

No. 726,024.

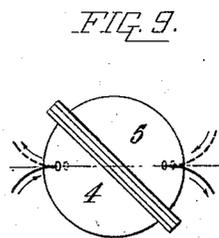
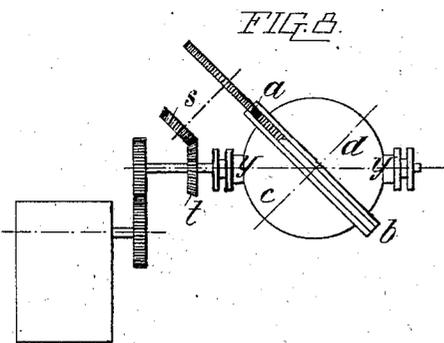
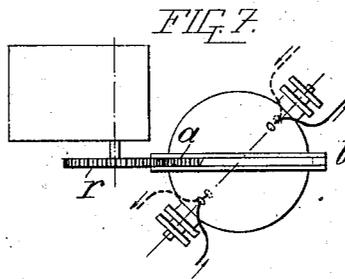
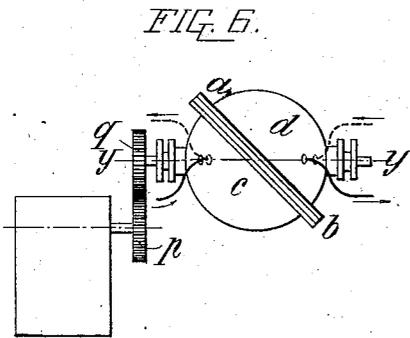
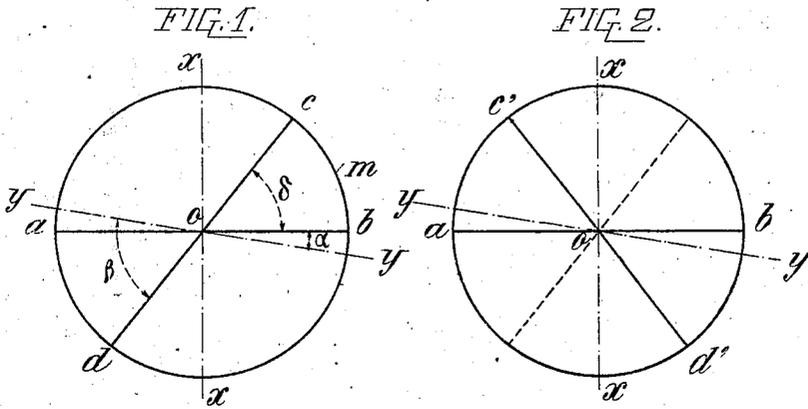
PATENTED APR. 21, 1903.

L. M. A. BUTIN.  
ROTARY ENGINE.

APPLICATION FILED OCT. 13, 1902.

NO MODEL.

5 SHEETS—SHEET 1.



WITNESSES:  
*Henry J. Schubert*  
*C. Broadway.*

INVENTOR  
*Louis Marcel Albert Butin*  
BY *Guise Viles*  
ATTORNEYS.

No. 726,024.

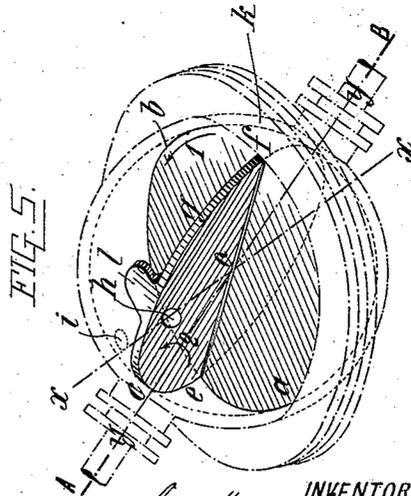
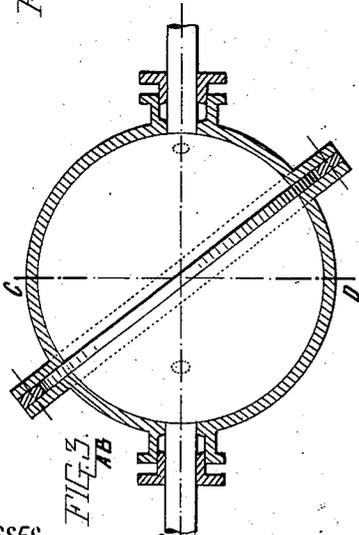
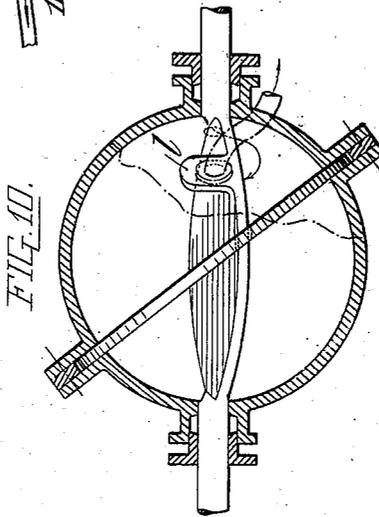
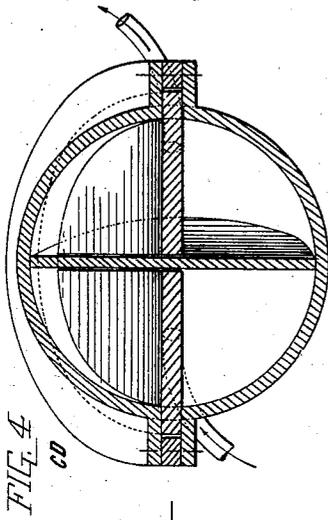
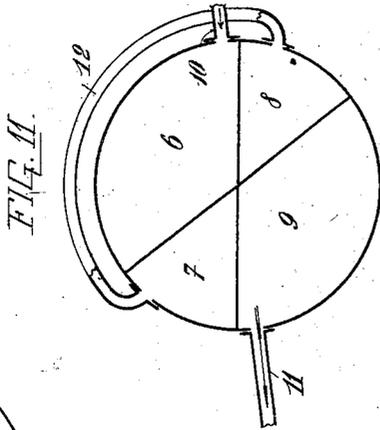
PATENTED APR. 21, 1903.

L. M. A. BUTIN.  
ROTARY ENGINE.

APPLICATION FILED OCT. 13, 1902.

NO MODEL.

6 SHEETS—SHEET 2.



WITNESSES:  
*Henry J. Suberbie*  
*W. C. Bradley*

INVENTOR  
*Louis Marcel Albert Butin*  
 BY *James Viles*  
 ATTORNEYS.

No. 726,024.

PATENTED APR. 21, 1903.

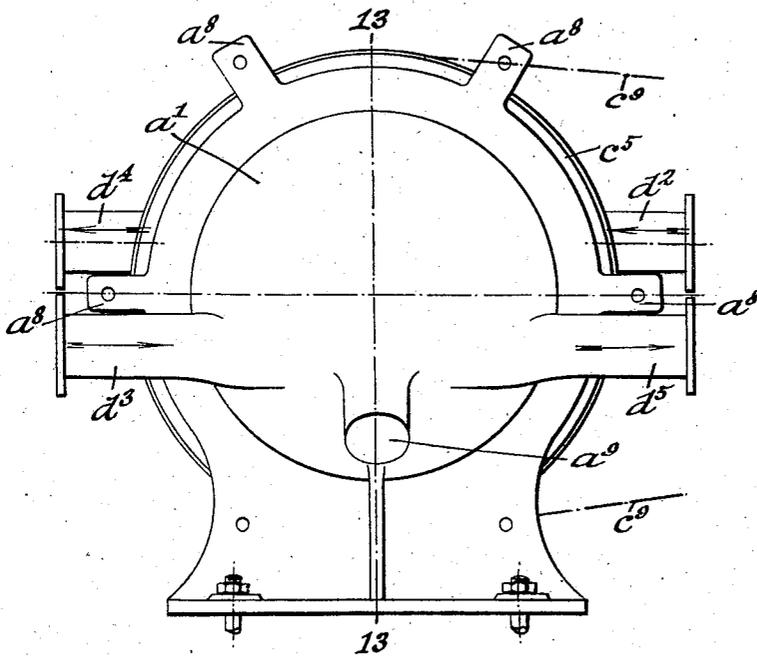
L. M. A. BUTIN.  
ROTARY ENGINE.

APPLICATION FILED OCT. 13, 1902.

NO MODEL.

5 SHEETS—SHEET 3.

Fig. 12.



WITNESSES:

*C. P. Goepel.*  
*Friedrich Starke*

INVENTOR

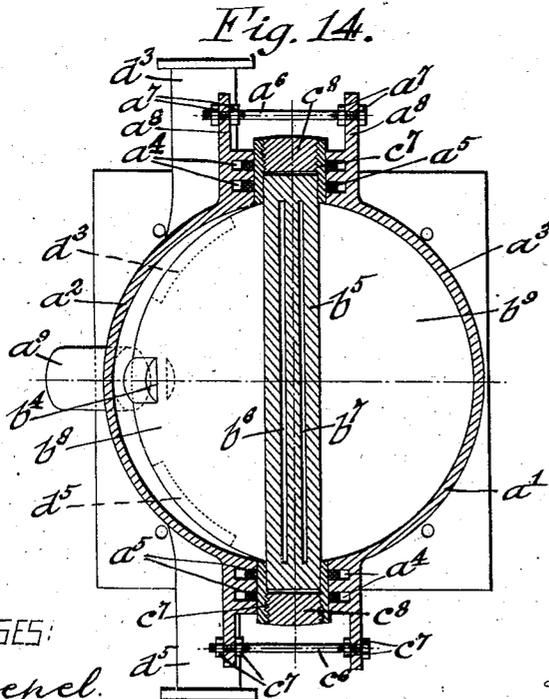
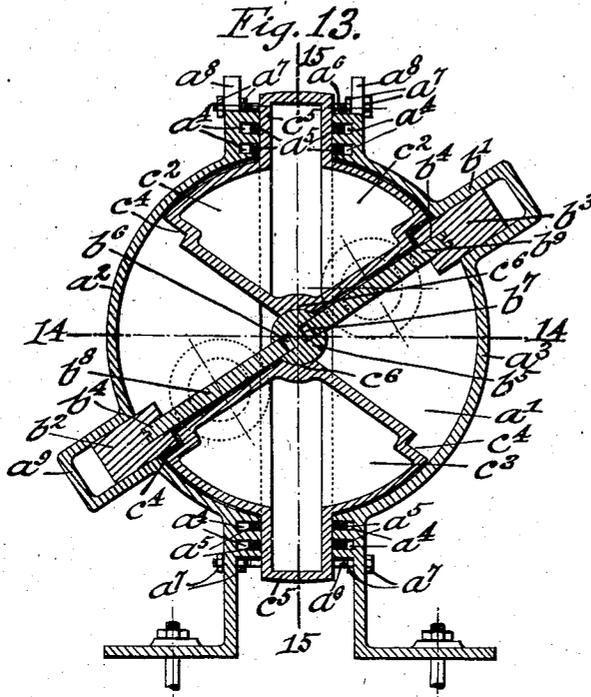
*Louis M. A. Butin*  
BY  
*Goepel & Niles,*  
ATTORNEYS.

L. M. A. BUTIN.  
ROTARY ENGINE.

APPLICATION FILED OCT. 13, 1902.

NO MODEL.

5 SHEETS—SHEET 4.



WITNESSES:  
*C. P. Goepel.*  
*Friedrich Starke.*

INVENTOR,  
*Louis M. A. Butin*  
 BY  
*Goepel & Niles,*  
 ATTORNEYS.

L. M. A. BUTIN.  
ROTARY ENGINE.

APPLICATION FILED OCT. 13, 1902.

NO MODEL.

5 SHEETS—SHEET 5.

Fig. 15.

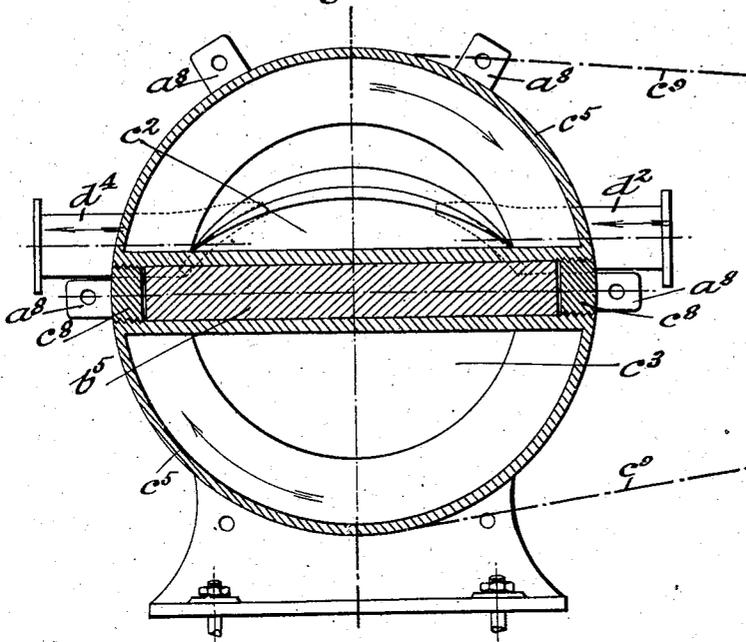
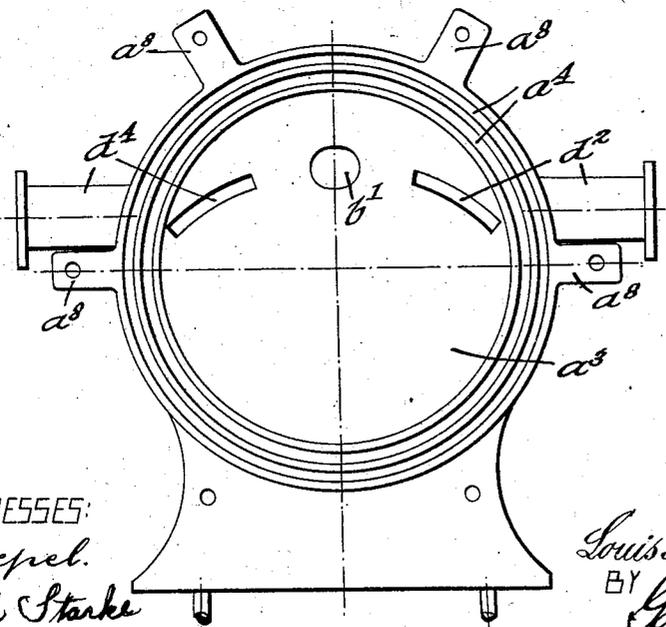


Fig. 16.



WITNESSES:  
C. P. Goepfel.  
Friedrich Starke

INVENTOR  
Louis M. A. Butin  
BY  
Goepfel & Niles,  
ATTORNEYS.

# UNITED STATES PATENT OFFICE.

LOUIS MARCEL ALBERT BUTIN, OF PARIS, FRANCE.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 726,024, dated April 21, 1903.

Application filed October 13, 1902. Serial No. 127,098. (No model.)

To all whom it may concern:

Be it known that I, LOUIS MARCEL ALBERT BUTIN, a citizen of the Republic of France, and a resident of Paris, France, have invented a new and useful Improvement in Rotary Engines, which improvement is fully set forth in the following specification.

The present invention relates to an improved motor capable of acting by means of any fluid under pressure or by the aid of any combustible mixture, such motor being capable of use as a pump without undergoing any modification in construction.

The characteristic feature of the improved motor consists in a kinematic device the object of which is to produce spaces of variable volume in the interior of a sphere.

In order that the invention may be quite clear, it will now be described with reference to the accompanying drawings, in which—

Figures 1 and 2 are diagrams showing the arrangement of the kinematic device independently of its uses. Figs. 3, 4, and 5 relate to the application to a steam-engine. Figs. 6, 7, and 8 relate to the application of the apparatus for use as a pump. Fig. 9 shows the case where one portion of the apparatus serves as a motor and the other portion as a pump. Fig. 10 shows the case where the apparatus is applied as an expansive steam-engine. Fig. 11 is a diagram to illustrate the application of the apparatus as an explosion-engine. Fig. 12 shows in side elevation a rotary engine constructed according to my invention. Fig. 13 is a vertical transverse section through the engine on line 13 13, Fig. 12. Fig. 14 is a horizontal section on line 14 14, Fig. 13. Fig. 15 is a vertical longitudinal section on line 15 15, Fig. 13; and Fig. 16 is a side elevation of one side or half of the casing of the engine with the internal portions of the engine removed.

Let there be a sphere of which Fig. 1 represents a section  $m$  at its largest diameter. Now place inside this sphere two disks  $ab$  and  $cd$ , formed in one or more pieces and both arranged to pass through the center  $o$  of the sphere. These disks are represented in the figures by their middle planes  $ab$  and  $cd$ , it being understood that the exterior surfaces of the disks may be of any shape to facilitate the connections of distributing, the ex-

pansion, the making of the joints to prevent waste spaces, and facilitating the putting together, these two planes cut at an angle  $\delta$ , which varies between zero and ninety degrees. Suppose that the disk  $ab$  revolves about the axis  $xx$ , Fig. 2, passing through the center of the sphere and perpendicular to its middle plane, and suppose also that the other disk  $cd$  revolves about the axis  $yy$ , making with its middle plane an angle  $\beta$ , lying between zero and ninety degrees. The angle  $\alpha$  being the angle formed by the axis  $yy$  with its projection upon the disk  $ab$ , it will be seen that, first, if  $\alpha$  equals zero the axis  $yy$  will fall in the plane  $ab$ ; second, if  $\alpha$  equals ninety degrees the axis  $yy$  coincides with the axis  $xx$ ; third, if  $\beta$  equals zero the axis  $yy$  coincides with the plane  $cd$ ; fourth, if  $\beta$  equals ninety degrees the axis  $yy$  will be perpendicular to the middle plane of the disk  $cd$ .

Take any position of the planes and of the axes other than that indicated in four degrees in supposing that one of the disks— $cd$ , for example—passes through a groove in the disk  $ab$ . It will be seen that on rotating either the disk  $ab$  about the axis  $xx$  or the disk  $cd$  about the axis  $yy$  the volume contained inside the sphere between the part  $co$  of the disk  $cod$  and the part  $ob$  of the disk  $ao$ , Fig. 1, will go on increasing in order to occupy (for a rotation of one hundred and eighty degrees) the volume  $c'ob$ , Fig. 2, and, conversely, will go on decreasing in the second part of the rotation to occupy (after a complete revolution) the original volume  $cob$ . For the same reasons the volume  $aod$  of the sphere (after a rotation of one hundred and eighty degrees) will have become  $aod'$ , to return at the end of the stroke to the original volume  $aod$ . In the fourth case above mentioned—that is to say, that in which  $\beta$  equals ninety degrees—the action just described will be *nil*.

In practice for the sake of simplicity in the arrangements adopted and facility of execution of the drawings I have chosen, preferably, the case where  $\beta$  equals zero—that is to say, that in which the axis  $yy$  lies in the plane of the disk  $cd$ . Let the application of this kinematic device now be considered in practice to the case of a steam-engine, referring for that purpose to Figs. 3, 4, 5, and 10, in

which Fig. 5 is a perspective view showing the whole of a motor in the case above indicated, where  $\beta$  equals zero. Fig. 3 is a section on the line A B of Fig. 5. Fig. 4 is a section on the line C D of Fig. 3. Fig. 10 is a supplementary view intended to show more particularly the device  $l$  employed where the machine is worked expansively. As will be seen by Fig. 5, the  $yy$  will lie, *e. g.*, in the plane of the disk  $cd$ , the disk  $ab$  will rotate in the direction of the arrow 1 about the axis  $xx$ , which is perpendicular thereto. Suppose the upper part of the disk  $cd$  lying above the line  $ef$  of intersection of the disks  $cd$  and  $ab$ —*i. e.*, that part of the disk  $cd$  which lies in the upper spherical semisegment—it will be seen that the sector  $eo c$  is smaller than the sector  $co f$ . If under these conditions steam is admitted to the interior of the sphere in the spherical segment formed by the part  $ecgf$  of the disk  $cd$  and by the wall itself of the sphere  $cgfa$ , this steam will tend to rotate the disk  $cd$  about its axis  $yy$  in the direction of the arrow 2, since the surfaces presented by the disk  $cd$  to the action of the steam are unequal on one or other side of the axis of rotation  $yy$ . The disk  $cd$  in rotating in the direction of the arrow 2 will carry around with it as it moves the disk  $ab$ , which will rotate in the direction of the arrow 1.

When the disk  $cd$  has rotated through an angle of ninety degrees, the spherical segment above mentioned, lying between  $ecgf a$ , will become  $ecgfb$ . Its volume will therefore be increased, as has been hereinbefore described. For a complete rotation of three hundred and sixty degrees the spherical segment mentioned will resume its original value.

If the steam-inlet be placed at  $h$  on the sphere and the exhaust at  $i$ , also on the sphere, for the position shown at Fig. 5, it will be seen that the inlet  $h$  is in the spherical segment  $ecgf a$ , while the exhaust is in the spherical segment  $ecgfb$ . The fluid entering the spherical segment  $ecgf a$  causes the disk  $cd$  to rotate in the direction just mentioned, the steam contained in the spherical segment  $ecgfb$  being exhausted through  $i$ . A continuous rotation of the whole system is thus obtained, and the axis  $yy$  may be taken as the axle transmitting the power, while the periphery of the disk  $ab$  may be taken as a pulley, a gear, or as an appropriate device for transmitting motion. There is of course a dead-point in the system—that is, when the two sectors  $eo c$  and  $fo c$  are equal, which manifestly happens during rotation. This dead-point, however, may be eliminated by any of the devices commonly used for motors.

It is to be understood that all that has been just said with regard to the upper spherical segment  $j$  is reproduced in the same way for the lower spherical segment  $k$ ; but the admission will take place in the portion  $eofdb$ , the exhaust taking place through  $eofda$ . Under these conditions the machine will work at full admission—*i. e.*, the steam will enter freely

into the acting section up to the moment when the acting section is opened to the exhaust.

It may be desirable to produce an expansion of the fluid, and to this end any connection commanded by the shaft  $yy$  and acting upon some distributing-gear for the fluid outside the sphere may be used. For instance, a cover  $l$  may, as shown in Figs. 5 and 10, be arranged on the disks  $cd$  and  $ab$ , which will close the inlet-port  $o$  before the sector of action is opened to the exhaust by the port  $i$ .

It is to be understood that the working of the motor would be the same if in place of steam some fluid under pressure be admitted by the port  $h$ , such as compressed air, water under pressure, &c.

If the apparatus is to be used as a pump, the port  $h$  will communicate with the suction-pipe and the port  $i$  with the delivery-pipe. The axle  $yy$  of the disk  $cd$  may in order to cause the rotation of the disks  $ab$  and  $cd$  be acted upon by toothed wheels  $pq$ , as shown in Fig. 6, or by any other device for transmitting motion. The outer periphery of the disk  $ab$  may, for instance, be toothed, as shown in Fig. 7, and this wheel may be driven by a gear  $r$ . This mode of transmission may be replaced by belt or other driving-gear. Again, as shown in Fig. 8, a train of bevel gear-wheels  $st$  may act both on the shaft  $yy$  of the disk  $cd$  and on the toothed periphery of the disk  $ab$ , or any other form of transmission may be employed.

It may be desirable now to indicate a considerable advantage of the new system, which is that in the same casing the apparatus may be used partly as a pump and partly as a motor. It is obvious that, for example, the spherical semisegment 4, Fig. 9, may serve as the motor, the spherical semisegment 5 serving as the pump. The spherical semisegment 4 will then be provided with inlet and exhaust ports for the motor fluid and the spherical semisegment 5 with suction and delivery valves for the fluid to be pumped.

The motor may without any modification and by the simple addition of a communicating conduit be used as an explosion-engine. Fig. 11 shows a diagram of this arrangement. In this case all four spherical segments are used. One segment, 6, constitutes, say, the inlet-segment, segment 7 is the compression-segment, segment 8 is the explosion-segment, and segment 9 is the exhaust-segment. The admission takes place at 10, the exhaust at 11. The segment 7 will be of course connected by a pipe 12 with segment 8.

Referring to Figs. 12 to 16, inclusive, in which similar letters of reference indicate corresponding parts,  $a'$  indicates the casing or housing of an engine or motor embodying the invention. Said housing is spherical in form at its interior, as shown, and is provided in the vertical longitudinal center plane with an opening extending entirely about the same. The casing is conveniently constructed in two parts  $a^2 a^3$ , each provided with cir-

cumferential grooves exterior to the hemispherical portion of the part, said grooves  $a^4$  being adapted to receive suitable packings  $a^5$ . The two housing-sections  $a^2$   $a^3$  are retained opposite and at suitable distance apart by means of suitable exterior fastening-bolts  $a^6$  and nuts  $a^7$ , said bolts passing through lugs  $a^8$ , projecting at suitable distances from the casing or housing. One housing-section—as, for example, the section  $a^2$ —is provided at a point on the transverse vertical center plane of the casing below the transverse horizontal center plane of the casing with a bearing or socket  $a^9$ , and the opposite section  $a^3$  is provided with a diametrically opposite bearing or socket  $b^1$ . In said sockets  $a^9$   $b^1$  are located pivot-pins  $b^2$   $b^3$ , which project into the spherical casing  $a'$  and are provided at their inwardly-projecting portions each with a slot  $b^4$ . On the longitudinal axis of said spherical casing  $a'$  is located a shaft  $b^5$ , which is provided with two longitudinal slots or grooves  $b^6$   $b^7$ . Between the pin or stud  $b^2$  and the shaft  $b^5$  is located a semi-circular driving-plate  $b^8$ , said plate at its inner edge entering the groove  $b^6$  of the shaft. Between the pin  $b^3$  and the shaft is located a semi-circular plate  $b^9$ , entering at its inner edge in the groove  $b^7$  of the shaft  $b^5$ . The plates at their outer edges enter into the slots  $b^4$  of the pins  $b^2$   $b^3$ . Said plates are therefore, as may be seen, arranged in a plane at an angle to the horizontal. In each of the hemispherical chambers into which the casing or housing  $a'$  is thereby divided at its interior is arranged a spherical section, the form of which may be compared to that of an orange slice or section. Said spherical sections  $c^2$   $c^3$  are preferably hollow at their interior. They are preferably of such width as to extend when in vertical arrangement (one above the other in said housing) from the pins  $b^2$   $b^3$ , respectively, to the central vertical longitudinal opening between the housing-sections  $a^2$   $a^3$  and are provided with recesses  $c^4$  for receiving said pins, so that the body of the sections can extend when in the position shown in Fig. 13 to the plates  $b^8$   $b^9$ . Said sections extend between the shaft  $b^5$  and the housing-wall. Each section is provided at its curved surface or periphery with a rib  $c^5$ ; also preferably formed hollow and integral with the body of the section. Said ribs  $c^5$  are arranged between the housing-sections  $a^2$   $a^3$  and extend in the vertical opening between the same to the outside of the sections. The packings  $a^5$  render the connection between the ribs  $c^5$  and the housing fluid-tight. The shaft  $b^5$  extends longitudinally between the centers, or rather apices, of said spherical sections at the center or on a center plane of the casing, said sections  $c^2$   $c^3$  being provided with concave bearing surfaces or seats for receiving said shaft. The rib of each section  $c^2$   $c^3$  is so formed at its end as to meet the rib of the opposite section, and said meeting por-

tions  $c^7$  are screw-threaded for a portion of their interior, as shown in Fig. 14. The shaft  $b^5$  extends at its ends into said rib  $c^5$  between the meeting portions  $c^7$ , but does not extend to the periphery of said rib. Plugs  $c^8$  are inserted into the screw-threaded portions of the sections beyond the ends of the shaft and form with the remainder of the periphery of the ribs a uniform driving-surface adapted to receive a belt  $c^9$  or other suitable power-transmission device.

Supply and exhaust ports for the driving fluid, such as steam, are provided, said ports communicating with the interior of the housing  $a'$ , preferably on the line of the periphery of the plates  $b^8$   $b^9$  when the same are in a horizontal longitudinal plane, as in Fig. 13. A double set of ports may be provided. Steam enters through ports  $d^2$   $d^3$  and exhausts through ports  $d^4$   $d^5$ , thereby exerting pressure upon the driving-plates  $b^8$   $b^9$ , whereby said plates and the sections  $c^2$   $c^3$  are rotated in the direction indicated by the arrow in Fig. 15.

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

1. A rotary motor, consisting of a spherical casing, a shaft arranged in and traversing the center of said casing, semi-circular plates connected with said shaft and arranged at opposite sides of the same in a plane at an angle to the horizontal, means pivoting said plates on an inclined axis transversely of the casing, spherical sections at opposite sides of said shaft, means for guiding said sections in the vertical longitudinal center plane of said casing, supply and exhaust ports arranged at opposite sides of said casing, and power-transmitting means connected with said spherical sections, substantially as set forth.

2. A rotary motor, consisting of a spherical casing, a shaft arranged in and traversing the center of said casing, semi-circular plates connected with said shaft and arranged at opposite sides of the same in a plane at an angle to the horizontal, means pivoting said plates on an inclined axis transversely of the casing, spherical sections at opposite sides of said shaft, and extending to the outside of the casing, means for guiding said sections in the vertical longitudinal center plane of said casing, and supply and exhaust ports arranged at opposite sides of said casing, substantially as set forth.

3. A rotary motor, consisting of a spherical casing, a shaft arranged in and traversing the center of said casing, semi-circular plates connected with said shaft and arranged at opposite sides of the same in a plane at an angle to the horizontal, means pivoting said plates on an inclined axis transversely of the casing, spherical sections at opposite sides of said shaft, and extending to the outside of the casing, bearings in said sections for said shafts, means for guiding said sections in the vertical longitudinal center plane of said casing,

and supply and exhaust ports arranged at opposite sides of said casing, substantially as set forth.

4. A rotary motor, consisting of a spherical casing, a shaft arranged in and traversing the center of said casing, semicircular plates connected with said shaft and arranged at opposite sides of the same, in a plane at an angle to the horizontal, means pivoting said plates on an inclined axis transversely of the casing, spherical sections at opposite sides of said shaft, said sections extending to the outside of said casing, and formed at their periphery for receiving power-transmitting means,

bearings on said sections for said shaft, plugs at the ends of said bearings, between the sections, means for guiding said sections in the vertical longitudinal center plane of said casing, and supply and exhaust ports arranged at opposite sides of said casing, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LOUIS MARCEL ALBERT BUTIN.

Witnesses:

EMILE LEDRET,

EDWARD P. MACLEAN.