No. 687,170. Patented Nov. 19, 1901.

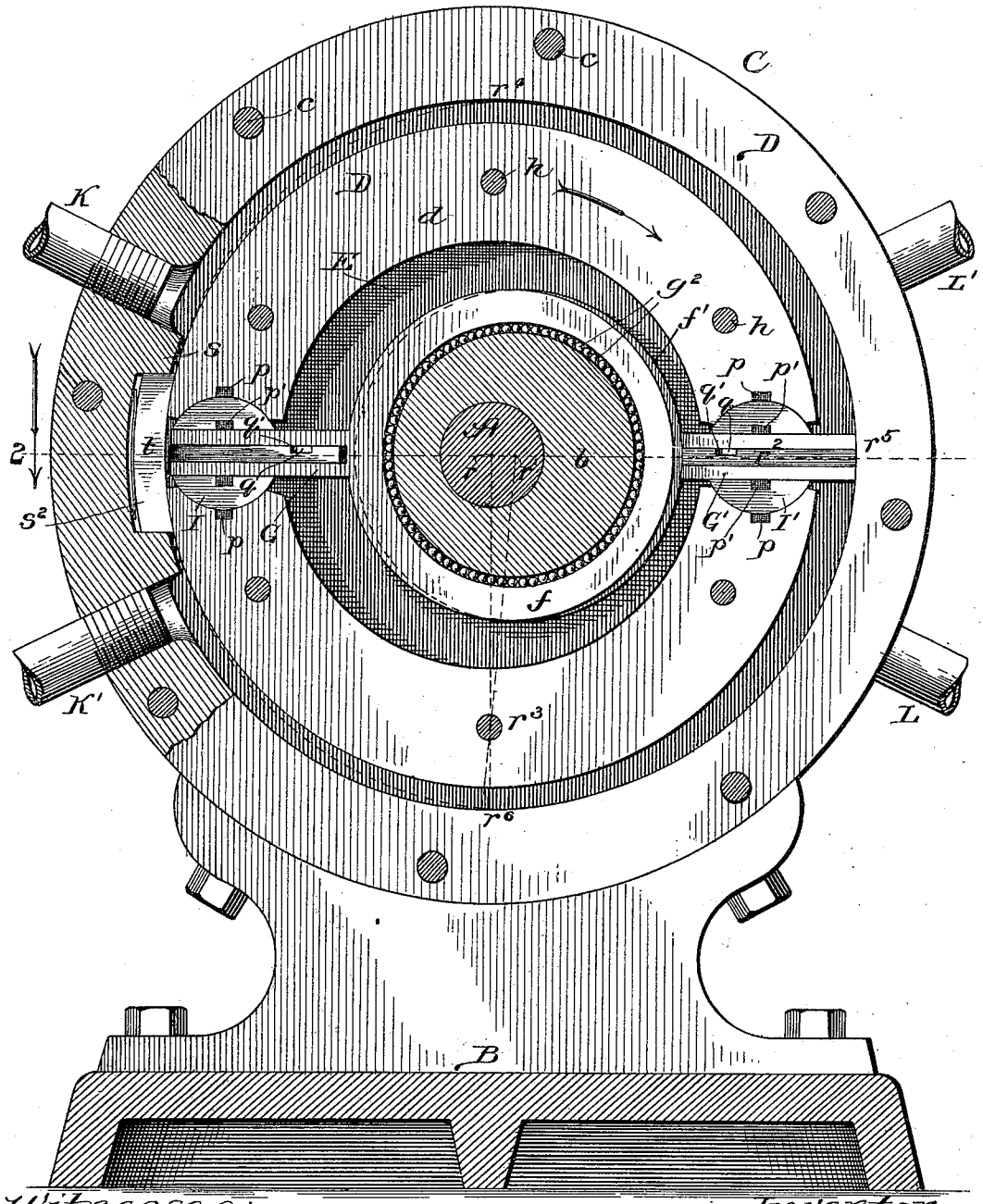
H. A. STILSON.

ROTARY ENGINE.

(Application filed Nov. 8, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses:
Chas. E. Gaylord.
John Enders, Jr.

Inventor
Herbert A. Stilson,
By Dyrenforth & Dyrenforth & Lee,
Att'ys.

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

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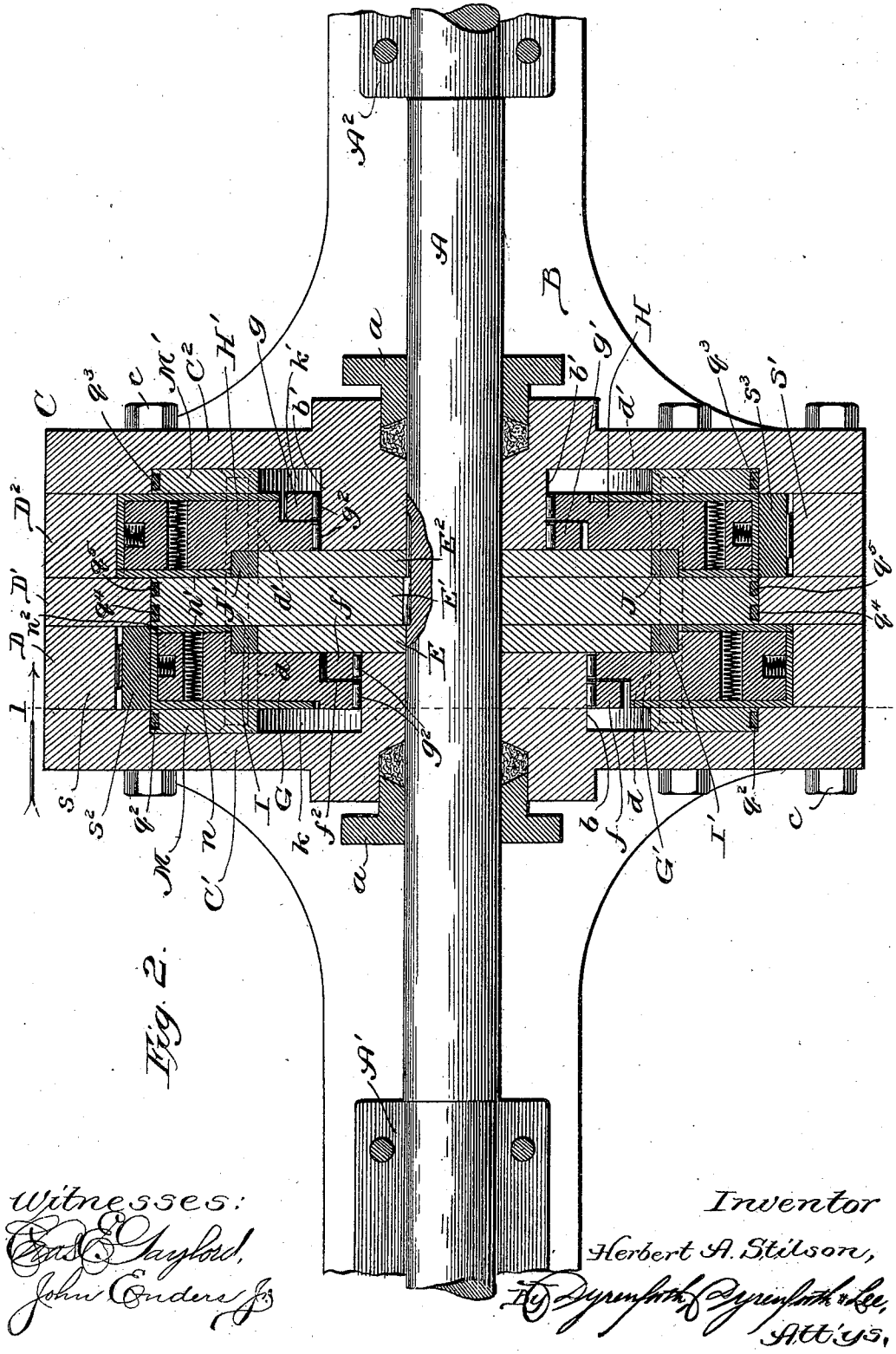


Fig. 2.

Witnesses:
Chas. E. Gaylord,
John Enders Jr.

Inventor
Herbert A. Stilson,
By Dyrenforth & Dyrenforth & Lee,
Att'ys.

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

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Fig. 3.

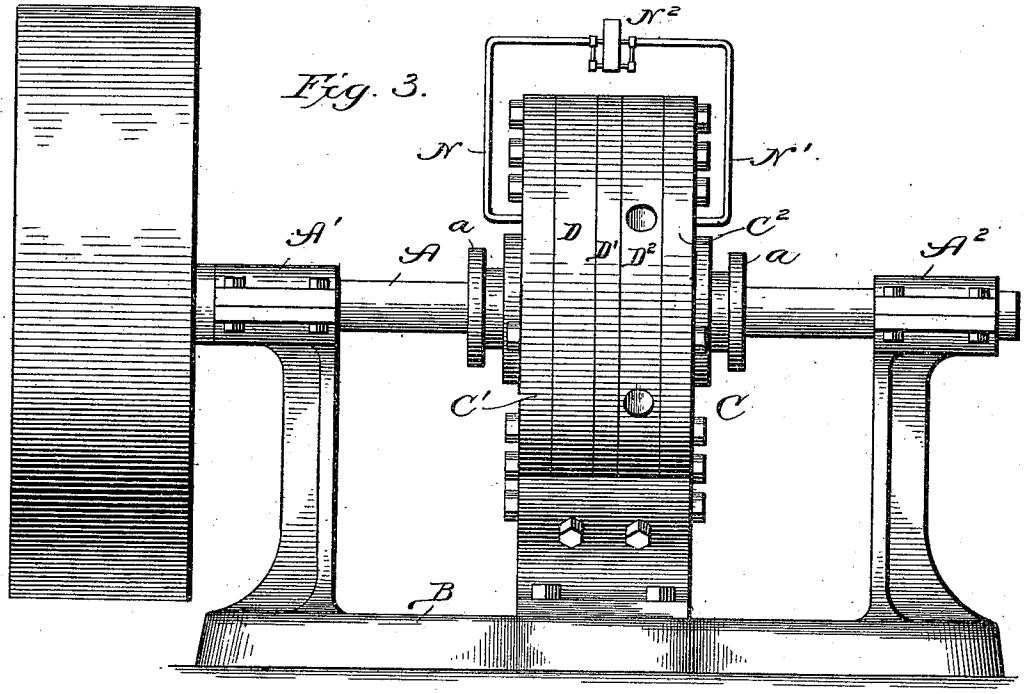


Fig. 4.

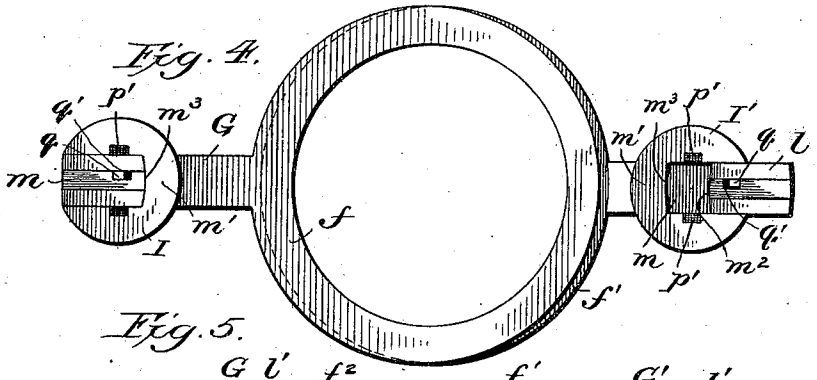


Fig. 5.

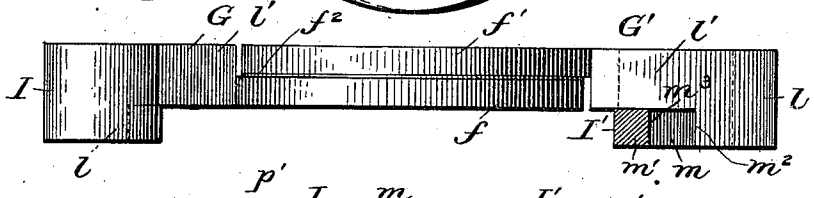


Fig. 6.

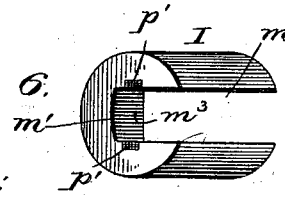
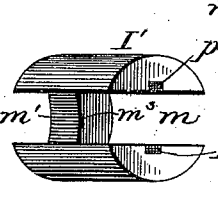


Fig. 7.



Witnesses:
Chas. E. Gaylord,
John Enders, Jr.

Inventor
Herbert A. Stilson,
By Pyne, Smith & Pyne, Smith & Lee,
Att'ys.

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

UNITED STATES PATENT OFFICE.

HERBERT A. STILSON, OF TAMPICO, ILLINOIS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 687,170, dated November 19, 1901.

Application filed November 8, 1900. Serial No. 35,798. (No model.)

To all whom it may concern:

Be it known that I, HERBERT A. STILSON, a citizen of the United States, residing at Tampico, in the county of Whiteside and State of Illinois, have invented new and useful Improvements in Rotary Engines and Pumps, of which the following is a specification.

My invention relates particularly to rotary engines and pumps of the type employing a central rotary core and a fixed external casing or cylinder.

My object is to provide a machine of this type of generally-improved construction, particular attention being paid to simplicity of construction, balancing of parts, and to securing a minimum of friction and a minimum of jar or "pounding" of parts.

In the preferred construction, which will be minutely described to facilitate an understanding of the invention, I employ a cylinder having an eccentric bore, a rotating core within said bore and eccentric thereto and supported on a shaft journaled concentric with the core, a fixed eccentric through which the shaft extends and which is preferably formed integrally with a cylinder end, and a vane or piston member operated from said eccentric and having an antifriction-bearing in said core and projecting during a portion of the revolution into the annular or partially-annular steam-chamber afforded between said core and the inner wall of said cylinder.

In the accompanying drawings, Figure 1 represents a transverse vertical section taken as indicated at line 1 of Fig. 2; Fig. 2, a longitudinal horizontal section taken as indicated at line 2 of Fig. 1; Fig. 3, a view in side elevation; Fig. 4, a view of two eccentric straps or rings employed and vanes or piston members connected therewith; Fig. 5, a view at right angles to the view of Fig. 4; and Figs. 6 and 7 perspective views of two antifriction-bearings employed for receiving the vanes or piston members.

It may be stated at the outset that the accompanying drawings illustrate the construction which it is preferred to employ for use in a steam-engine having two steam chambers or cylinders, the corresponding parts of which are separated by an angle of one hundred and eighty degrees.

A represents a rotating shaft supported in journal-boxes A' A^2; B, a base whereon are supported standards for said journal-boxes; C, a fixed casing or double cylinder supported from said base; C' C^2, ends for said casing having central openings for the shaft A and provided thereat with packing-boxes *a* and provided on their interior surfaces with integrally-formed piston-member bearings or pivots *b b'*, eccentric to the shaft A and having their prominences separated by an angle of one hundred and eighty degrees; D, D', and D^2, fixed rings forming the circumferential wall of the cylinder C and rigidly secured between the cylinder ends C' C^2 by bolts *c*; E, E', and E^2, disks rigidly secured to the shaft A and constituting the main portion of the rotating core, the disks E and E^2 being provided on their faces toward the ends of the cylinder with annular flanges *d d'*; G G', piston members or vanes for one of the steam-chambers, said members being provided with eccentric-rings *f f'*, journaled on the eccentric *b*; H H', piston members for the other steam-chamber, said members being provided with eccentric-rings *g g'*, journaled on the eccentric *b'*, roller-bearings g^2 being provided for each of the four eccentric-rings mentioned; I I', antifriction-bearings journaled in the section E of the rotating core and receiving piston members G G', respectively; J J', antifriction-bearings journaled in the section E^2 of the rotating core and receiving the piston members H H', respectively; K K', pipes or ports leading to the chamber formed between the flange *d* of the core-section E and the surrounding wall of the cylinder; L L', pipes or ports leading to the chamber formed between the flange *d'* of the core-section E^2 and the surrounding wall of the cylinder; M M', annular core sections or rings secured to the flanges *d d'* of the core-sections E E^2 by bolts *h*, and N N' oil ducts or tubes communicating with annular spaces *k k'* within the rings M M' and supplied from a common oil-fountain N^2.

The construction of the piston members and the antifriction-bearings therefor, with which the rotating core is supplied, is shown in Figs. 4 to 7, inclusive. Each piston member has a fluid-engaging portion *l* of a width equal to the width of the cylinder-sections D D^2, which is the same as that of the periph-

eral portion of the core-sections E E^2. Extending inwardly from the part l is a reduced part l', the width of which is equal to about twice the width of each eccentric-ring. Fig. 5 shows the manner in which the eccentric-rings lie side by side when mounted on their pivot or bearing, being separated, however, by a washer f^2. Each core-carried piston-member bearing comprises a short cylindrical part provided with a longitudinal slot m, which receives the outer end of a piston member and virtually divides the cylindrical bearing into two parts, which are connected by a web m'. One of the bearings is shown in section in Fig. 5 to illustrate clearly the manner in which the slot m receives the outer end of the piston member. From this view it will be observed that the part l of the piston member has a shoulder m^2, which approaches closely to a shoulder m^3 of the part m' in one position of the piston member. In Fig. 1 the outer end of the piston member G is shown sheathed in the bearing I and the outer end of the piston member G' is shown projecting beyond the bearing I' and into the steam-chamber. Each piston member is provided, Fig. 2, with a packing-piece n, which serves to make a tight joint at one edge of the outer portion of the piston member and also at the outer end of the piston member. Each piston member is also provided with an edge packing-piece n', which preferably has a loose tenon-and-mortise joint with the adjacent end of the piece n, as illustrated in dotted lines at n^2 in Fig. 2. Springs are provided for pressing the packing-pieces outwardly.

As shown in Fig. 1, the pivotal bearings for the outer ends of the piston members are journaled in sockets provided therefor near the peripheries of the core-sections E and E^2, and the adjacent portions of the core-sections are suitably slotted to receive said piston members and permit a certain relative movement between each piston member and the core-section, as will be hereinafter explained. It will be observed from Fig. 2 that the outer ends of the piston members are of the same width as the pressure-chambers, and that consequently the peripheral or flanged portions of the core-sections E E^2 are cut entirely through. The central relatively thin portions of said core-sections, however, are not recessed, and the web portions of the piston-member bearings correspond to said thin portions. The sockets for the bearings mentioned are provided with packings p for the outer surfaces of said bearings, and packings p' are provided at the walls of the slot m for making a tight joint between said walls and the piston members received by the walls. In Fig. 4 I have shown the piston members provided with studs q, which project into slots q' in the packing-pieces $n\,n'$, thereby limiting the radial movement of said pieces during that portion of the revolution when the packing does not contact with the inner wall of the cylinder. Circumferential packings $q^2\,q^3\,q^4\,q^5$ are provided to prevent lateral escape of steam from the steam-chambers.

Assuming steam to be admitted through the pipes K and L, the engine will rotate in the direction indicated by the arrow in Fig. 1. From a view of this figure it will be understood that the shaft A and the core carried thereby rotate about the center r, whereas the bearings of the piston members G and G' have their center at r'. The piston members G G' are shown located directly opposite to each other in the position they occupy when the core is in the position shown in Fig. 1. As the core is rotated under the action of fluid-pressure upon the piston members, it is obvious that the piston members must change their position in some degree with relation to the core. Thus the center line of the piston member G' in the position of Fig. 1 is as indicated by the dotted line $r'\,r^2$, which corresponds with a radius $r\,r^2$ of the core. Assuming the core to be rotated through an angle of ninety degrees, it will be obvious that the center line of the piston member will be indicated by the line $r'\,r^3$, whereas a radius of the core is indicated by a line $r\,r^3$. Reflection will show that only when the center lines of the piston members correspond with the line joining the center of the core with the center of the piston member bearings are the piston members exactly one hundred and eighty degrees from each other.

In the preferred construction the outer wall of the steam-chamber has a true circular formation for a portion of its extent only. Thus in Fig. 1 the portion of the wall represented by $r^4\,r^5\,r^6$ is of true circular form, and the portion of the wall to the left thereof is recessed or cut below a true circle. The wall-section $r^4\,r^5\,r^6$ is concentric with the piston-member bearing b. It follows that the piston members will contact with said wall throughout its true circular portion and be held out of contact therewith through the remainder of the revolution. The purpose of recessing the wall at the admission side of the chamber is twofold—first, to prevent throttling of the steam or fluid, and, second, to permit the passage of the fluid past the piston member which happens to be adjacent to the recess. The abutments of the two steam-chambers occur at points $s\,s'$, which, as clearly indicated in Fig. 2, are separated by an angle of one hundred and eighty degrees. Spring-held packing-blocks $s^2\,s^3$ are provided at these abutments. These blocks have concave inner surfaces and bear continuously against the adjacent surfaces of the core-sections E E^2. The dotted line $t\,r^4$ indicates the path of the end of the piston member G during a rotation of ninety degrees from the position shown in Fig. 1, and it will be observed from this view how gradual is the approach of the piston member into contact with the wall of the steam-chamber. It will be understood that while the piston member G is passing through the

arc $t\,r^4$ a portion of the steam or other motive fluid admitted through the pipe K escapes past said piston member and acts upon the piston member G'. The pressure upon the piston member G gradually increases until the point r^4 is nearly reached, by which time the piston member G' has reached the point r^3 and is about ready to release the pressure behind it. From the point r^4 to the point r^5 the increase of pressure upon the piston member G is gradual, owing to the gradual increase of the exposed surface of said piston member. While pressure is being admitted at the pipe K and the pipe K' is serving as an exhaust-pipe, pressure is being admitted at the pipe L for the other pressure-chamber, and the pipe L' is serving as an exhaust-pipe for said chamber. As the corresponding parts of the duplicate steam-chambers and core-sections are located at an angle of one hundred and eighty degrees to each other, it follows that the pressures as well as the weights are evenly balanced.

It will be understood that any desired motive-fluid may be employed for running the engine, and also experience has shown that by applying power to the shaft the construction described will serve readily as a rotary pump, producing practically a continuous flow. The engine is well balanced, compact, free from pounding, and capable of attaining and maintaining its most economical speed. It will be observed that the oil supplied to the machine cannot escape by reason of the packings *a*, and the working parts may be caused to run practically in a bath of oil.

While I have shown no reversing-valves and no automatic cut-off, it is obvious that such devices may be readily applied to the engine, and where reversing-valves are employed it is obvious that the set of pipes K L may act as eduction-pipes, while the pipes K' L' act as induction-pipes.

Many minor changes in details of construction within the spirit of my invention may be made by those skilled in the art, and hence no limitation is intended by the foregoing description except as shall appear from the appended claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a machine of the character described, the combination of a cylinder having two core-openings eccentric to each other, a core eccentric to both said openings, and piston members in said core-openings and having bearings in said core and located at an angle to each other, substantially as described.

2. The combination of a cylinder-section having a true circular inner wall-section, an abutment opposite the same and ports flanking said abutment, a shaft eccentric to said wall section, a core-section concentric with said shaft, a fixed bearing eccentric to said shaft, a piston member journaled thereon, a core-carried bearing for said piston member, a second cylinder-section having a true circular inner wall-section, an opposite abutment, and ports flanking said abutment, said parts being at an angle of substantially one hundred and eighty degrees to the corresponding parts of the first cylinder-section, a second fixed bearing eccentric to said shaft and with its prominence at substantially one hundred and eighty degrees from the corresponding eccentric, a second eccentrically-mounted piston member, and a core-carried bearing therefor at an angle of one hundred and eighty degrees to the corresponding bearing of the other core-section, substantially as and for the purpose set forth.

3. The combination of a cylinder having a true inner circular wall-section, a rotating core eccentric to said wall-section, a fixed bearing concentric with said wall-section, a piston member G journaled on said bearing, a pivotal bearing I receiving said piston member and journaled in said core, the same having a longitudinal slot *m* and connecting-web *m'*, an abutment opposite said wall-section, and ports flanking said abutment, substantially as and for the purpose set forth.

4. The combination of a cylinder, an eccentrically-located core-section E provided with a peripheral flange *d*, a bearing eccentric to said shaft, a piston member journaled on said bearing and passing through a slot in said flange, means for confining fluid between the periphery of said core-section and the internal wall of said cylinder, and a slotted pivotal bearing receiving said piston member and journaled in said core-section near the periphery thereof, said pivotal bearing having longitudinal sections connected by a web, substantially as and for the purpose set forth.

5. The combination of a cylinder, core-sections E, E^2 placed eccentrically with relation to the openings therefor in said cylinder and having outturned peripheral flanges, means for confining fluid between the peripheries of said core-sections and the adjacent walls of said cylinder, a shaft concentric with and rigidly connecting both said core-sections, fixed bearings eccentric to said shaft, piston members journaled on said bearings and extending through slots in said flanges, and pivotal bearings for said piston members journaled in said core-sections, substantially as and for the purpose set forth.

6. In a machine of the character described, the combination of core-sections E, E', M, a piston member moving in a slot in the section E, a bearing in said section at said slot for said piston member, cylinder-sections D, D', a cylinder end C' rigidly connected with the sections D, D', an eccentric *b* on said end C' and pivotally connected with said piston member, and a shaft projecting through said cylinder end and rigidly connected with said core-sections, substantially as and for the purpose set forth.

7. The combination of cylinder-sections D, D', D^2, the sections D and D^2 having bores eccentric to each other, core-sections E, E', E^2,

the sections E, E^2 having outturned peripheral flanges and slots to receive piston members, cylinder ends rigidly secured to said cylinder-sections and provided with shaft-openings concentric with said core-sections, fixed bearings on the inner surfaces of said cylinder ends and eccentric to said shaft-openings, piston members journaled on said bearings and extending through said slots, and a suitably-journaled shaft A rigid with said core-sections, substantially as and for the purpose set forth.

8. In a machine of the character described having a cylinder and a rotating core provided with a slot receiving a piston member, a piston member G, a pivot connected with the inner end thereof, a bearing I journaled in said core near the periphery thereof and having a slot coinciding with the slots in said core, packing-strips n, n' for the edges of said piston member, and packing-strips between said piston member and the walls of the slot in the bearing I, substantially as and for the purpose set forth.

HERBERT A. STILSON.

In presence of—
D. W. LEE,
A. D. BACCI.