Fig. 3 is a similar view of a pump embodying the improvements;

Fig. 4 is a like view of the invention as applied to a clutch or brake;

Fig. 5 is a transverse section through a modified construction;

Fig. 6 is a detailed elevation of the vane-controlling ring incorporated therein;

Fig. 7 is a transverse section of the modified form taken at right angles to the plane of section for Fig. 5;

Fig. 8 is an elevation of the rotor *per se*;

Fig. 9 is a transverse section through a further modification;

Fig. 10 is a similar view of the rotor therefor taken on line 10—10 of Fig. 11.

Fig. 11 is a side elevation of the rotor; and

Fig. 12 is an inside view of one of the sections of the casing depicted in Fig. 9.

In the form depicted in Figs. 1 through 4, the casing 1 is circumferentially divided into two sections each having in its radial face a concentric channel or runway 2 whose plane is inclined relative to the diametral plane of the casing whereby the channel will gradually rise to its greatest height for one-half of the circumference and then gradually descend for the second half of the circumference, the channelway on one side of the casing being arranged in staggered or reverse relation to the channelway on the opposite side whereby the points of greatest depth will occur diametrically opposite each other.

A rotor 3 is fixed on the shaft 4, journaled in bearings 5 of the casing, and is provided with radial slots in which the vanes 6 are mounted to slide in an axial direction.

Consequently, upon rotating the shaft relative to the casing the bottom of both channels will engage the opposite ends of the vanes and the gradual rise of one bottom will effect shifting of the vane into the opposite channel. Therefore, the vanes will be alternately shifted from one side of the rotor to the other and thus drive or impel the fluid in each channel in advance thereof and out through the ports provided unless the flow is impeded or restricted. When the device is to operate as a brake the casing will be anchored to a fixed support and when it is to function as a fluid clutch the casing will be attached to a second shaft.

At intervals the radial face or base of each channel is provided with ports 6 over which an arcuate, trough-shaped conduit 8 is secured whereby the fluid driven ahead of the vanes may have a way of escape, which is through the openings 7 and passages 8. Where the device is to serve as a pump, as depicted in Fig. 3 each runway 2 is equipped with two conduits 8, one connecting the openings 7 on one side of the shallowest portion of the runway and the other disposed on the opposite side thereof, thereby providing an inlet and an outlet for the respective sides of the pump. In the clutch and brake embodiment as in Fig. 4 the single conduit 8 provides a continuous bypass about the shallow portion or point of greatest resistance in the runway so that the rotor may freely rotate within the casing. Adjustable means are provided for varying the resistance to the passage of the fluid through the conduit, the same prefer-

ably consisting of a valve 9, interposed therein and controlled by lever 10 which in turn may be connected to a collar (not shown) slidable on the shaft. If the valve is completely closed, the fluid will be prevented from by-passing and consequently the casing and rotor will be locked against relative movement. A positive mechanical lever (not shown) may be further provided. More or less opening of the valve will increase or decrease the relative movement between the casing and shaft.

In the embodiment shown in Figs. 5 through 8, the rotor 11 is mounted in the casing 12 which has only one runway or channel 13, the vanes 14 being slidable in an axial manner thereinto by means of a guide ring 15. This ring is pivoted on the opposite side of the rotor to the casing by means of a bracket 16, fixed to the cover 17 thereof, and a screw 18 countersunk into the ring as shown. The cover is spaced from the rotor to provide a large compartment 19 for the ring, and into this compartment extend the rear ends of the vanes the same having inwardly opening slots or seats 20 for slidably embracing the ring. Said ring is provided with a pair of parallel, chordal arms 21 between which and the intercepted arcs are pivotally mounted the inner ends of rods 22, as by pivot bolts 23, and these rods slidably extend through stuffing boxes 24, on the cover 17, and have their outer ends secured to the outer ends of radial arms 25, the latter extending from a collar 26. This collar, together with a second collar 27, is carried on a sleeve 28 which is slidable upon the drive shaft 29 by means of a lever 30 whose forked end straddles and is pivotally attached to the collar 27. In the brake embodiment, a fulcrum support 31 for the vane-controlling lever 30 is fixed to the cover whereby the vanes, their ring and the vane controlling mechanism can be removed as a unit with the cover. When the device is employed as a clutch wherein the casing itself revolves, the fulcrum is supported on an independent fixed frame (not shown).

Obviously, swinging the lever handle to the left (Fig. 5), the ring 15 will be swung inwardly about the pivot 18 to assume a position upwardly inclined from its pivot and to the right, the innermost inclination paralleling the bottom of channel 13. Consequently, decreasing the inclination from the vertical will withdraw the vanes and accordingly decrease the resistance to the passage of the vanes. In their rotary movement the vanes are carried by the rotor about the guide ring 15, said ring being held from a rotary movement relative to the casing. With the vanes fully withdrawn the ring will be disposed parallel to the cover where it is engaged by an abutment 32 projecting from the cover into the path of a stop lug

33 on said ring. When the device is operative as a liquid clutch the base of the runway is uninterrupted by openings whereas for a pump these openings are provided in a manner similar to the arrangement depicted in Fig. 2, or they may be provided in the periphery of the casing.

In each of the forms hereinbefore described the vanes were movable in an axial manner. The embodiment of Figs. 9 to 12 inclusive disclose a plurality of vanes 34 which are slidable in a radial direction, the same being mounted in the radial slots 35 of a rotor 36 and operable within the cylindrical casing 37 whose side or end walls are flat throughout and provided with shaft bearings which are eccentrically disposed. The casing is preferably divided circumferentially into a pair of sections each formed with an axially extending, annular flange 38, which flange is concentric within the casing, but eccentric relative to the shaft, and is spaced from the opposing flange to define therewith an annular space through which the web of the rotor 36 extends. The flanges 38 define an annular channel or runway for the vanes which, by reason of the eccentric disposal of the shaft, are successively projected and retracted from the radial slots 35, and the fluid is driven ahead of the vanes in the arcuate chamber 39 and discharged through the lateral orifices 40.

In this latter form, as is also true of the embodiment exemplified in Figs. 1 to 4, inclusive, the vanes are automatically shifted into and out of the fluid channels by the walls thereof, while in Fig. 5 the vanes are under manual control and can be withdrawn entirely from the compression or fluid chambers. The vanes are double acting at each end, or they may operate in a single capacity only. For certain purposes two or more arcuate, inclined channels on each end, having respective points of greatest depth and shallowness at different circumferential positions, and arranged concentrically, may be required, which, in turn will require a double set of vanes. The casings are provided with filling openings 41 for supplying the liquid to the interior mechanism, in an obvious manner.

What is claimed is:

1. In a mechanism of the character described, a casing, a rotor therein, vanes movable in an axial direction on the rotor, and means for adjusting the vanes on the rotor.

2. In a mechanism of the character described, a casing, a rotor therein, vanes movable in an axial direction on the rotor, said casing having a runway for the vanes, and means for varying the degree of movement of the vanes into the runway.

3. In a mechanism of the character described, a casing, a rotor therein, vanes movable in an axial direction on the rotor, said

casing having a runway for the vanes, and means for varying the depth at which the vanes are to operate in the runway, said means including a vane-guiding member
5 movable toward and from the side of the rotor.

4. In a mechanism of the character described, a casing, a rotor therein, vanes movable in an axial direction on the rotor, said
10 casing having a runway for the vanes, and means for varying the depth at which the vanes are to operate in the runway, said means including a vane-guiding member movable toward and from the side of the
15 rotor.

5. In a mechanism of the character described, a casing having a runway, a rotor in the casing having a transverse slot, a vane slidable in the slot for projection into
20 the runway, and movable guide means for projecting the vane into the runway.

6. In a mechanism of the character described, a casing having a runway, a rotor in the casing having a transverse slot, a vane
25 slidable in the slot for projection into the runway, a guide member pivoted in the casing at one side for swinging inwardly toward the rotor at the opposite side, said vane slidably embracing the periphery of
30 the guide member, and means for adjusting the position of the guide member to vary the movement of the vane into the runway.

7. In a mechanism of the character described, a casing having a runway, a rotor

in the casing having transverse slots, vanes 35 slidable in the slot for projection into the runway, a guide ring pivoted to the casing and slidably connected to the vanes whereby the latter may revolve about the ring, and means for adjusting the ring angularly to
40 accord the vanes a corresponding angular path of movement in the runway.

8. In mechanism of the character described, a casing having a runway, a rotor in the casing having a transverse slot, a
45 vane slidable in the slot for projection into the runway, a guide ring pivoted to the casing and slidably connected to the vane whereby the latter may revolve around the
50 ring, and means for adjusting the ring angularly to accord the vane a corresponding angular path of movement in the runway, said runway provided with intake and discharge orifices.

9. In a mechanism of the character described, a casing having a runway on the end thereof, the end wall of which runway is inclined from the axial perpendicular to the end that a gradual variation shall exist in the distance from said end wall of said
60 runway and the face of a rotor revoluble within said casing, said rotor carrying means obstructing said runway.

In testimony whereof I affix my signature.

HARVEY B. LINDSAY.

Witnesses:

C. SETON LINDSAY,
JAMES M. HUDNUT.