R. McGRAW.

ROTARY MOTOR.

APPLICATION FILED MAY 9, 1908.

943,783.

Patented Dec. 21, 1909.

Fig. 1.

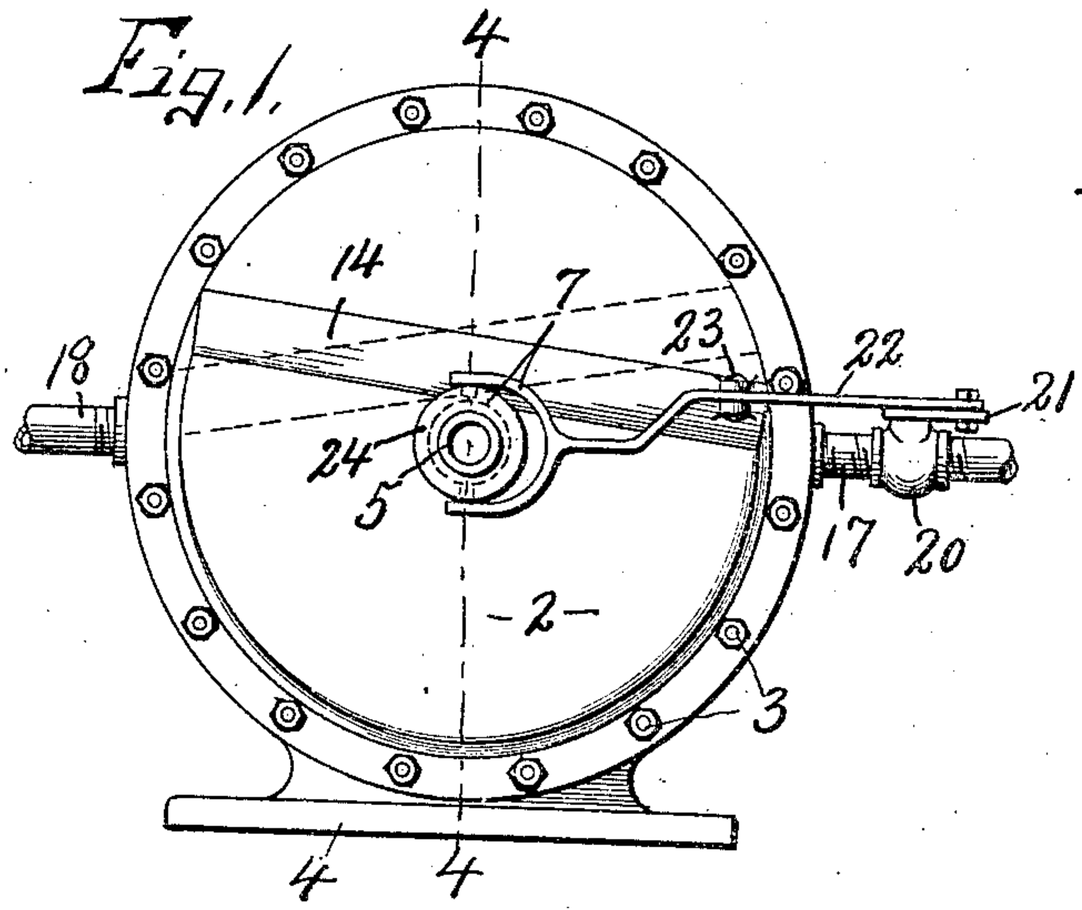


Fig. 2.

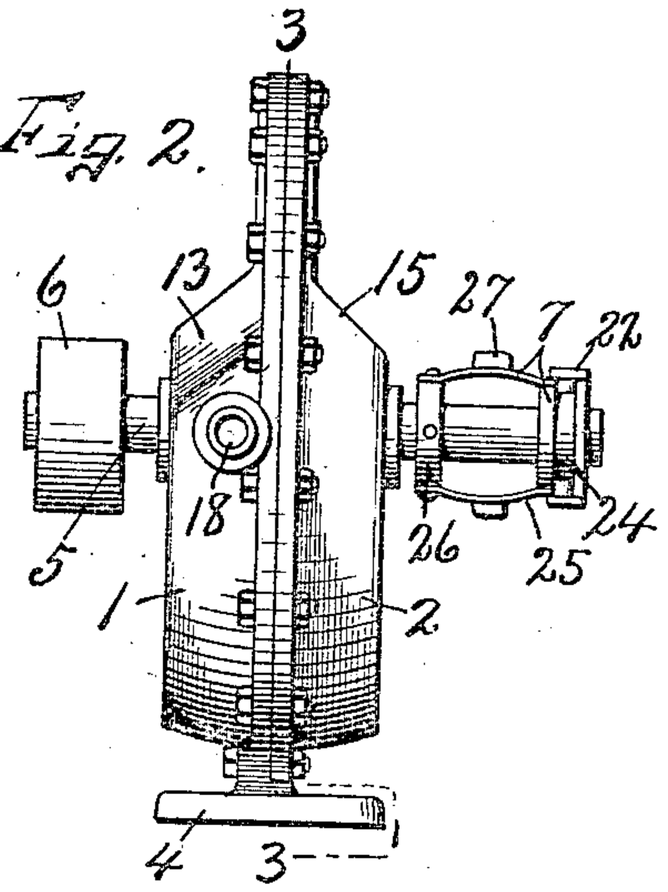


Fig. 3.

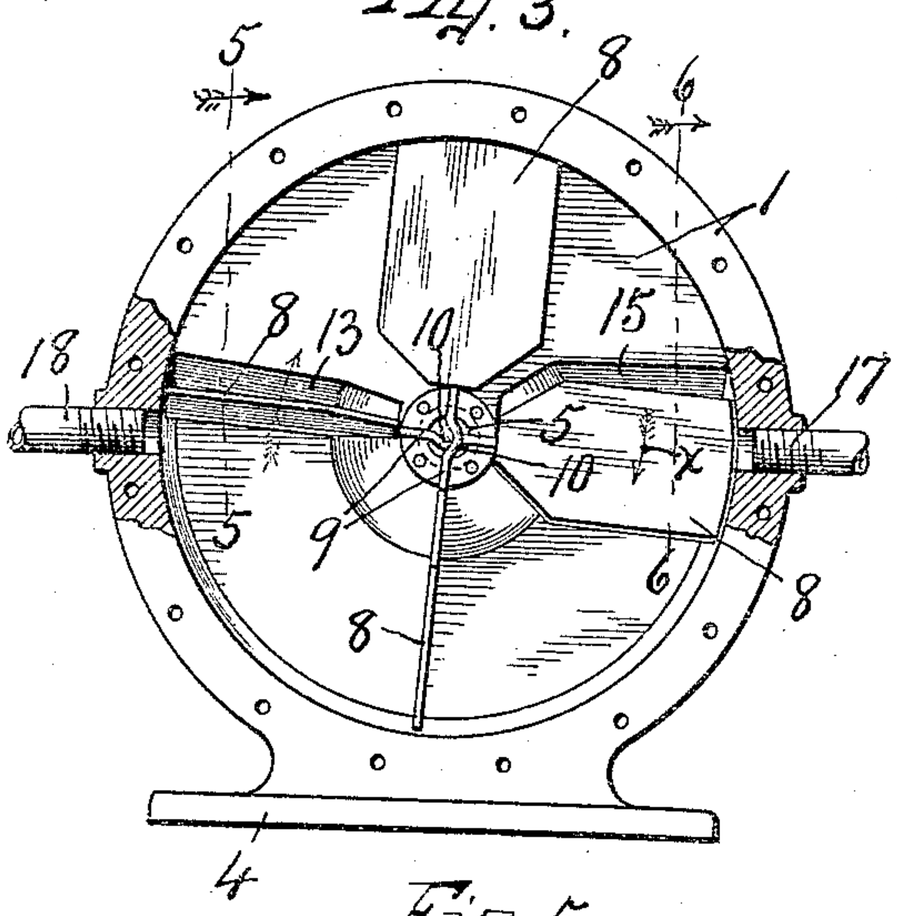


Fig. 4.

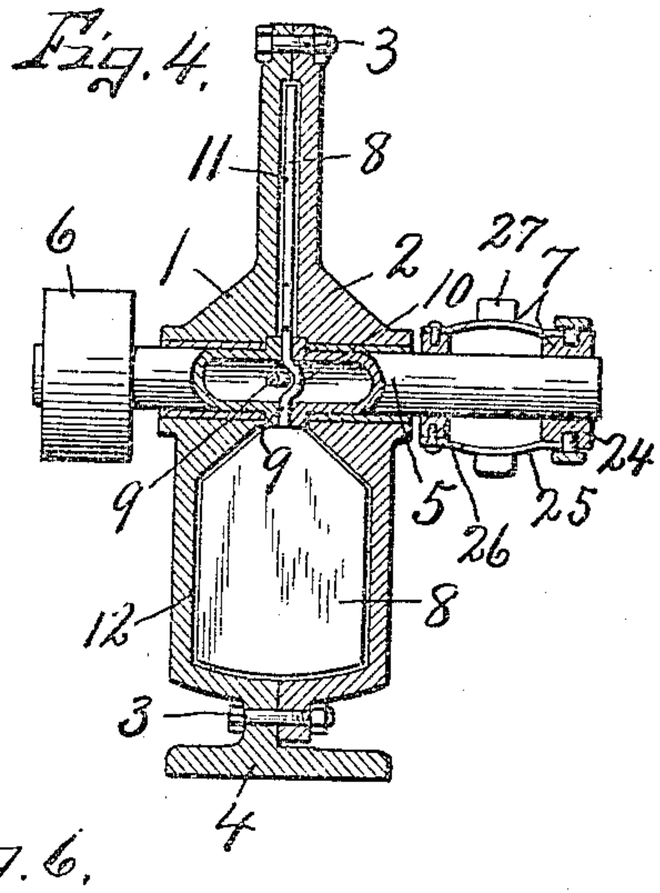


Fig. 5.

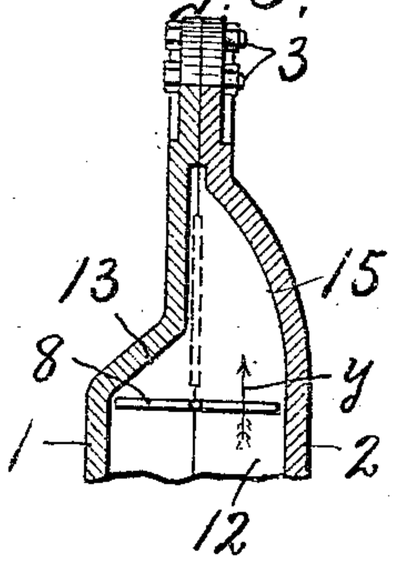


Fig. 6.

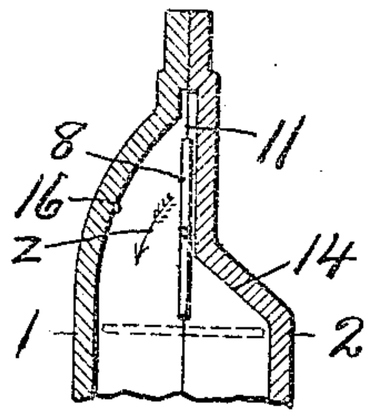
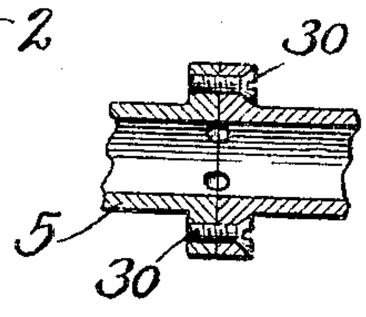


Fig. 7.



Witnesses.

F. C. Thomas

H. E. Chase.

Inventor.

Rhoda McGraw

By.

Howard P. Denison

Attorney.

UNITED STATES PATENT OFFICE.

RHODA McGRAW, OF SYRACUSE, NEW YORK.

ROTARY MOTOR.

943,783. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed May 9, 1908. Serial No. 431,787.

To all whom it may concern:

Be it known that I, RHODA McGRAW, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Rotary Motors, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in rotary motors in which a plurality of blades are arranged in pairs, those of each pair being disposed in planes at substantially right angles to each other and rigidly connected together by a transverse shaft extending through and journaled in a main driving shaft, said blades revolving in a suitable casing and impelled by any suitable fluid as steam or water under pressure and propelling the main driving shaft.

My main object is to rigidly connect the diametrically opposite blades of each pair through a central shaft in planes at right angles to each other and to provide the interior of the inclosing case with deflecting abutments adapted to be engaged by one edge of the blades to tilt them successively from a position in a plane parallel with the axis to a position in a plane at right angles to the axis, such tilting movement being effected automatically by the action of the blades through the medium of the impelling fluid.

Another object is to provide opposite walls of the chamber in which the blades are movable with similar pairs of deflecting abutments so that the direction of rotation of the blades may be reversed.

A further object is to make substantially one-half of the interior of the chamber of about the thickness of the blade so that the latter will ride easily therethrough flatwise while the other half of the chamber is of the same cross sectional area as the flat area of one of the blades with sufficient clearance to permit said blades to rotate freely therein and to locate the inlet and exhaust openings at diametrically opposite sides of the case in close proximity to the junction of the reduced portion of the chamber with the widened portion thereof.

A still further object is to provide means for governing the speed of rotation of the blades.

Other objects and uses will be brought out in the following description.

In the drawings—Figures 1 and 2 are respectively end and side elevations of a rotary motor embodying the various features of my invention. Figs. 3 and 4 are sectional views taken respectively on lines 3—3, Fig. 2 and 4—4, Fig. 1. Figs. 5 and 6 are enlarged sectional views taken respectively on lines 5—5 and 6—6, Fig. 3. Fig. 7 is an enlarged sectional view of the meeting ends of the main shaft sections.

In carrying out the objects stated I provide a suitable inclosing case which, in this instance, is substantially circular in end view and is composed of opposite similar sections —1— and —2— having annular marginal flanges which are clamped together by suitable means as bolts —3—, one of the sections being provided with a suitable base —4— by which the entire motor may be secured to and supported upon a suitable bed or equivalent support, not shown.

Centrally journaled in the opposite sides —1— and —2— of the inclosing case is a hollow shaft —5— extending some distance beyond the outer face of said case sections, one end being provided with a balance wheel or pulley —6— while the other end is provided with a suitable governor —7— for controlling the speed of rotation of the blades.

A series of in this instance four blades —8— are mounted within the casing comprising the sections —1— and —2— and are rotatable about the axis of the shaft —5— and are preferably arranged in pairs, those of each pair being located at diametrically opposite sides of the shaft —5— and are permanently and rigidly connected to each other by transverse shafts or spindles —9— passing diametrically through and journaled in the central portion of the shaft —5— so as to intersect each other, the central portions of the shafts or spindles —9— being deflected laterally forming offsets or eccentric portions —10— as best seen in Figs. 3 and 4 to permit said shafts and the blades which they connect to rotate relatively to each other and still maintain the axes of the shafts —9— in the same plane at right angles to the shaft —5—. By thus rigidly connecting diametrically opposite blades with each other, it is evident that when one blade is rotated or tilted transversely of its axis of rotation around the shaft —5—, the other blade will be similarly tilted but in the opposite direction.

Approximately one-half of the interior of the case section is formed with a chamber —11— of substantially the same width as the thickness of the blades —8—, just sufficient clearance being left to permit the blades to travel easily and freely therein with an easy running fit while approximately the other half of the interior of the casing is formed with a chamber —12— of substantially the same dimensions as the flatwise area of one of the blades —8— with sufficient clearance to establish an easy running fit of the motor blades in the case. These chambers —11— and —12— communicate with each other and at their junctions one with the other, the opposite case sections are formed with inclined deflectors or abutments —13— and —14— lying in the path of movement of each blade and constituting an inclined bearing for rocking the blade from a position in a plane parallel with the axis of the shaft —5— as shown in Fig. 5 to a position in a plane at substantially right angles to said shaft or through a half revolution upon the axis of the spindle —9— as shown by dotted lines in the same figure, the sides of the case opposite to the abutments —13— and —14— being also formed with inclined ways —15— and —16— of sufficient radius or sweep to permit the sides of the blades opposite to that which engages the abutments —13— or —14— to tilt from one plane to another as best seen in Figs. 5 and 6. The case is provided with a radial inlet conduit —17— and a diametrically opposite exhaust conduit —18— both of which communicate with diametrically opposite sides of the large chamber —12— near its junction with the narrow chamber —11—.

Now assuming that the shaft —5— with the blades thereon is adapted to rotate in the direction indicated by arrows —X—, then the longitudinal edge of the blade —8— nearest to the abutment —13— will encounter said abutment just after passing the exhaust —18— which abutment being at one side of the rocking axis of the blade and its supporting spindle —10— will cause said blade to rock or tilt from a position flatwise to an edgewise position relative to its direction of rotation and at the same time pass from the flatwise position in the larger chamber to an edgewise position in the smaller chamber —11—, the opposite incline —15— affording sufficient clearance to permit the adjacent side of the blade to tilt in the manner just described during its forward movement. This tilting of the blade —8— from flatwise to an edgewise position in the direction of movement of arrow —X— causes the reverse movement of the opposite blade —8—, that is this latter blade will tilt from an edgewise position in the smaller chamber —11— to a flatwise position in the larger chamber —12— and will assume the flatwise position after passing the inlet —17— ready to receive the impact of the impelling fluid, it being understood that the inclined surfaces —14— and —16— constitute the abutments for the impelling fluid, which, therefore, reacts directly upon the flat surface of the adjacent blade to impel the blades forwardly and thereby rotate the shaft —5—.

By the use of four blades connected in pairs in the manner described at right angles to each other, it is evident that at least two of the blades will present a flat side to the impelling fluid in the larger chamber —12—, the inlet —17— being located at one end while the exhaust conduit —18— is located at the opposite end of the chamber —12— so as to permit the impelling fluid to exhaust at about the same time that it enters the inlet. In like manner as each blade encounters the abutment —13— it is tilted from a flatwise to an edgewise position in the direction of rotation while the opposite blade will be tilted in the opposite direction or from an edgewise to a flatwise position in the direction of rotation.

In order to automatically control the speed of the motor, I have provided the inlet conduit with a valve —20— having an operating lever —21— connected to one end of a rock lever —22— which is fulcrumed at —23— on one side of the inclosing case and its inner end connected to a groove collar —24—, the latter being slidable upon the shaft —5—. This sliding collar is connected by opposite springs —25— to a fixed collar —26— also mounted upon the shaft —5—, said springs being provided with suitable centrifugal weights —27—.

It is evident from the foregoing description that as the speed of the motor increases, the central portion of the spring —25— will be thrown outwardly by the centrifugal force of the weights —27— thereby drawing the collar —24— inwardly and rocking the lever —22— to partially close the valve —20—.

One of the essential features of my present invention is the rigid connection between the diametrically opposite blades, such connection consisting of spindles journaled in the main shaft with their axes in substantially the same plane at right angles to said shaft and having their intermediate portions provided with offsets at their intersection one with the other so as to allow said spindles with the blade thereon to rotate as the blades are tilted or rocked from one position to another. Another feature is the location of the fixed abutments on the opposite case sections to deflect or turn both diametrically opposite blades of each pair simultaneously whereby as the blade operated upon by the

abutment is tilted to a flatwise position in the direction of rotation into the narrow chamber —11—, the walls of the latter will positively hold said blade in this flat position and will also hold the opposite blade in a plane in the larger chamber —12— to prevent turning of the latter by the impelling fluid.

In Fig. 5 I have shown the blade in end view in the chamber as moving in the direction indicated by arrow —Y— against the abutment —13— and have also shown in dotted lines, the position which the blade assumes after passing the high point of the abutment and tilted to its flatwise position in the smaller chamber —11—, this figure also showing the inclined way —15— for the purpose of showing the clearance for the sweep of the blade in passing from one position to another through an arc of substantially 90°.

In Fig. 6, I have shown the diametrically opposite blade as moving in the opposite direction in the enlarged chamber —12— showing also the abutment —14— and inclined way —16—, said blade moving in the direction indicated by arrow —Z— from a flatwise position in the chamber —11— to a crosswise position in the chamber —12—, the purpose of these two figures —5— and —6— being to show the relative positions of diametrically opposite blades in the case and in their relative position to the abutments —13— and —14— and ways —15— and —16— respectively. The shaft —5— is preferably made in coaxial sections secured together end to end by fastening means as screws —30—, the bearings for the spindles —9— being formed in the meeting ends, one-half in each so as to permit said spindles with the blades thereon to be readily replaced in operative position or removed when desired without removing the blades from their spindles.

In operation as each blade is brought into registration with the inlet —17— it is instantly tilted by the contact of the opposite blade rigidly connected thereto with the abutment —13— which instantly tilts the first named blade nearest the inlet to a flatwise position facing the inlet to receive the impact of the impelling fluid and this latter blade is held in this position traveling through the narrow chamber —11— until the blade just leaving the inlet has reached the exhaust whereupon it is acted upon in a similar manner by the abutment —18— and the operation repeated.

It will be apparent that the direction of rotation of the engine may be reversed by simply diverting the impelling fluid through the present exhaust, making the latter the inlet and using the present inlet as an exhaust. This diversion of the impelling fluid from one port to the other may be accomplished by any well known form of connection with the source of supply, not necessary to herein illustrate or describe.

What I claim is:

1. A rotary motor comprising a casing having a motive fluid inlet and an outlet, a hollowed driven shaft journaled in the walls of said casing and projecting therefrom, a pair of rotatable spindles journaled in said shaft, said spindles disposed at right angles with respect to each other and each of said spindles having an off-set portion arranged within said shaft to provide clearances during the rotation of the spindles, a blade fixed to each end of the spindle, the blade upon one end of the spindle extending at right angles with respect to the blade upon the other end of the same spindle, and means within the casing and adapted to engage the blades for rotating the spindles whereby the position of a blade upon one end of a spindle will be changed with respect to the blade upon the other end of the same spindle.

2. A rotary motor comprising a casing having a motive fluid inlet and an outlet, a hollowed driven shaft journaled in the walls of said casing and projecting therefrom, a pair of rotatable spindles journaled in said shaft, said spindles disposed at right angles with respect to each other and each of said spindles having an off-set portion arranged within said shaft to provide clearances during the rotation of the spindles, a blade fixed to each end of the spindle, the blade upon one end of the spindle extending at right angles with respect to the blade upon the other end of the same spindle, means within the casing and adapted to engage the blades for rotating the spindles whereby the position of a blade upon one end of a spindle will be changed with respect to the blade upon the other end of the same spindle, and means carried and operated by the driven shaft for controlling the supply of motive fluid through said inlet, said inlet being independent of said driven shaft.

3. A rotary motor comprising a casing provided in its lower portion with a chamber and in its upper portion with a chamber, said chambers communicating with each other, a hollowed shaft extending through said casing, spindles journaled transversely of said shaft, said spindles extending at right angles with respect to each other and rotatable, each of said spindles approximately centrally thereof off-set to provide a clearance to permit the spindles to rotate relatively to each other and maintain the axes in the same plane at right angles to said shaft, a blade connected to each end of a spindle, the blade upon one end of the spindle disposed at right angles upon the other end of the same spindle, said blades adapted to extend

through said chambers, said upper chamber of a width slightly greater than the thickness of a blade, and said lower chamber of a width slightly greater than the width of a blade, said casing provided with a motive fluid inlet and a motive fluid outlet, a deflector arranged in said casing and above said outlet and adapted to be engaged by a blade thereby rotating the spindle carrying such blade and changing the positions of the blades upon said spindle, and a deflector arranged within said casing above said inlet and adapted to be engaged by a blade upon the spindle thereby rotating the spindle and changing the position of the blades carried by the spindle, and said casing provided with means constituting clearances to allow of the shifting of the blades when engaged by the deflectors.

4. A rotary motor comprising a casing provided in its lower portion with a chamber and in its upper portion with a chamber, said chambers communicating with each other, a hollowed shaft extending through said casing, spindles journaled transversely of said shaft, said spindles extending at right angles with respect to each other and rotatable, each of said spindles approximately centrally thereof off-set to provide a clearance to permit the spindles to rotate relatively to each other and maintain the axes in the same plane at right angles to said shaft, a blade connected to each end of a spindle, the blade upon one end of the spindle disposed at right angles upon the other end of the same spindle, said blades adapted to extend through said chambers, said upper chamber of a width slightly greater than the thickness of a blade, and said lower chamber of a width slightly greater than the width of a blade, said casing provided with a motive fluid inlet and a motive fluid outlet, a deflector arranged in said casing and above said outlet and adapted to be engaged by a blade thereby rotating the spindle carrying such blade and changing the positions of the blades upon said spindle, and a deflector arranged within said casing above said inlet and adapted to be engaged by a blade upon the spindle thereby rotating the spindle and changing the position of the blades carried by the spindle, and said casing provided with means constituting clearances to allow of the shifting of the blades when engaged by the deflectors, and means operated by said shaft for regulating the supply of motive fluid through said inlet.

5. A rotary motor comprising a casing provided in its lower portion with a chamber and in its upper portion with a chamber, said chambers communicating with each other, a hollowed shaft extending through said casing, spindles journaled transversely of said shaft, said spindles extending at right angles with respect to each other and rotatable, each of said spindles approximately centrally thereof off-set to provide a clearance to permit the spindles to rotate relatively to each other and maintain the axes in the same plane at right angles to said shaft, a blade connected to each end of a spindle, the blade upon one end of the spindle disposed at right angles upon the other end of the same spindle, said blades adapted to extend through said chambers, said upper chamber of a width slightly greater than the thickness of a blade, and said lower chamber of a width slightly greater than the width of a blade, said casing provided with a motive fluid inlet and a motive fluid outlet, and means within said casing and adapted to engage the blades to rotate the spindles to change the positions of the blades of each pair with respect to each other.

In witness whereof I have hereunto set my hand this 4th day of May 1908.

RHODA McGRAW.

Witnesses:

H. E. Chase,

Caroline McCormack.