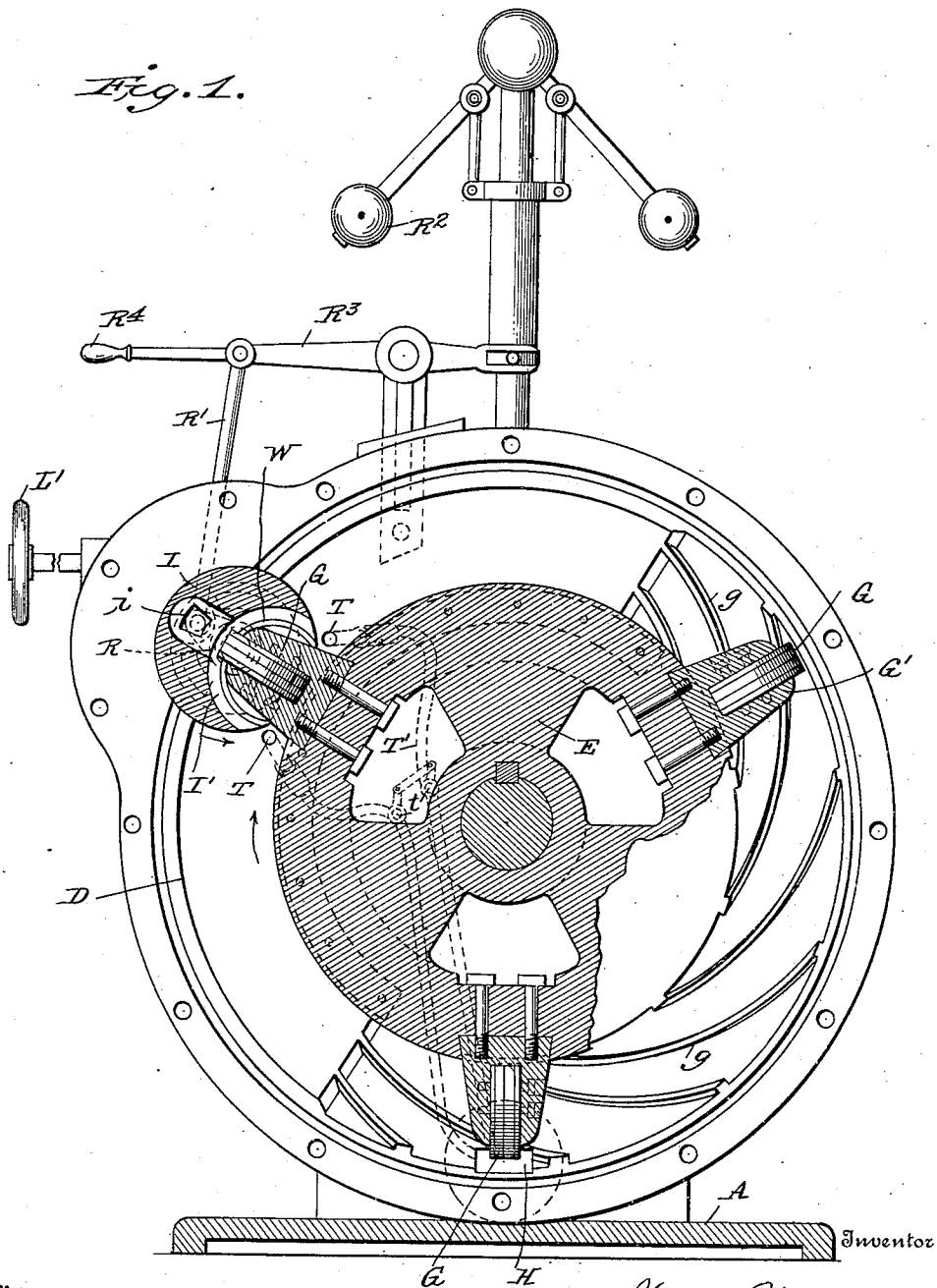


No. 873,597.

PATENTED DEC. 10, 1907.

V. PINGRET.
ROTARY ENGINE.
APPLICATION FILED MAY 4, 1906.

3 SHEETS—SHEET 1.



Witnesses

Edmund L. Jewell

Thomas Durant

Victor Pingret

By

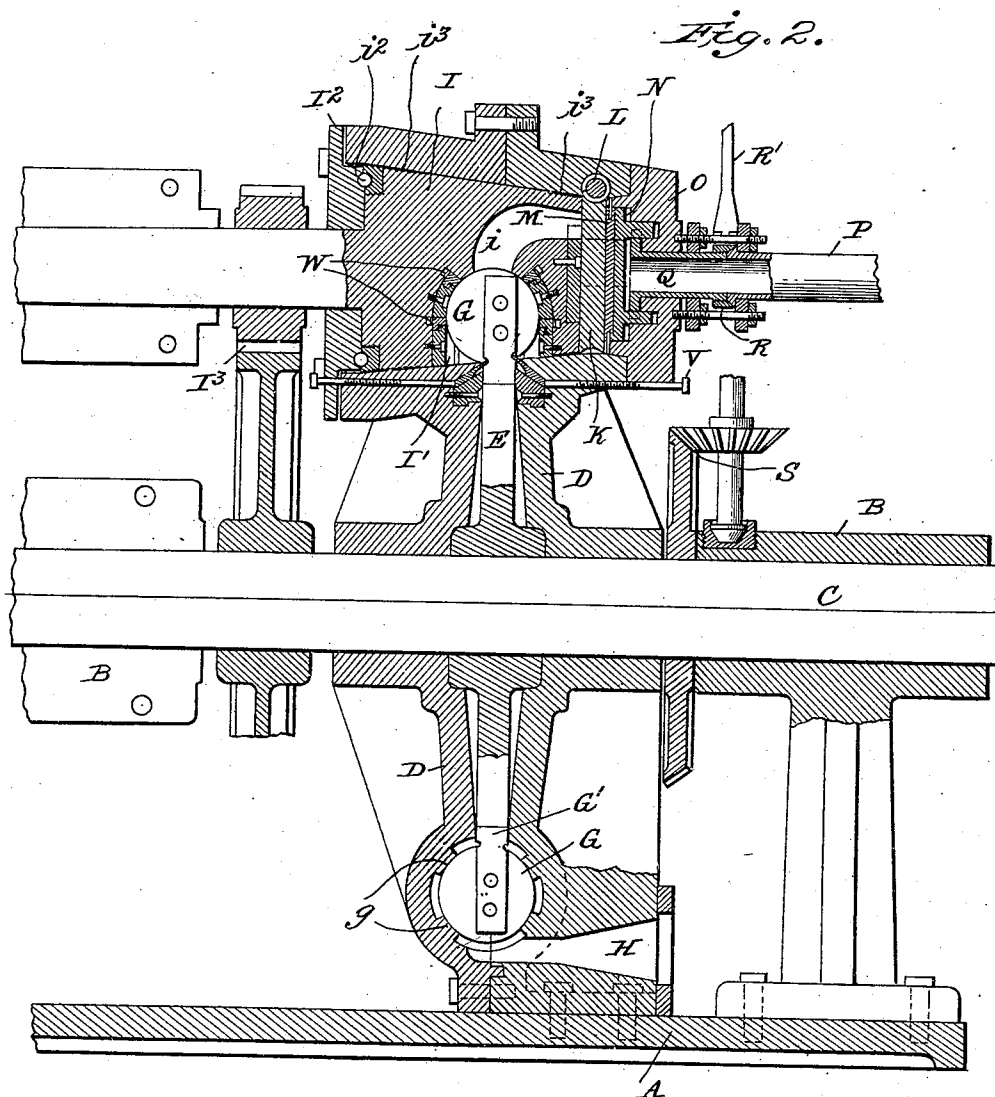
Chas. & Chas.
his Attorneys

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3 SHEETS—SHEET 2.



Witnesses

Edwin L. Jewell

Thomas Durant

Inventor

Victor Pingret,

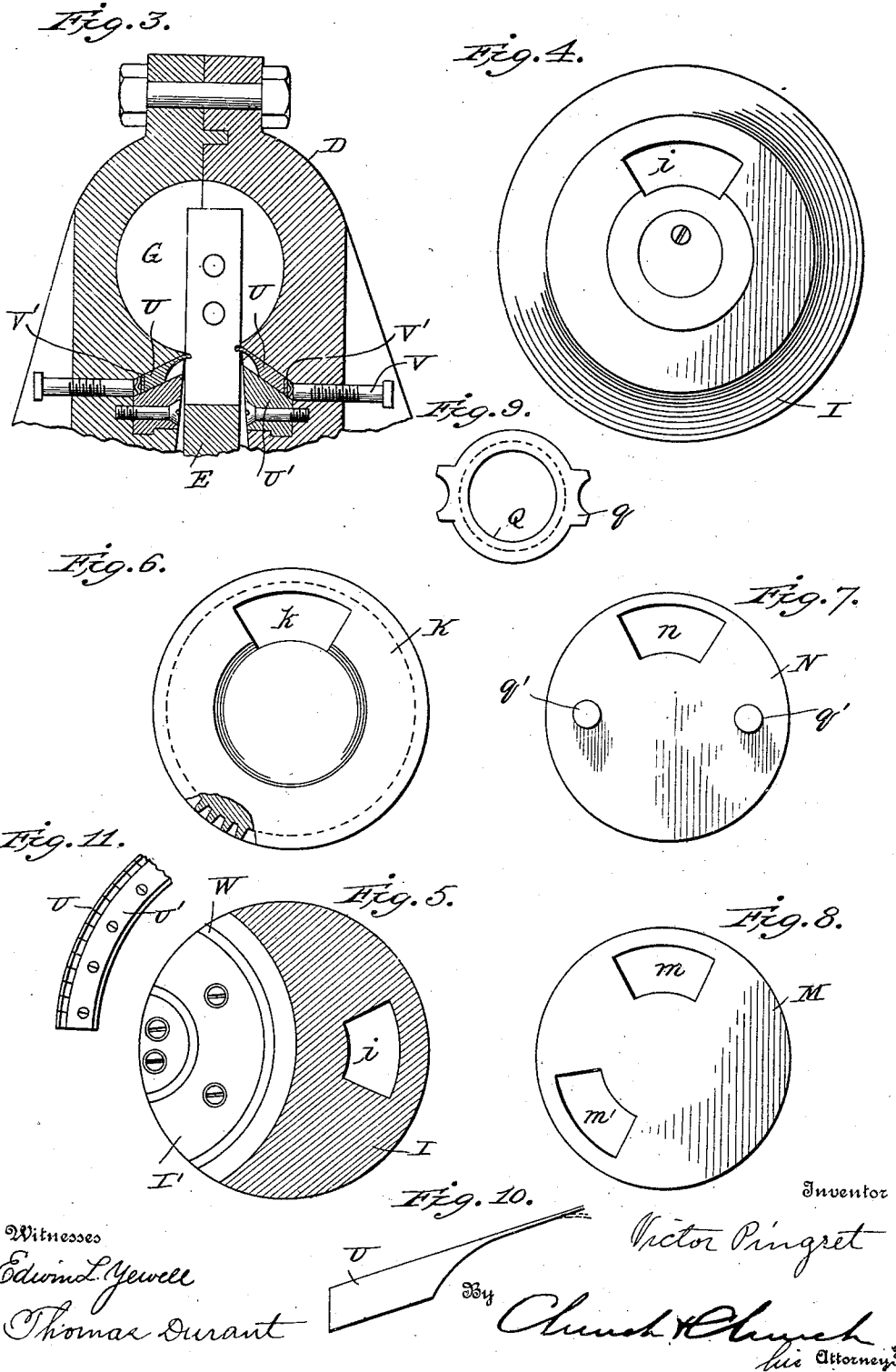
By *Church & Church*
 his Attorneys

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ROTARY ENGINE.
APPLICATION FILED MAY 4, 1906.

3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

VICTOR PINGRET, OF RIO GRANDE DO SUL, BRAZIL, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PINGRET TURBO PISTON ENGINE CO., OF ESCANABA, MICHIGAN, A CORPORATION OF MICHIGAN.

ROTARY ENGINE.

No. 873,597.

Specification of Letters Patent.

Patented Dec. 10, 1907.

Application filed May 4, 1906. Serial No. 315,210.

To all whom it may concern:

Be it known that I, VICTOR PINGRET, a citizen of the Republic of Brazil, and a resident of Rio Grande do Sul, in the State of Rio Grande do Sul, Brazil, now temporarily residing in Washington, District of Columbia, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention relates primarily to rotary engines of the concentric piston type and in its general construction embodies a cylinder or casing, a rotary piston or piston carrier having abutments thereon adapted to travel through a working chamber in the cylinder or casing and past another abutment journaled in the casing or cylinder and provided with a recess through which the abutments on the piston travel, said rotary abutment in the casing also constituting a portion of the valve mechanism whereby the admission of steam or other elastic fluid is controlled.

The invention consists in certain improvements relating more especially to the construction of the admission or control mechanism and in the means employed for maintaining steamtight joints.

The invention further consists in certain novel details of construction and combinations and arrangements of parts all as will be now described and pointed out particularly in the appended claims.

Referring to the accompanying drawings—Figure 1 is a vertical section through a rotary engine embodying the present improvements, parts being shown in elevation and in dotted lines in order that the invention may be more clearly understood. Fig. 2 is a sectional view longitudinal of the drive shaft and partly in a plane intersecting the abutment in the cylinder and partly in a vertical plane to show the driving mechanism for the governor together with the exhaust port. Fig. 3 is a detail sectional view through one of the working chambers of the cylinder with a piston or movable abutment in elevation. Fig. 4 is an elevation looking at the smaller end of the abutment journaled in the casing or cylinder. Fig. 5 is a section through the abutment in a plane intersecting the recess

through which the piston travels. Fig. 6 is an elevation of the manually controlled reversing valve. Fig. 7 is a similar elevation of the governor valve. Fig. 8 is a similar elevation of the valve plate which the reversing and governor valves cooperate. Fig. 9 is an elevation of the operating shaft of the governor valve, which shaft also serves as a part of the inlet pipe. Figs. 10 and 11 are details of the packing for rendering the working chambers steam tight.

Similar letters of reference in the several figures indicate like parts.

As illustrated, the engine is mounted on a base A having bearings B for a drive shaft C, said shaft being usually arranged horizontally and extending through the cylinder D of the engine. Said cylinder D is usually formed in vertical halves to facilitate the construction and is adapted to contain within it a disk like piston or piston carrier E which latter is rigidly affixed to the shaft C in any approved manner. Around its periphery the piston or piston carrier E is provided with abutments which in the present instance are preferably in the form of cylindrical abutments or pistons proper as indicated at G, each being held in a bracket G¹ suitably attached to the piston or carrier E.

The pistons or movable abutments G are adapted to traverse a circular chamber in the casing or cylinder, said chamber being cylindrical in cross section as is best shown in Fig. 3, a portion of the length of said chamber being adapted to form the working chamber, while the remaining portion of said chamber is provided with spiral ribs g which serve to hold packing rings in the pistons or abutments G compressed but at the same time permit the steam or elastic fluid to pass freely around the pistons or abutments. The latter portion of the circular chamber may be properly denominated the exhaust chamber, inasmuch as it is open to the exhaust port H, and when the pistons or abutments move into the same the elastic fluid is free to pass to and out of the exhaust port.

The working part of the chamber preferably extends on both sides of the abutment I, in order that a working chamber may be provided for operating the engine in either direction, it being understood, of course, and as will presently appear, that steam or elastic fluid is admitted between the abutment I and the pistons or abutments G

after the latter have passed the abutment I with the engine running in either direction, and that the pressure will be continued between the abutments until the pistons or abutments G move out of the working chamber and into the exhaust chamber. In engines of this character wherein the pistons or movable abutments travel at a practically constant speed with no pauses such as occur in a reciprocating engine, it is of prime importance that the steam or elastic fluid should be admitted with great rapidity and that the admission port should be opened instantly when the chamber between the two ports has been closed against the escape of steam or pressure and that the capacity should exist of regulating the admission from a point close to the working chamber in order that the losses due to the gradual accumulation of pressure in the chamber as well as those due to the existence of port connections of large capacity shall be avoided.

In the present engine, the desired ends are accomplished by providing the rotary abutment I, to which reference has before been made, with a recess or chamber I' for the passage of the movable abutments or pistons, said rotary abutment being also provided with a steam inlet passage *i* opening into said chamber I'. The inlet passage *i* extends out to the flat face of the abutment in position to register with a port *k* in a disk or valve K, which latter is journaled in the end of the valve or abutment chamber and is adapted to be moved or adjusted manually as by a worm L and hand wheel L' whereby the port *k* may be turned so as to effect the admission at the proper instant or so as to effect the proper admission for running the engine in either direction.

The rotary abutment I is preferably in the form of a tapering plug which may be accurately ground to a seat in the valve or abutment chamber of the cylinder or casing and it is held to its place by an adjustable cap I² between which and the abutment, ball bearings *i*² may be interposed to reduce frictional resistance. In addition, the end portions of the abutment may be provided with screw threads or spiral oil feed channels as indicated at *i*³ in Fig. 2 for feeding lubricating material from the ends of the abutment towards the center. The abutment may be rotated by gearing from the main shaft, as at I³ and its rate of rotation is such that its periphery will move at the same speed as the edge of the piston carrier E with which it contacts to make a steam tight joint. It will be understood that the edge of the said piston carrier is beveled or inclined to correspond to the bevel or inclination of the abutment, thus any wear between the parts may be taken up by advancing the abutment in the direction of its smaller end.

Outside of the valve K is a non-rotary plate M, Figs. 2 and 8, which plate M is provided with two ports *m* and *m'* one of which is in position to register with the port *k* in the valve K for operating the engine in one direction, while the other is in position to register with said port *k* for operating the engine in the opposite direction. Bearing against the outer face of the plate M is a governor valve N, Figs. 2 and 7, having a port *n* therein adapted to register with the ports *m* and *m'* in the plate M, the position of the governor valve N being regulated by automatic governor so as to admit more or less steam in accordance with the speed of the engine. In the preferred construction, the said governor valve N works in a cylindrical chamber in the head O of the valve casing and is held up to its seat by steam pressure upon its outer face for which purpose the admission pipe P preferably opens through the head O to the outer side of the valve N and the means for controlling the said valve preferably consists of a short section Q of said pipe, which at its inner end, is flanged and provided with lugs or arms *q* adapted to embrace pins *q'* on the valve *n* while its outer end is connected with the pipe P by a steam tight joint and is provided with a crank arm R, Fig. 1, with which a connecting rod R' is jointed, said connecting rod R' being in turn connected with an ordinary centrifugal governor R² through an operating lever R³. The latter may, if desired, be provided with a handle R⁴ by which the governor controlled valve may be reversed when the engine is reversed. The governor may be driven from the main shaft C through bevel gears S, best shown in Fig. 2, and in operation it will move the valve N to vary the port opening in the well understood manner.

To relieve any possible back pressure which might occur as each piston or abutment G is approaching the abutment I, supplemental exhaust ports T are provided in proximity to the abutment I, such exhaust ports T being connected by pipes T' (dotted lines Fig. 1), with the main exhaust H. Connected valves *t* are so arranged in the pipes T' that when one is opened, the other is closed, and consequently when the engine is running in one direction the valves should be so moved as to permit the exhausting of pressure behind the abutment I while the port T in front of the abutment is closed against the escape of pressure from the working chamber.

Located in the cylinder on each side of the piston carrier are packing strips U, such strips being preferably formed with flexible ends adapted to lie close to the beveled edges of the piston carrier E as best shown in Figs. 3, 10 and 11. The strips are normally, however, just out of contact with the piston carrier and adapted to be pressed into con-

tact therewith by the pressure in the working chamber. A number of such strips may be provided as shown in Fig. 11, or their flexible ends may be subdivided so as to bend
 5 down freely to form steam tight joints at the points mentioned and the brackets G' are recessed or grooved immediately below the pistons or abutments G to form passage ways for the ends of the strips as shown clearly in
 10 Figs. 1 and 3. Said strips may be confined in grooves one side of which may be formed by the movable segments U', Fig. 3, and they may be adjusted by adjusting screws V passing through to the outside of the casing adapted to bear against segments or rings
 15 V', said segments V', being especially useful where a series of packing strips U are employed and it is not desired to provide an adjusting screw for each strip. In their passage through the abutment I, the pistons or
 20 movable abutments G have their packing rings confined by ribs W which latter are preferably formed on curves to conform to the relative movements of the two abutments in
 25 passing each other, thus the packing rings on the abutments G will be held compressed and in proper shape for entering the working chambers as they pass out of the abutments I.

In operation, steam or pressure entering
 30 through the pipe P will seat the governor valve N firmly against the plate M and passing through the ports *n m* will enter the port *k* in the valve K. At the proper instant, or when one of the abutments G has moved
 35 through the abutment I and the latter has turned sufficiently to close the rear end of the working chamber, the port *i* in the abutment I will be brought into registry with the port *k* and steam will be admitted between
 40 the abutments G and I and will effect the forward movement of the former together with the piston carrier and shaft. Depending upon the position of the valve K, the steam will be cut off at the proper instant and when
 45 the abutment G reaches the exhaust chamber, the exhaust may take place through said chamber and through the exhaust port H as will be readily understood. To reverse the engine, it is only necessary to move the valve
 50 K into position for its port to register with the other one of the ports *m* or *m'* as the case may be, when steam will be admitted to turn the shaft in the opposite direction, the governor controlled valve N being also reversed
 55 by means of the handle R⁴ as will be readily understood.

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

60 1. In a rotary engine, the combination with the cylinder or casing, the rotary piston carrier and pistons thereon and the rotary abutment journaled in the casing, having a recess for the passage of the pistons
 65 therethrough, and having an inlet port

therein, of a manually controlled valve having a port with which the inlet port in the abutment is adapted to register and a governor controlled valve for regulating the supply of pressure to the manually controlled
 70 valve; substantially as described.

2. In a rotary engine, the combination with the cylinder or casing, the rotary piston carrier and pistons thereon and the rotary abutment journaled in the casing, having a
 75 recess for the passage of the pistons therethrough and having an inlet port therein opening into said recess, of a valve having a port with which the inlet port in the abutment is adapted to register, a fixed plate
 80 having a port therein with which the port in the valve is adapted to register and a second valve having a port adapted to register with the port in the plate; substantially as described.
 85

3. In a rotary engine, the combination with the cylinder or casing, the rotary piston carrier and pistons thereon and the rotary abutment of frusto-conical form journaled in the casing and having the recess for the
 90 passage of the pistons therethrough and the inlet passage extending from said recess to the end face of the abutment, of the disk valve against which said end face of the abutment seats, said valve having a port therein with
 95 which the inlet in the abutment is adapted to register, means for moving said valve independently of the abutment and a fixed plate having a plurality of ports therein with which the port in the valve is adapted to register; substantially as described.
 100

4. In a rotary engine, the combination with the cylinder and casing, the rotary piston carrier and pistons thereon and the rotary abutment journaled in the casing and
 105 having a recess for the passage of the pistons therethrough and the inlet passage extending from said recess to one end face of the abutment of a disk valve interposed between the end of the abutment and end of its chamber and having a port therein with which the inlet passage in the abutment is adapted to register and means for adjusting the abutment longitudinally towards the valve; substantially as described.
 110
 115

5. In a rotary engine, the combination with the cylinder and casing, the rotary piston carrier and pistons thereon and the rotary frusto conical abutment journaled in the casing and having a recess for the
 120 passage of the pistons therethrough and the inlet passage extending from the recess to the smaller end face of the abutment, of a disk valve interposed between the end of the abutment and end of its chamber and having a port
 125 therein with which the inlet passage in the abutment is adapted to register and means for adjusting the abutment longitudinally toward the valve; substantially as described.
 130

6. In a rotary engine the combination with the casing, rotary piston carrier and pistons thereon and the rotary abutment journaled in the casing and having the recess
5 for the passage of the pistons therethrough and an inlet passage leading from the end of the abutment, of an inlet pipe, a disk valve arranged axially of the abutment and connected with the end of the inlet pipe to be
10 turned thereby; substantially as described.

7. In a rotary engine, the combination with the casing, rotary piston carrier and pistons thereon and the rotary abutment journaled in the casing and having the recess for the passage of the pistons there-
15 through and an inlet passage leading from the recess to the end of the abutment, of a disk valve at the end of the abutment, a fixed plate against which the valve seats, a second
20 disk valve, an inlet pipe having a movable end section and connections between said movable end section and second valve whereby the said valve may be turned; substan-
tially as described.

25 8. In a rotary engine, the combination with the rotary piston carrier and substantially cylindrical pistons thereon, of the casing having the piston chamber of cylindrical form in cross section and an exhaust cham-
30 ber with internal spiral ribs, a rotary abutment bridging the piston chamber and having a recess therein for the passage of the pistons through the abutment, said abutment having an inlet passage therein and a valve
35 separate from the abutment for controlling the admission of pressure through the abutment; substantially as described.

9. In a rotary engine, the combination with the cylinder or casing and the concentric piston carrier having pistons thereon, of
40 packing strips held in the casing and having flexible edges overlapping the edges of the piston carrier and forming a tight joint with the pistons; substantially as described.

10. In a rotary engine, the combination 45 with the cylinder or casing and the concentric piston carrier having pistons thereon and grooves adjacent said pistons, of packing strips held in the casing and having flexible edges overlapping the edges of the piston
50 carrier and adapted to pass through said grooves; substantially as described.

11. In a rotary engine, the combination with the cylinder or casing and the concentric piston carrier having pistons thereon, of
55 diagonally arranged packing strips having flexible edges projecting over the edges of the piston carrier and adapted to be moved into contact therewith by pressure in the cylinder; substantially as described. 60

12. In a rotary engine, the combination with the cylinder or casing and the concentric piston carrier having pistons thereon, of a series of packing strips arranged side by side concentrically of the carrier and having
65 flexible ends adapted to overlap the edges of the carrier and to be held in contact therewith by pressure in the cylinder; substantially as described.

VICTOR PINGRET.

Witnesses:

ALEXANDER S. STEUART,
THOMAS DURANT.