No. 637,429. Patented Nov. 21, 1899.

J. THEEMLING.

REVERSIBLE ROTARY MOTOR.

(Application filed Mar. 25, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

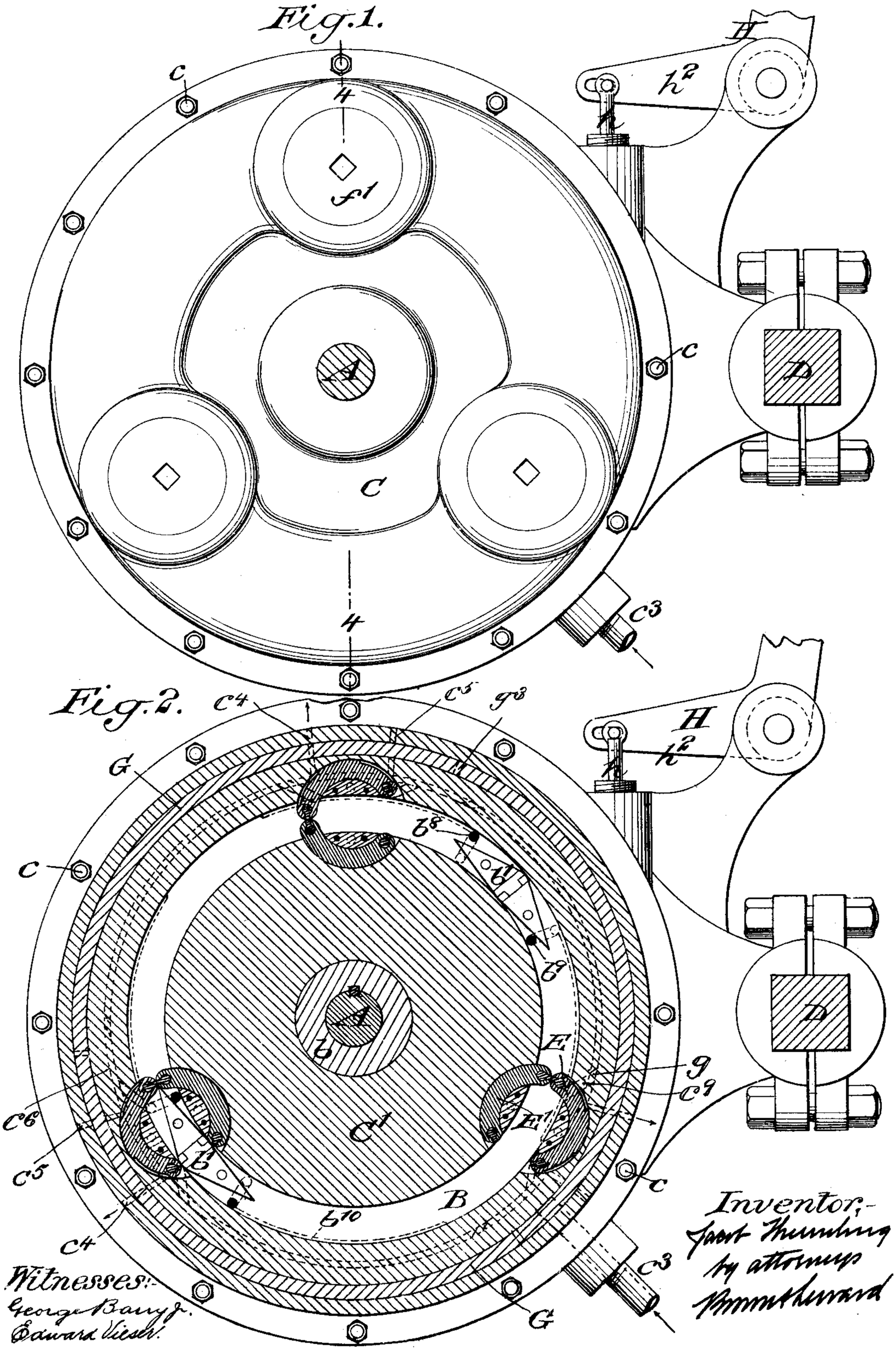

Fig. 2.

Witnesses:-
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Edward Kieser.

Inventor;-
Jost Thumling
by attorneys
Brownell & Howard

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

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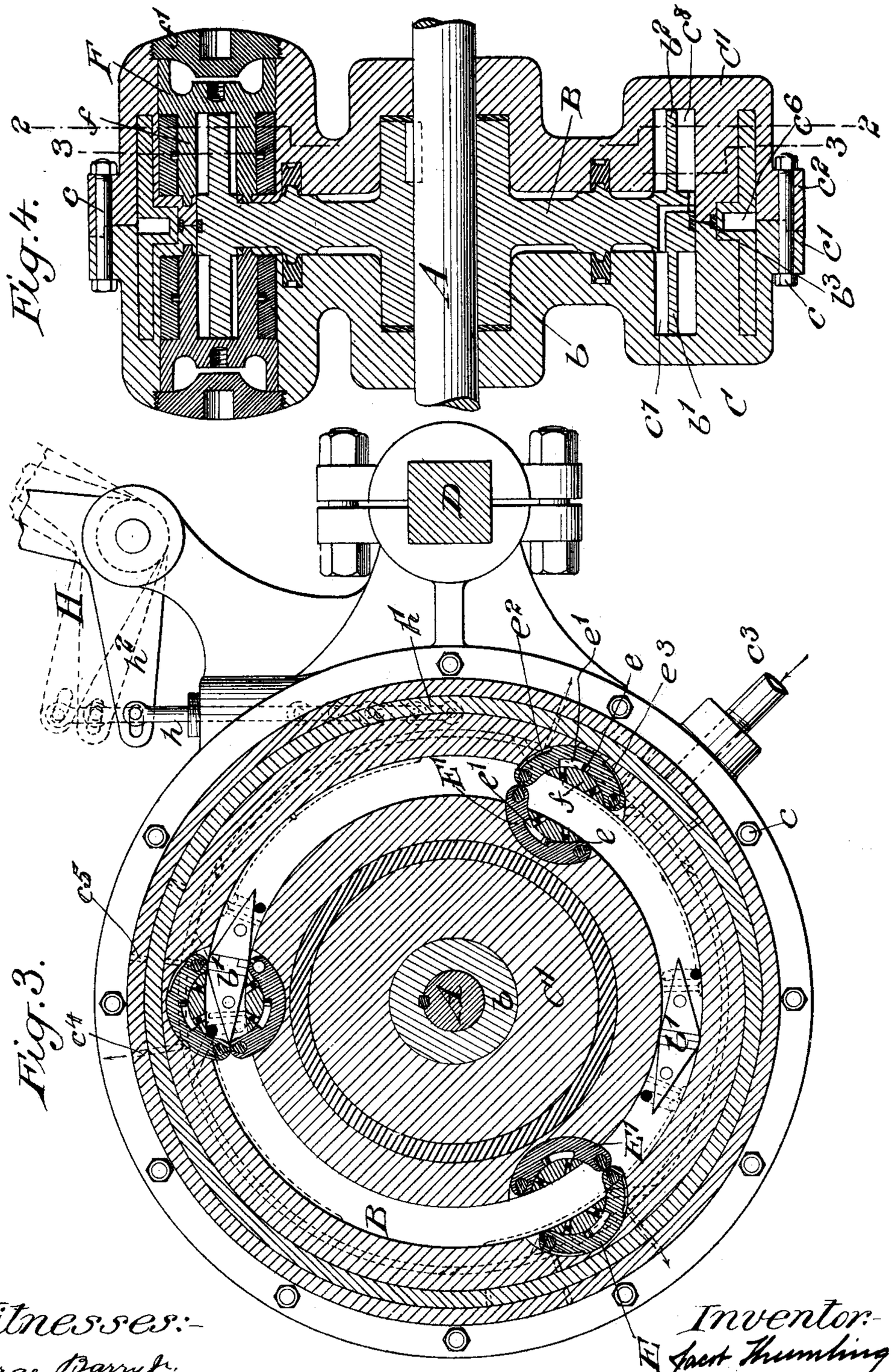
(No Model.) 3 Sheets—Sheet 2.

Fig. 4.



Witnesses:-
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Inventor:-
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by attorneys
Brown & Howard

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

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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

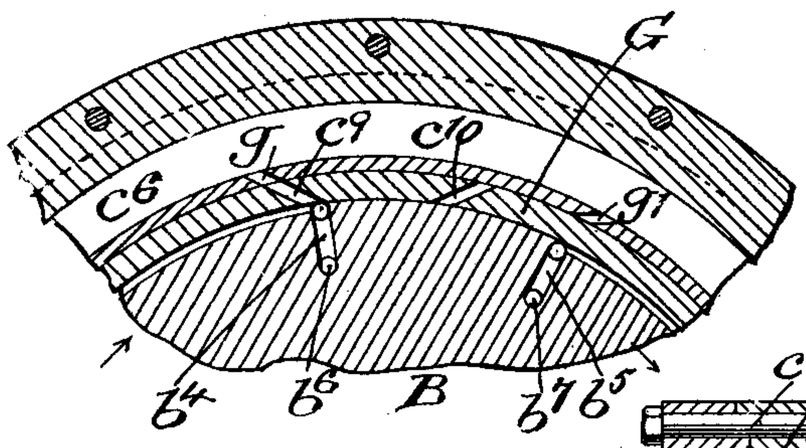


Fig. 6.

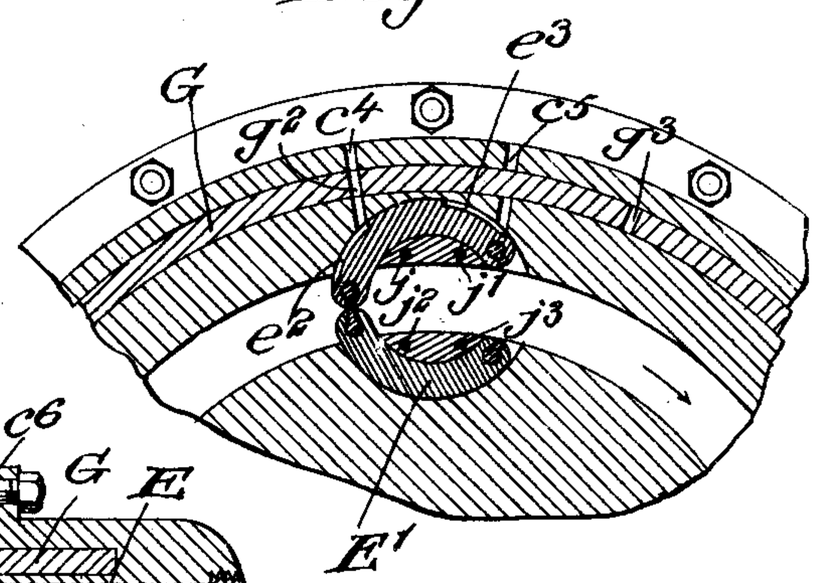


Fig. 14.

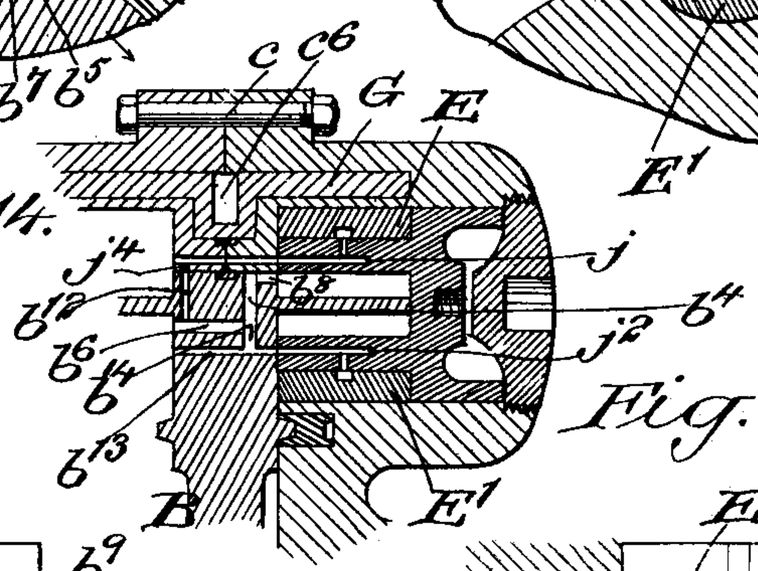


Fig. 7.

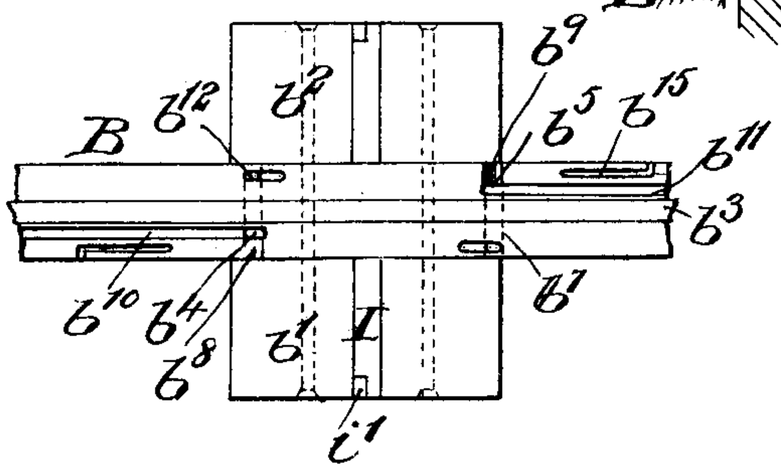


Fig. 8.

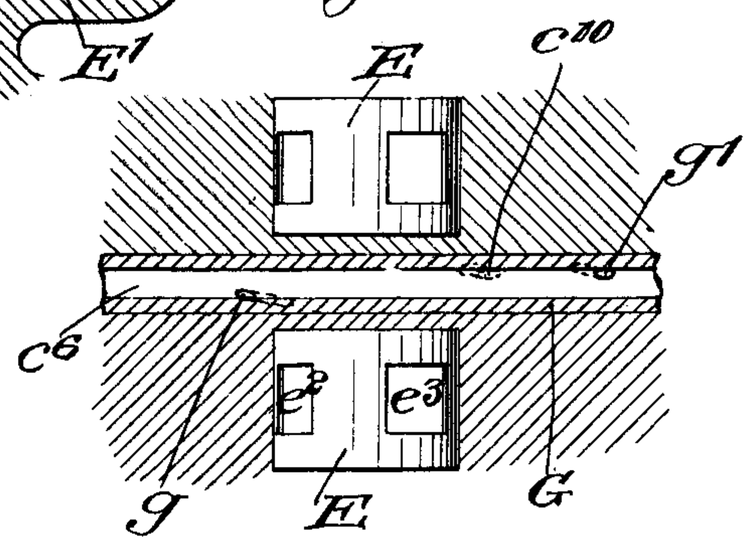


Fig. 9.

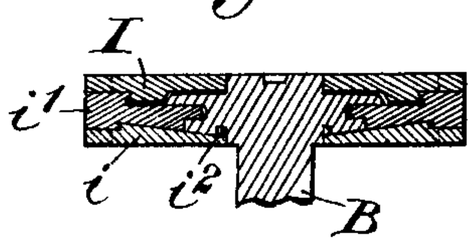


Fig. 10.

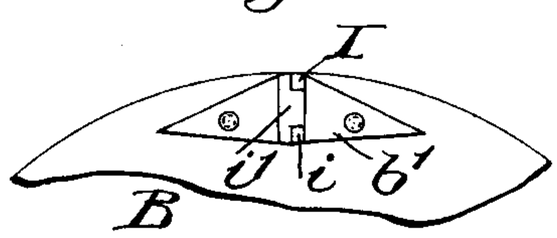


Fig. 11.

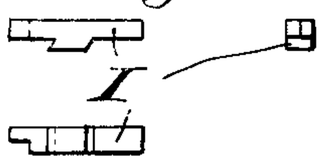


Fig. 12.

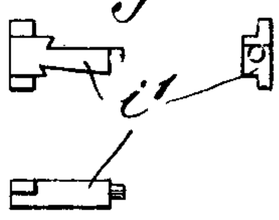
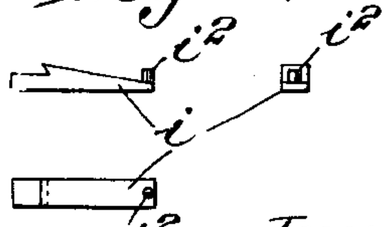


Fig. 13.



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UNITED STATES PATENT OFFICE.

JACOB THEEMLING, OF UNION HILL, NEW JERSEY, ASSIGNOR OF ONE-HALF TO EDMUND K. RIGHTER, OF NEWARK, NEW JERSEY.

REVERSIBLE ROTARY MOTOR.

SPECIFICATION forming part of Letters Patent No. 637,429, dated November 21, 1899.

Application filed March 25, 1899. Serial No. 710,422. (No model.)

To all whom it may concern:

Be it known that I, JACOB THEEMLING, a citizen of the United States, and a resident of Union Hill, in the county of Hudson and State of New Jersey, have invented a new and useful Improvement in Reversible Rotary Motors, of which the following is a specification.

My invention relates to an improvement in reversible rotary motors which will be well adapted for use in connection with any motive power—such, for instance, as steam, compressed air, or gas.

The objects of my invention are to provide a structure which will be very simple and strong, in which the several working parts may be readily reached, in which the wearing parts are well packed, in which the piston-heads are provided with automatic devices for taking up wear thereon, and in which the motor may be instantly reversed or the power shut off when so desired.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 represents a side view of the motor. Fig. 2 represents a transverse sectional view in the plane of the line 2 2 of Fig. 4. Fig. 3 is a similar view taken on the line 3 3 of Fig. 4, showing the piston in another position. Fig. 4 is a longitudinal section in the plane of the line 4 4 of Fig. 1. Fig. 5 is a detail sectional view of a portion of the motor, showing the ports for admitting the motive power to the piston in full lines. Fig. 6 is a detail sectional view of a portion of the motor, showing the exhaust-ports in full lines. Fig. 7 is a top plan view of a portion of the piston and one pair of its heads. Fig. 8 is a detail sectional view showing in top plan one pair of oscillating abutments. Fig. 9 is a transverse sectional view through a portion of the piston and a pair of its heads. Fig. 10 is a side view of the same. Fig. 11 represents three views of one of the sections of the piston-head packing. Fig. 12 represents three views of another one of the said sections. Fig. 13 represents three views of the third section of the piston-head packing, and Fig. 14 is a detail transverse section through the piston and its adjacent parts.

The driving-shaft of the motor is denoted by A, to which is rigidly fixed the hub b of the piston B. This piston B is of disk form and is provided with two pairs of laterally-extended piston-heads, the two heads of a pair being denoted by b' b^2, respectively. These two pairs of piston-heads are located at the periphery of the piston at points diametrically opposite to each other. Each of these piston-heads is pointed at both ends, as shown. The periphery of the piston is provided with a suitable annular packing-ring b^3. The inlet-ports b^4 b^5 are provided in the piston adjacent to each pair of piston-heads, which ports are located upon opposite sides of the piston packing-ring b^3. The port b^4 leads inwardly from the periphery of the piston to a transverse branch b^6, which leads to the opposite face of the piston at one end of the head b^2, and the port b^5 leads inwardly to a transverse port b^7, which leads to the opposite face of the piston at the other end of the piston-head b'. A short branch port b^8 leads from the port b^4 to one end of the piston-head b', and a short branch port b^9 leads from the port b^5 to the other end of the piston-head b^2. A branch port b^{10} leads from the port b^4 along the periphery of the piston in a direction away from the piston-heads. Another branch port b^{11} leads along the periphery of the piston from the port b^5 in a direction opposite to the port b^{10}.

The motor-casing embraces the piston B and surrounds the shaft A, which casing is divided transversely into two sections C C'. The meeting edges of these two sections of the casing may be rigidly secured together by means of an annular series of bolts c, which pass through flanges c' c^2 upon the peripheries of the said sections C C'. This casing is rigidly mounted upon some stationary support—such, for instance, as a cross-bar D. The casing is further provided with a main motive-power inlet c^3, and each section C C' is provided with three pairs of exhaust-ports located equal distances apart. The pairs of exhaust-ports in each section are arranged to correspond with each other. The ports of each pair are denoted by c^4 c^5, respectively. An annular continuous motive-power reservoir c^6 extends around within the casing and communicates with the main power-inlet c^3.

The sections C C′ of the casing are provided with annular motive-power chambers c^7 c^8, located at the same distance from the axis of the piston as the piston-heads, the three walls of each of the said chambers being engaged by the three walls of each of the piston-heads.

Three pairs of motive-power inlet-ports lead from the motive-power reservoir c^6 into the annular steam-chambers at points adjacent to the exhaust-ports hereinbefore described. The inlet-ports of each pair are designated by c^9 c^{10}.

Two pairs of oscillating abutments are mounted in the casing adjacent to each of the pairs of inlet and exhaust ports. Each pair of these oscillating abutments comprises outer and inner sections E E′, the sections being mounted in the outer and inner walls of the annular motive-power chamber in position to have their adjacent ends alternately meet within the chamber, the widths of the sections being sufficient to form a partition in the chamber when one or the other of the pairs of adjacent ends is in engagement with each other. The means which I employ for removably mounting these oscillating abutments in their position is as follows: A cylindrical hole extends inwardly to a point near the inner face of the casing-section, the size of the hole being sufficient to permit the easy sliding engagement between the outer walls of the oscillating abutment and the wall of the said hole. A cylindrical plug F is fitted to the hole and is provided with a reduced portion f, the interior of which forms a continuation of the motive-power chamber and the exterior of which forms curved bearings for the concave portions of the inner and outer sections of the oscillating abutment. This plug is held positively in its position by means of a screw-cap f', which cap when screwed home abuts against the outer end of the said plug F.

The outer and inner sections of the oscillating abutment are guided in their movements by pin-and-slot connections e e', as shown. The exterior wall of the outer section of the oscillating abutment is provided with a pair of surface ports e^2 e^3, which serve to open and close communication between the motive-power chamber and continuations of the ports c^4 c^5.

A reversing ring G is located within the annular motive-power reservoir c^6, which ring is provided with pairs of openings g g' therethrough, so arranged that when the ring is shifted to the limit of its movement in one direction the openings g will form continuations of the ports c^9 for opening communication from the motive-power reservoir to the piston. When the ring is shifted to the limit of its movement in the opposite direction, the openings g' will correspond with the ports c^{10}, and thus opens communication from the reservoir to the piston. The reversing ring G is further provided with sets of openings g^2 g^3, so arranged that when the ring is shifted to bring the inlet-ports c^9 into communication with the reservoir the sets of openings g^2 g^3 will open communication from the oscillating abutments through the exhaust-ports c^4. The openings g^3 are so arranged that when the ring is reversed to bring the openings g' into alinement with the inlet-ports c^{10} the said openings g^3 will open communication from the abutments through the ports c^5. This reversing ring is operated by means of a reciprocating rod h, one portion of which enters the casing and is connected to the said ring by a link h', the other end of which is connected to one arm h^2 of a rocking lever H, the said rocking lever being operated by any suitable means. (Not shown.)

I provide a sectional packing for each of the piston-heads arranged to automatically take up the wear at the portion of the said head where it engages the three sides of the motive-power chamber. This sectional packing consists of an outer section I, an inner section i, and an intermediate section i'. The outer section I is provided on its bottom with a downwardly and outwardly inclined surface which engages an upwardly and inwardly inclined surface on the top of the intermediate section i', so that the centrifugal action of the piston will tend not only to throw the section I outwardly, but through the said inclined surfaces also serve to force the intermediate section i' laterally away from the piston. The intermediate section i' is provided with an upwardly and outwardly inclined surface on its bottom which engages an upwardly and outwardly inclined surface on the top of the lower section i, so that as the intermediate section i' is forced outwardly it will force the lower section i inwardly. The lower section i is held against outward movement by means of a pin i^2, which extends upwardly into a socket in the piston.

The means which I employ for holding the adjacent ends of each pair of abutments together after one of the piston-heads has passed by the said abutments is as follows: The reduced end of each of the plugs F is provided with a pair of ports j j' adjacent to the outer abutment E and a pair of ports j^2 j^3 adjacent to the inner abutments E′. The ports j j' lead to the periphery of the reduced portion of the plug, so that when the outer abutment is slid in one direction the port j will open into the slot e' on one side of the pin e, and when the abutment is slid in the opposite direction the port j' will open into the said slot e' on the other side of the pin e. The ports j^2 j^3 are similarly arranged to connect with the slot e' in the inner abutment. The port j leads from the reduced end of the plug through the casing into the reduced plug upon the opposite side thereof. A downwardly-extended branch j^4 leads from the port j within the casing to the periphery of the piston in position to correspond with a vertical port b^{12}, which leads to the transverse port b^6. The port j^2 leads to the face of the piston in po-

sition to correspond with a transverse port b^{13}, which has a short branch b^{14}, forming an extension of the port b^4. It will thus be seen that as power is admitted to the port b^4 through the inlet-port c^9 a portion thereof will pass through the several ports into the slots e' in the outer and inner abutments, tending to hold the adjacent ends of the abutments together which the head has just slid into engagement with each other.

Just in advance of the port b^{13} on the periphery of the piston B, I locate an exhaust-port b^{15}, which is arranged to exhaust the power which has been holding the meeting ends of the pair of abutments together, so as to permit the approaching head to easily slide the ends apart. This piston is provided with a similar arrangement of ports leading to the inlet-port b^5, arranged to be operated when the motor is driven in the reverse direction.

The operation of my invention is as follows: The reversing ring is operated to bring the series of power inlet-ports c^9 into communication with the motive-power reservoir if the motor is to be operated in one direction. By the arrangement of two pairs of piston-heads and three sets of oscillating abutments the piston may be in such a position that the motive power will be admitted to the rear of at least one of the pairs of piston-heads. Supposing one of the pairs of piston-heads to be just leaving one of the three sets of oscillating abutments, the motive power will act directly upon the said piston-head as long as the branch ports b^{10} are in communication with the port c^9. As the pair of heads leaves the set of abutments it will have positively brought the adjacent ends of the abutments farthest from the heads together, so that the full pressure of the power is exerted upon the said heads. At the same time the next set of oscillating abutments have been left so that communication is established between the power-chamber in advance of the head and the exterior through the surface ports e^2 in the outer sections of the said set of abutments. As the advance points of the said pair of heads enter between the rounded ends of the last-named set of abutments the ends are forced apart, thus cutting off the exhaust. If it is desired to stop the action of the motor, the ring may be shifted half-way between the limits of its movement, thus cutting off all of these power-inlet ports from the power-reservoir.

If it should be desired to reverse the motor, the ring is shifted so as to open communication between the several inlet-ports c^{10}, and the power-reservoir and the piston will thus be immediately caused to rotate in the opposite direction, because of the pressure being directed against the opposite sides of the pairs of heads from that above described.

The lengths of the branch ports leading along the periphery of the piston are such that the power may act directly upon the piston-heads for a portion of the distance between any two sets of oscillating abutments, and the power is then cut off and the heads driven the balance of the distance to the next set of abutments which they are approaching by means of expansion of the motive force within the power-chambers.

The piston may be packed in a number of places, so as to render it tight and so that the wear may be taken upon the said packing.

The motor as above described is very simple and effective, is positive in its action, and it may be run at a very high rate of speed.

It is obvious that changes might be resorted to in the form and arrangement of the several parts without departing from the spirit and scope of my invention. Hence I do not wish to limit myself strictly to the structure herein set forth; but

What I claim is—

1. A rotary motor comprising a casing divided transversely into two sections, each of said sections being provided with an annular motive-power chamber and a plurality of oscillating abutments, a rotary piston located within the casing and provided with oppositely-extended piston-heads fitted to the power-chambers in the said sections and arranged to operate the oscillating abutments and means for feeding power into the spaces between the one set of abutments and one side of the heads and exhausting power between the next set of abutments and the other side of the heads, substantially as set forth.

2. A rotary motor comprising a casing having an annular power-chamber therein, three pairs of oscillating abutments arranged at equal distances apart and fitted to form partitions in the said chamber, a rotary piston mounted within the casing and provided with a pair of heads diametrically opposite fitted to the said chamber and arranged to successively operate the three pairs of oscillating abutments and means for supplying an exhausting power upon opposite sides of the heads as the piston is rotated, substantially as set forth.

3. A reversible rotary motor comprising a casing having an annular motive-power reservoir and an annular motive-power chamber therein, a plurality of oscillating abutments fitted to form partitions in the said power-chamber, a rotary piston having a head fitted to said chamber and arranged to operate the oscillating abutments, a plurality of sets of power-inlet ports and a plurality of sets of power-exhaust ports leading from the chamber, and a reversing-ring located within the casing provided with ports fitted to open and close certain of the power inlet and exhaust ports for causing the piston to be rotated in one or the other direction, substantially as set forth.

4. A rotary-motor casing comprising two transversely-divided sections, each of which is provided with an annular power-chamber and with a plurality of holes leading from the exterior of the casing inwardly and intercept-

ing the said power-chamber, a pair of oscillating abutments inserted in the said hole in position to form a partition in the chamber, a plug fitted to the said hole and having a reduced portion, the interior of which is cut away to form an extension of the said chamber, the exterior of which forms bearings for the said oscillating abutments, substantially as set forth.

5. In a rotary motor, a casing having an annular motive-power chamber therein, a pair of oscillating abutments arranged to form a partition in the chamber and a rotary piston provided with a head fitted to travel in the said chamber, the said head being provided with oppositely-pointed ends for operating the said abutments, substantially as set forth.

6. In a rotary motor, a casing having an annular motive-power chamber therein and a piston provided with a head fitted to travel in the said chamber, the said head being provided along the portions in engagement with the three walls of the chamber with a sectional packing comprising an outer section, an inner section and an intermediate section so arranged that the tendency of the outer section to be thrown outwardly due to centrifugal action will impart to the intermediate section a positive lateral movement and to the inner section a positive inner movement away from the head, substantially as set forth.

7. In a rotary motor, a casing having an annular power-reservoir and an annular power-chamber therein, a rotary piston provided with a head fitted to the said chamber, a pair of oscillating abutments fitted to be operated by the said head, means for admitting power to the space between the head and the oscillating abutments and means for positively holding the meeting ends of the abutments together and releasing the same at intervals, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 23d day of March, 1899.

JACOB THEEMLING.

Witnesses:
FREDK. HAYNES,
C. S. SUNDGREN.