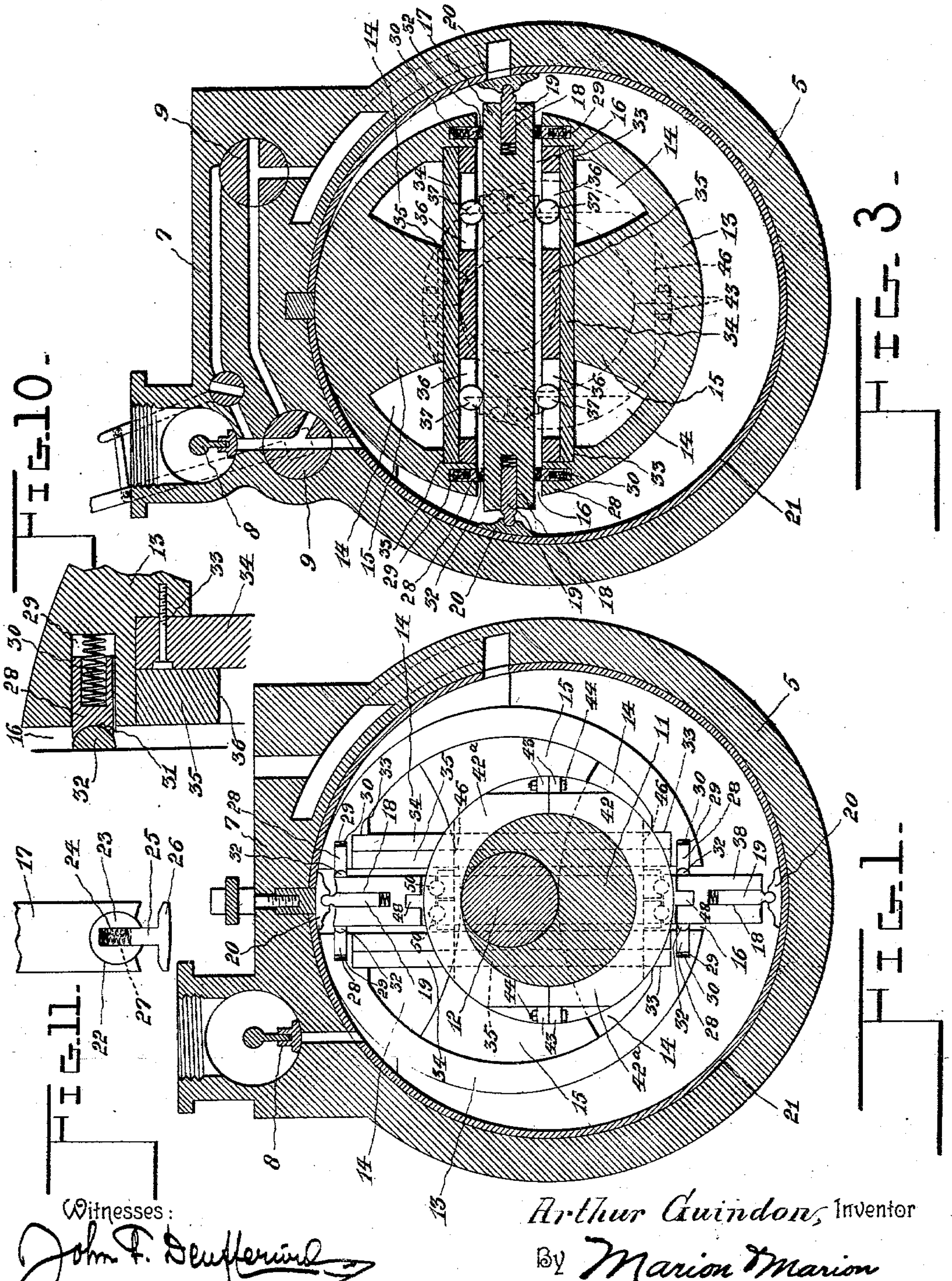
No. 748,861. PATENTED JAN. 5, 1904.

A. GUINDON.

ROTARY ENGINE.

APPLICATION FILED JUNE 5, 1901. RENEWED JUNE 8, 1903.

NO MODEL. 2 SHEETS—SHEET 1.



Witnesses:
John F. Deufferwiel
W. F. Bernhard

Arthur Guindon, Inventor

By Marion & Marion

Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

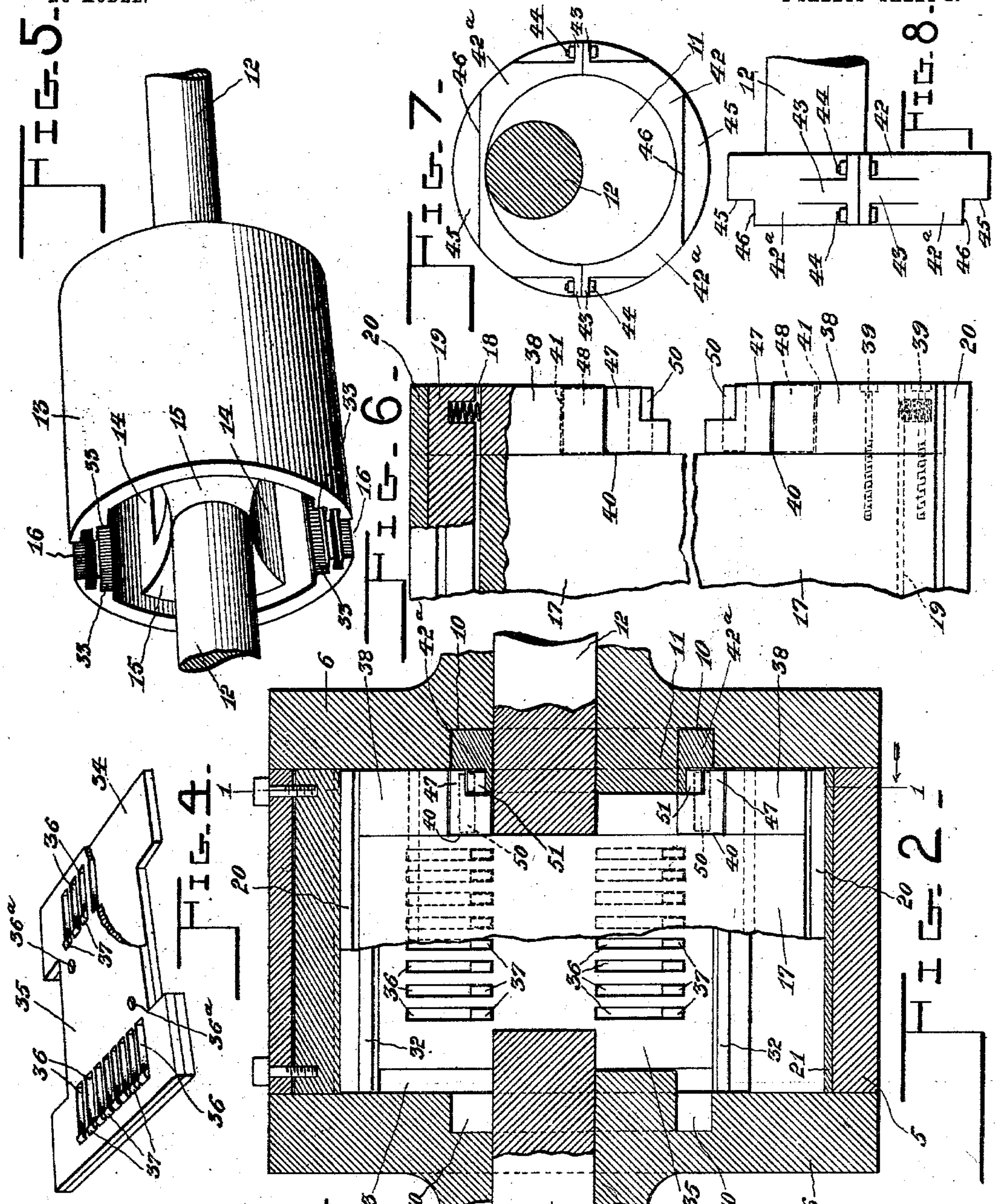
No. 748,861. PATENTED JAN. 5, 1904.

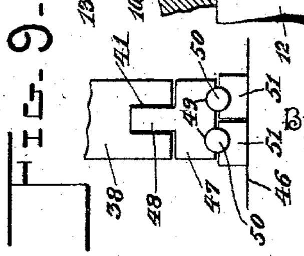
A. GUINDON.

ROTARY ENGINE.

APPLICATION FILED JUNE 5, 1901. RENEWED JUNE 8, 1903.

NO MODEL. 2 SHEETS—SHEET 2.





Witnesses:
John F. Deufferwiel
H. H. Bernhard

Arthur Guindon, Inventor

By Marion & Marion

Attorneys

No. 748,861. Patented January 5, 1904.

UNITED STATES PATENT OFFICE.

ARTHUR GUINDON, OF MONTREAL, CANADA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 748,861, dated January 5, 1904.

Application filed June 5, 1901. Renewed June 8, 1903. Serial No. 160,638. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR GUINDON, a subject of His Majesty the King of Great Britain, residing in the city and district of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare that the following is 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.

My invention relates to improvements in rotary engines of that class in which a rotary eccentric-piston is equipped with radially-movable wings, which are exposed to the pressure of the motive fluid, as fully disclosed in a prior application for Letters Patent of the United States, filed by me December 28, 1900, Serial No. 41,314.

The objects of the present invention are to provide means for reducing the friction and wear between the revoluble and the slidable members forming the eccentric-piston, to provide means between the slidable piston member and the engine's cams which are calculated to absorb some of the friction and wear and allow for renewal of the working parts at a minimum cost, to reduce the friction and wear between the slidable piston member and the cam-actuated shiftable controller, and to provide a novel connection between the slidable piston member and the piston-shoes, said connection allowing the shoe to easily and accurately conform to the curvature of the inner surface of the cylinder.

To the accomplishment of these ends, the invention consists in the novel construction and arrangement of parts, which will be hereinafter fully described and claimed.

In the drawings hereto annexed, forming a part of this specification, Figure 1 is a vertical transverse section through a rotary engine, illustrating one type of valve, the plane of the section being indicated by the dotted line 1 1 on Fig. 2. Fig. 2 is a vertical central longitudinal section through the engine. Fig. 3 is a vertical cross-section through the engine shown by Figs. 1 and 2, except that the cylinder is provided with a valved reversing mechanism and that the rotary eccentric-piston occupies a position turned one-quarter of the way around. Fig. 4 is a detail perspective view, partly broken away, of one of the roller-bearing plates and the backing-plate provided therefor. Fig. 5 is a detail perspective view of the revoluble member forming a part of the eccentric-piston. Fig. 6 is a sectional view, partly broken away, showing about a half of the slidable piston member. Figs. 7 and 8 are views in side and edge elevation, respectively, of the shiftable controller which is actuated by the cam of the engine and serves to positively govern the slidable member of the revoluble eccentric-piston. Fig. 9 is an enlarged detail view of a portion of the roller-bearing adapted to be interposed between the shiftable controller and the slidable piston member. Fig. 10 is an enlarged sectional view of one of the cut-off plates which is carried by the revoluble piston member and is provided with a shiftable sole-strip arranged to ride against one face of the slidable piston member. Fig. 11 is an enlarged detail view of a preferred form of the piston-shoe and its loose connection with the slidable piston member.

The same numerals of reference denote like parts in each of the several figures of the drawings.

5 designates the stationary cylinder, which is closed at its ends by means of the heads 6, and this cylinder is provided with a valve-chest 7, which may be constructed as shown by Fig. 1 or as represented by Fig. 3. In the former figure a single rocking valve 8 controls the inlet of the live motive fluid to the working chamber of the cylinder; but in Fig. 3 the valve-chest is equipped with the reversing-valves 9, in addition to the controlling-valve 8, for the purpose of admitting the motive fluid to the cylinder in a manner to drive the piston in either direction, all as will more clearly appear in my prior application, to which reference has been made.

The cylinder-heads 6 are provided in their opposing faces with the cam-grooves 10, which produce the stationary cams 11 of the engine, said cams being arranged in corresponding positions and eccentric to the transverse axis of the cylinder. The cylinder-heads are furthermore provided with openings through which passes the engine-shaft

12, the same being fast or integral with the revoluble member 13 of the eccentric-piston. Said piston member 13 is preferably cast in a single piece of metal in the form shown more clearly by Figs. 1, 3, and 5, and in order to reduce the weight of this piston member I prefer to form it with the longitudinal passages 14, which are so arranged as to leave an intermediate solid web 15. Through this piston member and its web is formed a diametrical slot 16, that extends entirely across the piston, so as to open through opposite faces thereof, and which is of sufficient width to accommodate a freely-slidable piston member 17. As shown by Figs. 1, 2, 4, and 6, this piston member 17 is in the form of a single solid plate, the width of which is less than the slot 16, and the end portions of this single plate are provided with recesses 18, (see Figs. 1, 3, and 6,) said recesses receiving the slidable plates 19, to which are loosely connected the piston-shoes 20, the latter arranged to frictionally ride against the lining 21 of the cylinder.

While the described construction of the plates 19 and the piston-shoes 20 may be employed, I prefer to adopt the construction represented by Fig. 11, in which a slidable piston member 17 is provided at each edge thereof with a circular bearing-recess 22, the same loosely receiving the turning bearing-plate 23, which is circular in cross-section and arranged to loosely fit in the recess 22, so as to be free to turn easily therein. This turning plate 23 is equipped with a recess or slot 24, that loosely receives the shank 25 of the piston-shoe 26. The engine which forms the subject-matter of this application is of the class known as "a high-powered and fast-speed engine," and in the practical service of the piston member 17 and its shoe 26 the latter will be made to ride against the cylinder-lining 21 by centrifugal energy. To keep the piston-shoe in engagement with the cylinder when the engine is not in motion, I employ a light spring 27, which is adapted to impel the piston-shoe outwardly from the member 17, said spring being housed or contained in the slot 24. It is evident that the piston-shoe 26 is arranged for its shank 25 to play freely in the slot of the bearing-plate 23 in order that the piston-shoe may have a radial movement with respect to the rotary eccentric-piston; but by employing a circular bearing-plate 23, which is fitted in a correspondingly-shaped recess of the piston member 17, the piston-shoe practically has a pivotal connection with the piston member 17, because the plate 23 is free to turn in the recess 22, and hence the piston-shoe will easily conform to the curvature of the cylinder. To allow the single-plate piston member 17 assuming the position of a chord or of a radius to the revoluble piston member 13, it is necessary that the plates 19 and the shoes 20 shall have a certain amount of movement with respect to the piston member 17 and also that the shanks 25 of the piston-shoes 26 shall have the same amount of travel in the bearing-plates 23 when the construction shown by Fig. 11 is adopted.

I have provided the eccentric-piston with means for preventing the passage of the motive fluid through the slot 16 in which travels the piston member 17, and according to this part of the invention I provide a series of cut-off plates 28. (See Figs. 1, 5, and 11.) Each cut-off plate is fitted in one of a series of longitudinal slots 29, which is provided in the cylindrical shell of the piston member 13, so as to open into the diametrical slot 16 thereof, and thereby enable the cut-off plates 28 to lie near the ends of the piston member 17, this description being applicable to each of the cut-off plates. A series of pressure-springs 30 are housed in each longitudinal slot 29 of the piston member 13 and seated against one of the cut-off plates 28 so as to normally force the latter toward the slidable piston member 17, and each plate 28 is provided with a curved recess 31, (see Fig. 10,) said recess receiving the curved edge of a sole-strip 32, which has a flat face that is arranged to ride against the slidable piston member 17. The employment of the series of plates 28, disposed in engagement with the lateral faces of the piston member 17 near the ends thereof, effectually excludes the admission of the motive fluid into the slot 16 or other portion of the piston member 13, and the sole-strips 32 of these cut plates easily conform to the motion of the piston member 17, and they absorb some of the friction and wear that takes place between the parts, and they also allow for the convenient renewal of worn parts at a minimum cost.

To facilitate the easy and free movement of the piston member 17 within the piston member 13, I have provided certain roller-bearing devices between the two members of the eccentric-piston, and the rollers of said bearings are shiftably confined in contact with the piston member 17, which is designed to have a limited slidable travel in the piston member 13. Said piston member 13 is furthermore provided with recesses forming the seats 33 on opposite sides of the diametrical slot 16, and these seats are occupied by the backing-plates 34 and by the bearing-plates 35. One bearing-plate and one backing-plate are united by screws, as at 36^a in Fig. 4, and the two connected plates are fitted in one of the seats 33 of the piston member 13, and in like manner the other connected plates 34 and 35 are seated in the other seat 33 on the opposite side of the slot 16, whereby the two bearing-plates 35 are disposed in opposing relation. Each bearing-plate is formed with two series of short longitudinal slots 36 36, in which are loosely confined the bearing-rollers 37, the diameter of said rollers exceeding the width of the slots. The rollers are not journaled in the bearing-plates, but they are free to have a limited movement in the

slots 36, and said rollers are arranged to travel against the backing-plates 34 and to have frictional engagement with the exposed faces of the piston member 17, whereby the latter is properly supported within the piston member 13 to have slidable movement therein. By reference to Fig. 3 it will be noted that the bearing-plates and the roller-bearings are disposed within or between the group of cut-off plates 28.

The width of the slidable piston member 17 is equal to the space between the adjacent ends of the members forming the engine-shaft 12, (see Fig. 2,) and in order to make the exposed end portions of this piston member 17 equal in width to the chamber between the cylinder-heads 6 I provide said member 17 with the wings 38, the latter being applied to the edges of the member 17 and secured firmly thereto by the countersunk screws 39. (See dotted lines in Fig. 6.) The wings of the pair at each end of the piston member 17 are provided in opposing edges with the recesses 40, and said wings are furthermore provided with the sockets 41. (See Fig. 9 and dotted lines in Fig. 6.)

In the cam-groove 10 of each cylinder-head is arranged the shiftable controller 42, the same being arranged to fit snugly to the cam 11 in order to be shifted thereby, and said controller having operative connection with the piston-member 17 for the purpose of positively giving the necessary slidable movement thereto during the rotation of the eccentric-piston as the element which is acted upon by the motive fluid in the high-powered fast-speed engine. Each shiftable eccentric is made in the form approximately of a ring or collar, as shown more clearly by Figs. 7 and 8, and said collar is bisected, so as to form the sections 42^a, which are provided with the lugs 43, that are secured together by the bolts or screws 44, whereby the sectional controller has its members separably united together in order to facilitate the application of the controller to the cam 11. The controller has a circular opening which conforms in diameter to said cam 11, and said controller is adapted to snugly fit upon the cam in a manner to permit the controller to have free rotary movement on the cam. An important feature in the construction of the controller consists in the formation of parallel straight recesses 45 in that face of the controller which is opposed to the wings 38 of the piston member 17, and these recesses form parallel tracks or ways 46, against which are adapted to ride the shoes of certain roller-bearings to be presently more fully described. The major portion of each controller 42 is snugly fitted in a cam-groove 10 of one of the heads; but the formation of the tracks or ways 46 reduces the diameter of one side of the controller, whereby the reduced portion is adapted to project beyond the inner face of the cylinder-head in order to make the tracks or ways 46 lie close to the edges of the wings 38 and to expose them to the roller-bearings. Two of the roller-bearings are provided at each side of the piston member, and one of these roller-bearings is disposed in coöperative relation to one of the wings 38 on the piston member 17 and to one of the tracks or ways 46 of the shiftable controller. Each roller-bearing consists of a bearing-plate 47, having a tang 48, that is slidably fitted in the socket 41 of one wing 38, and in the other edge of this bearing-plate 47 is provided the recesses 49, arranged to tightly receive the rollers 50, the latter being interposed between the plate 47 and the shoes 51. I prefer to equip each roller-bearing with two shoes 51 and with two rollers 50, as shown by Fig. 9. It is to be observed that the shoes 51 of the two roller-bearings are arranged to ride against the tracks or ways 46 of one of the shiftable controllers, that the bearing-plates 47 of said roller-bearing have slidable engagement with the socketed wings of the piston member 17, and that the rollers 50 of each roller-bearing are normally kept in spaced relation to each other, whereby the parts are disposed to adjust or accommodate themselves so as to take up the wear and the shoes 51 are free to move or turn in a manner to avoid cutting into or abrading the active faces of the tracks 46 on the shiftable controllers.

Changes within the scope of the appended claims may be made in the form and proportion of some of the parts, while their essential features are retained and the spirit of the invention is embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

In the engine herein shown the steam is admitted to one side of the cylinder, so that the excessive friction comes on one side of the shaft; but I reserve the right to build a double or triple engine in order to equalize the friction on the shaft. In the double engine using a single shaft the steam is admitted in opposite directions, so as to make the friction come on opposite sides of the shaft; but the best results are secured by making a triple engine in which the large cylinder is arranged between two smaller cylinders and the steam is admitted in one direction to the large cylinder and in an opposite direction to the two smaller cylinders, thus neutralizing the pressure and friction on the shaft and reducing the friction to a very small degree.

I also reserve the right to embody my improvements in a compound engine in which the elements are operable to minimize vibration. This is attained by placing the large or double cylinder between two small engines and arranging the motive-fluid inlets to the two smaller engines for the fluid to pass thereinto in an opposite direction to the inlets for the fluid to the middle large engine.

Having thus described my invention, what I claim as new is—

1. In a rotary engine, the combination of a cylinder provided with stationary cams, a revoluble piston member having a transverse slot, a single-plate piston member slidably fitted in said revoluble member, a shiftable controller between each cam and said slidable piston member, and groups of normally separated bearing-rollers operatively arranged to said controllers and shiftable for a limited distance with said slidable piston member, substantially as described.

2. In a rotary engine, the combination of a cylinder provided with stationary cams, a revoluble piston member, a slidable piston member fitted to said revoluble piston member and having piston-shoes connected with the end portions thereof and arranged to ride against said cylinder, roller bearing-plates between the slidable and revoluble piston members, and bearing-rolls loosely confined in said bearing-plates and engaging with the slidable piston member, substantially as described.

3. In a rotary engine, a slidable piston member provided with edgewise extensions, and roller-bearings shiftably confined in said extensions of said piston member, combined with cylinder-cams, a shiftable controller arranged for the roller-bearings to travel thereon, and a revoluble piston member, substantially as described.

4. In a rotary engine, the combination of a cylinder provided with stationary cams, a revoluble eccentric piston member therein, another piston member slidably connected with the revoluble member and carrying the shiftable and separated bearing-rolls which are disposed in opposing relation, and shiftable controllers fitted to said stationary cams and interposed between said roller-bearings of the slidable piston member, substantially as described.

5. In a rotary engine, the combination with a revoluble piston member and a cylinder, of a slidable piston member having the wings, stationary cams within said cylinder, shiftable controllers fitted to said cams, and adjustable bearing-plates slidably connected with the wings of the slidable piston member and having means arranged to ride upon the shiftable controllers, substantially as described.

6. In a rotary engine, the combination with a revoluble piston member, and stationary cams within a cylinder, shiftable controllers revolubly fitted to said stationary cams and each consisting of members separably clamped together and provided with parallel tracks or ways, a slidable piston member, and roller-bearings fitted to said slidable piston member and arranged to ride upon the tracks or ways of the controllers, substantially as described.

7. In a rotary engine, the combination with a revoluble piston member, and stationary cams within a cylinder, of a slidable piston member provided with edgewise extensions, bearing-plates connected with said extensions, shiftable controllers fitted to said cams and provided with the track-faces, and roller-supported shoes in operative relation to the bearing-plates and arranged to ride upon the track-faces of the controllers, substantially as described.

8. In a rotary engine, a slidable piston member provided at its exposed edge with a bearing-recess of circular cross-section, a bearing-plate snugly fitted in said recess to turn therein and provided with a slot, and a piston-shoe having a shank slidably fitted in said slot of the bearing-plate, substantially as described.

9. In a rotary engine, the combination with a revoluble piston member, and a slidable piston member, of a group of cut-off plates seated in said revoluble member and provided with sole-strips which engage with the faces of the slidable member, substantially as described.

10. In a rotary engine, the combination with a revoluble piston member having a transverse slot, and a slidable piston member fitted therein, of a group of cut-off plates slidably seated in the revoluble piston member and having the curved recesses, means for impelling said cut-off plates, and sole-strips fitted in said recesses of the cut-off plates to turn therein and provided with flat faces arranged to bear against the slidable piston member, substantially as described.

11. In a rotary engine, the combination with a revoluble piston member, and a slidable piston member, of slotted bearing-plates secured in said revoluble member on opposite sides of the slidable member, and shiftable bearing-rolls confined in the bearing-plates and engaging with the slidable piston member, substantially as described.

12. In a rotary engine, the combination with a revoluble piston member having a slot, and a slidable piston member fitted in said slot, of slotted bearing-plates each provided with a backing-plate and fitted in the revoluble member on one side of the slidable member, and bearing-rolls loosely arranged in the slots of the bearing-plates and arranged to travel against the backing-plates and the slidable piston member, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ARTHUR GUINDON.

Witnesses:
H. T. BERNHARD,
JOHN F. DEUFFERWIEL.