No. 844,758. PATENTED FEB. 19, 1907.

J. C. SIMMONS.

ROTARY ENGINE.

APPLICATION FILED SEPT. 9, 1905.

5 SHEETS—SHEET 1.

Fig. 1

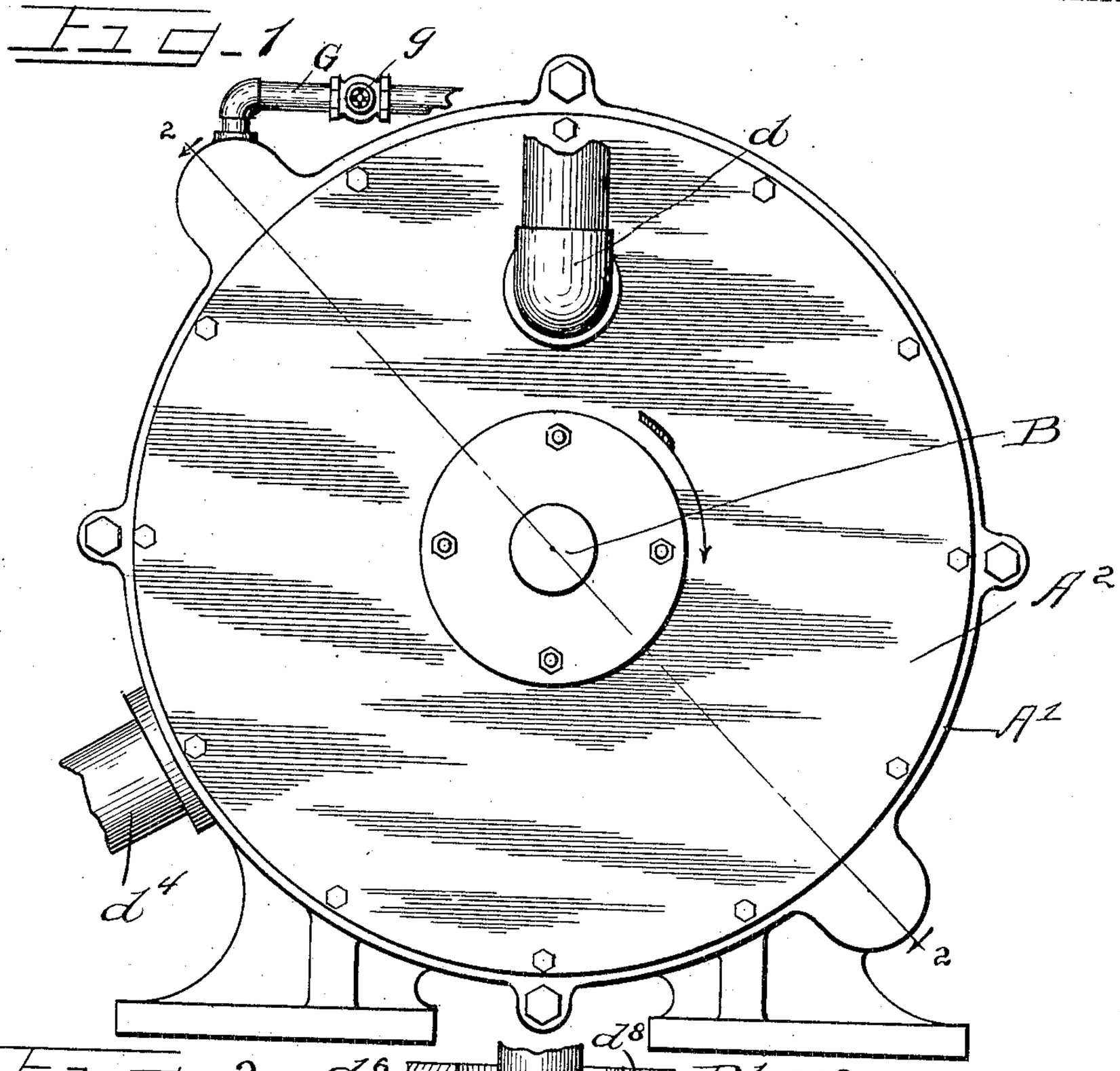
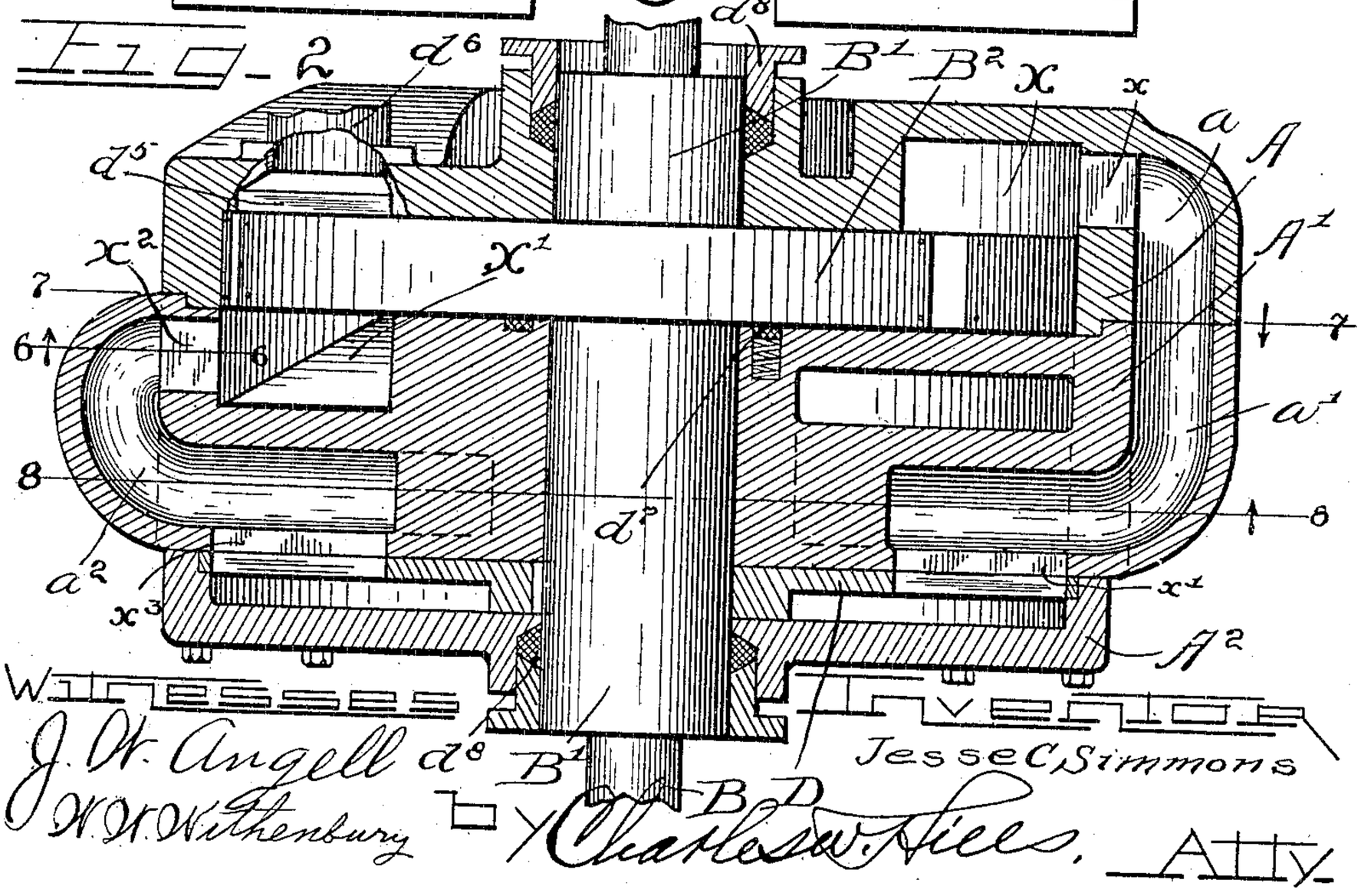


Fig. 2



Witnesses

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5 SHEETS—SHEET 2.

Fig. 3

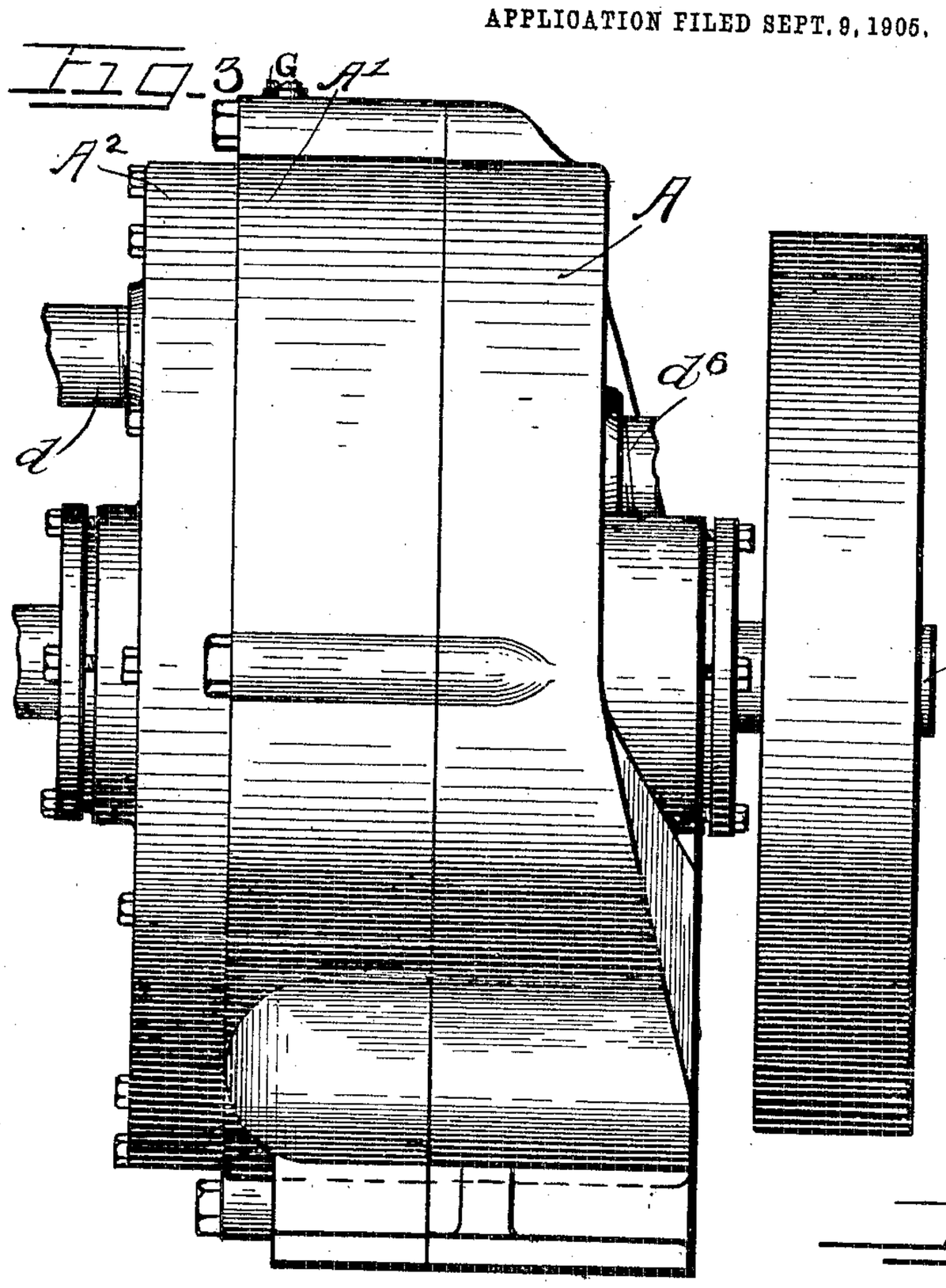


Fig. 10

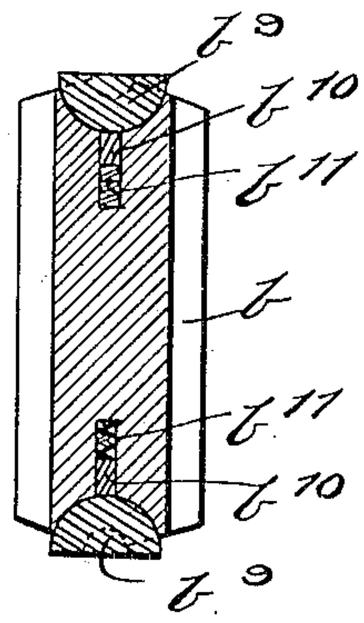


Fig. 11

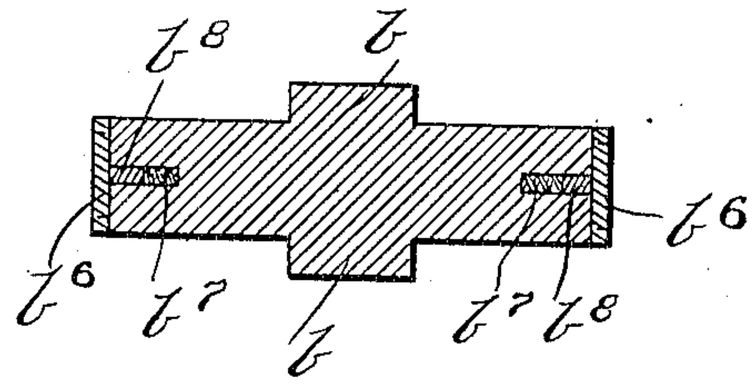
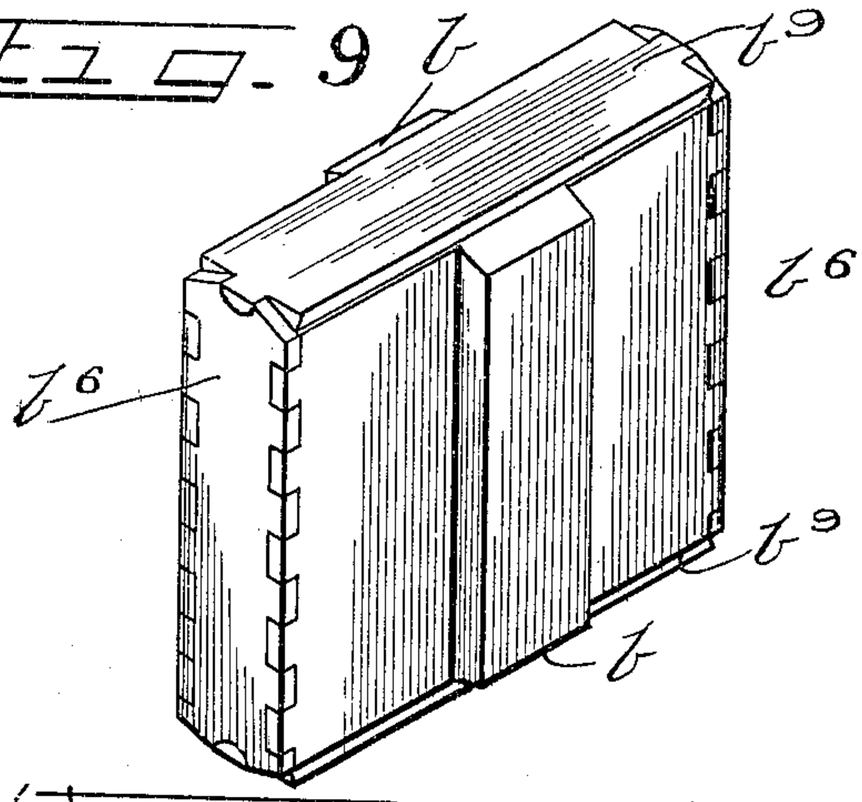


Fig. 9



Witnesses
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5 SHEETS—SHEET 3.

Fig. 4

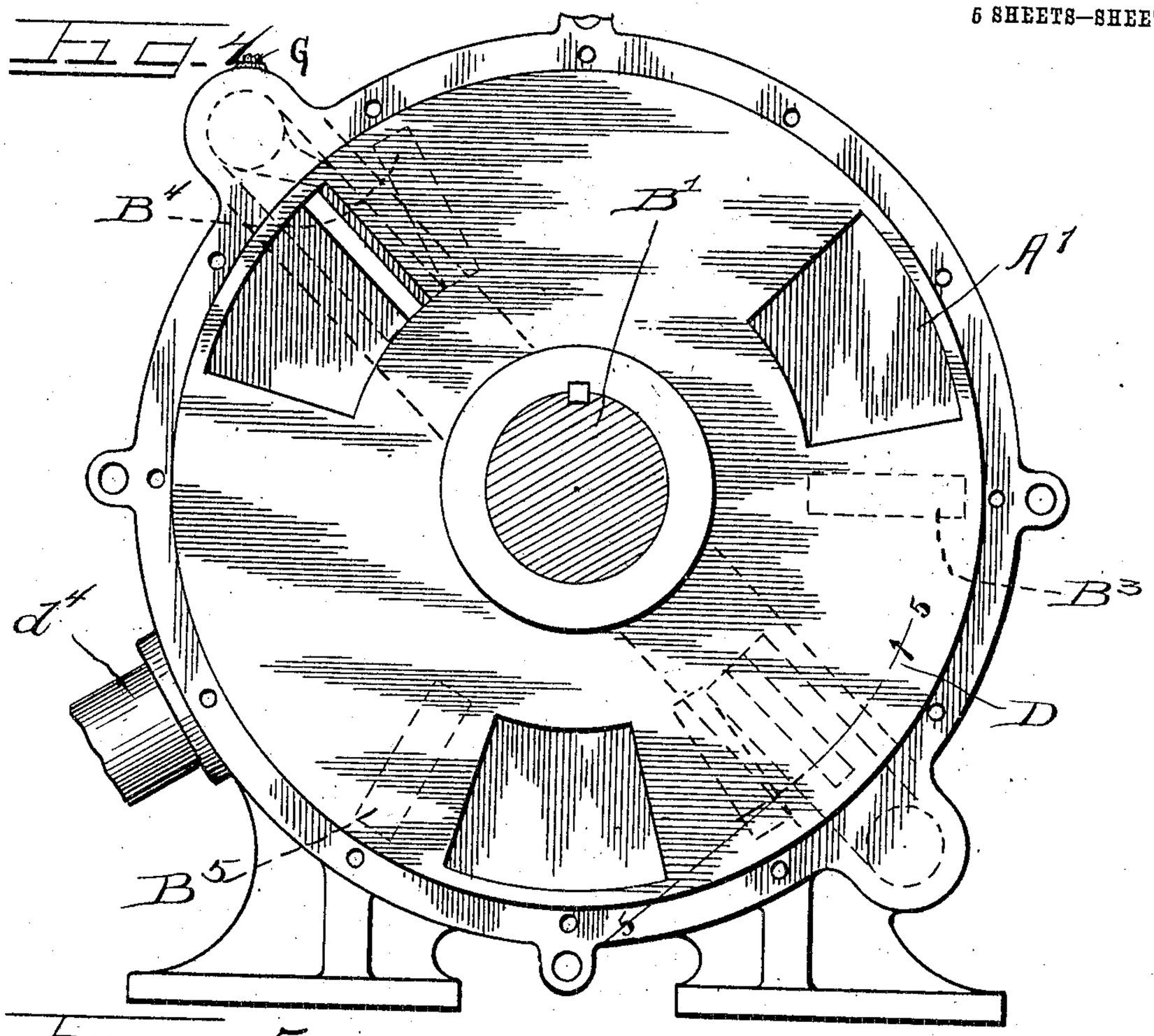
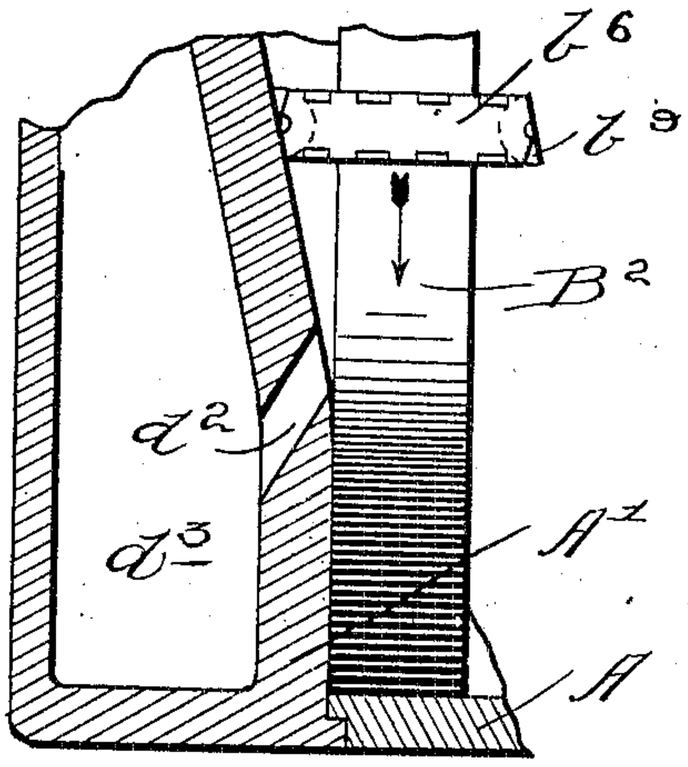
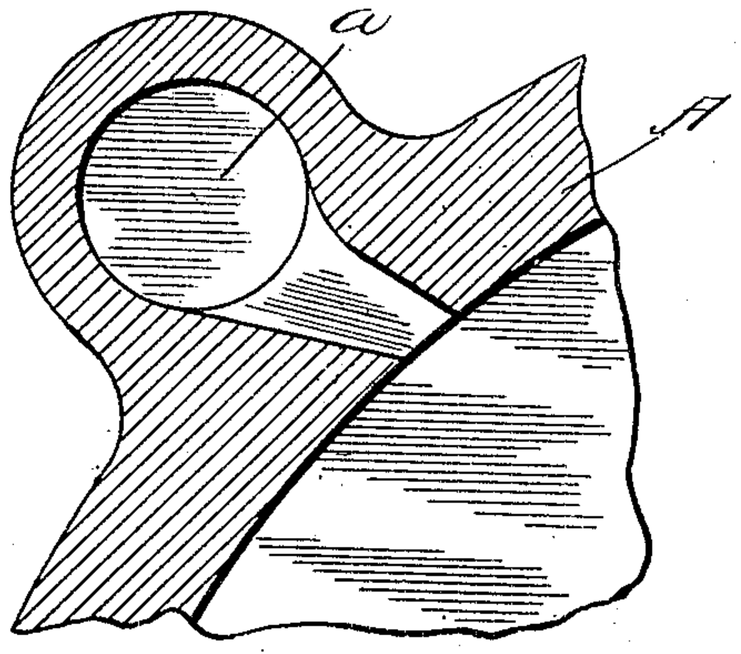


Fig. 5

Fig. 6





Witnesses

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No. 844,758. PATENTED FEB. 19, 1907.

J. C. SIMMONS.

ROTARY ENGINE.

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5 SHEETS—SHEET 4.

Fig. 7

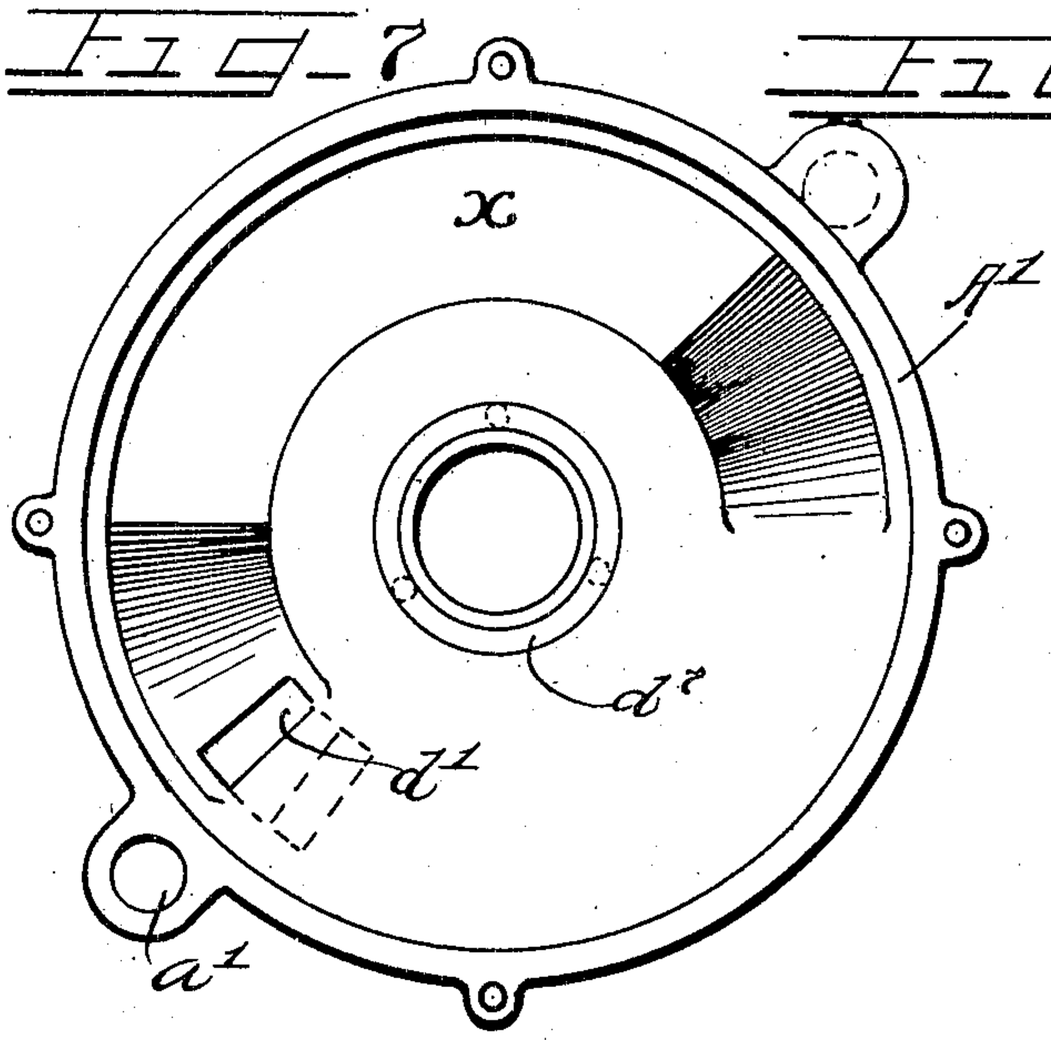


Fig. 8

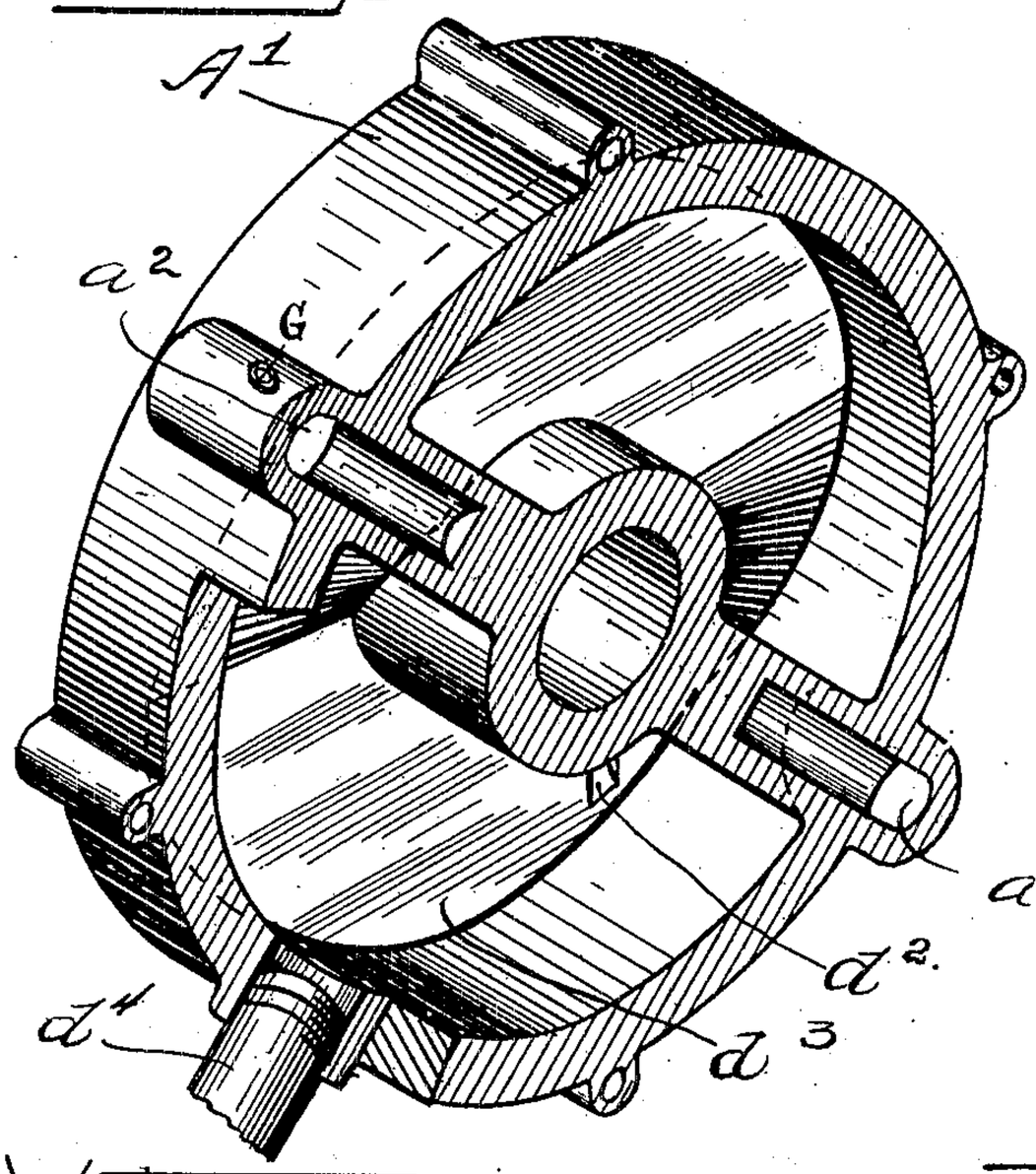
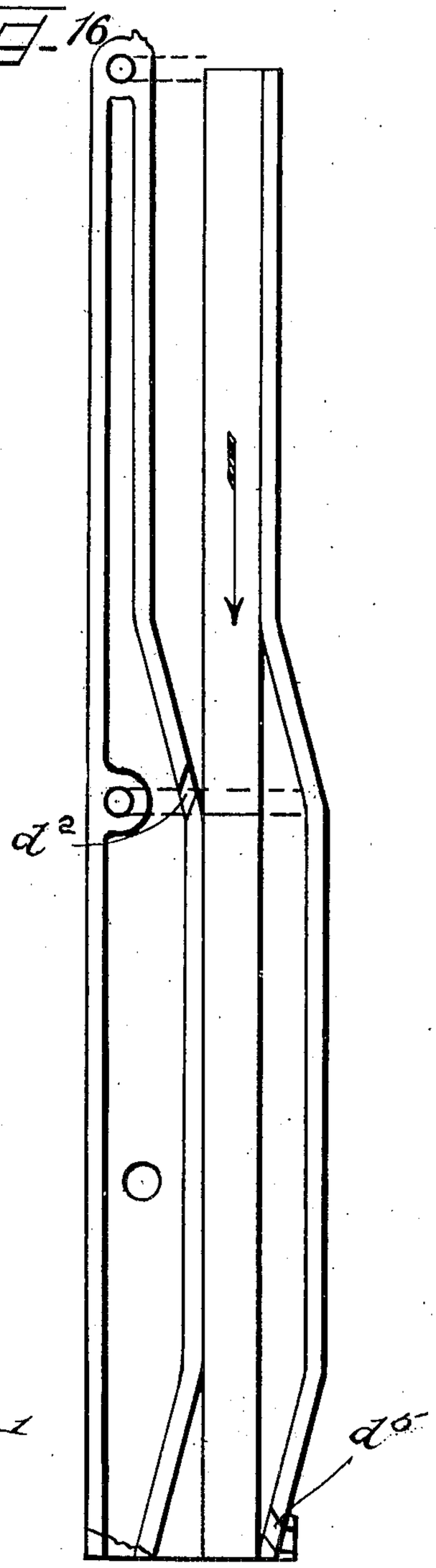


Fig. 16



Witnesses

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No. 844,758. PATENTED FEB. 19, 1907.

J. C. SIMMONS.

ROTARY ENGINE.

APPLICATION FILED SEPT. 9, 1905.

5 SHEETS—SHEET 5.

FIG. 15

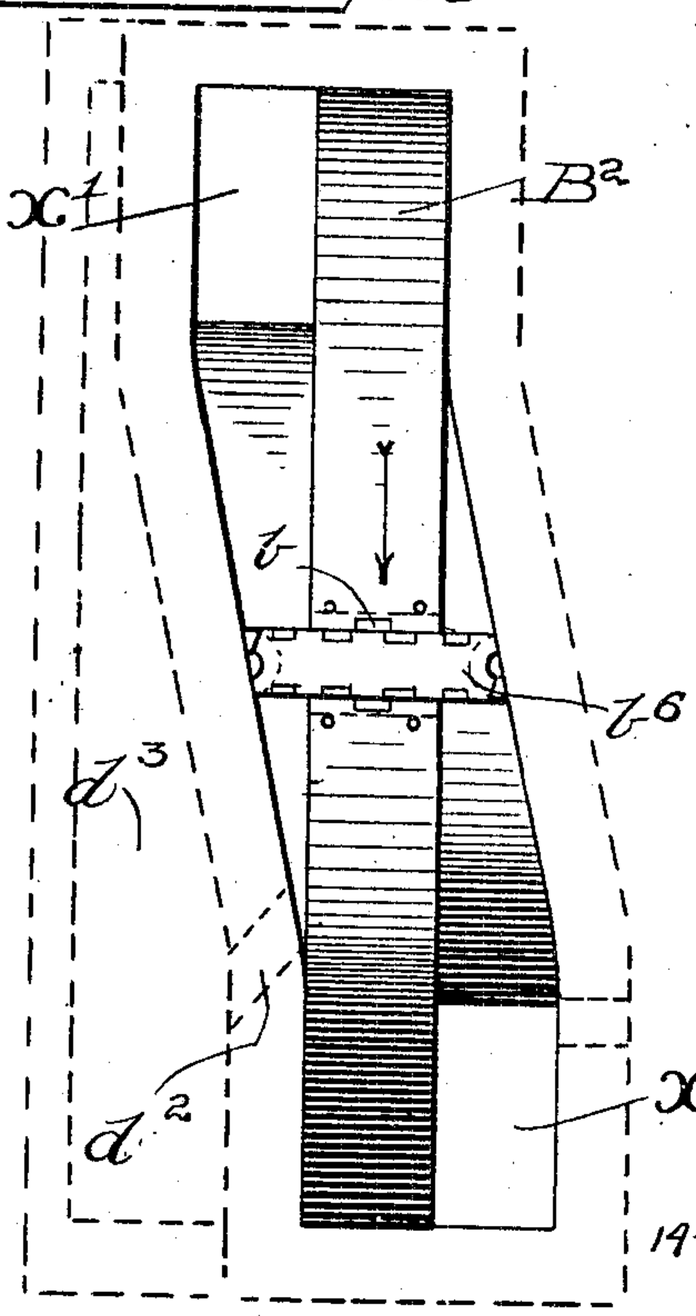


FIG. 12

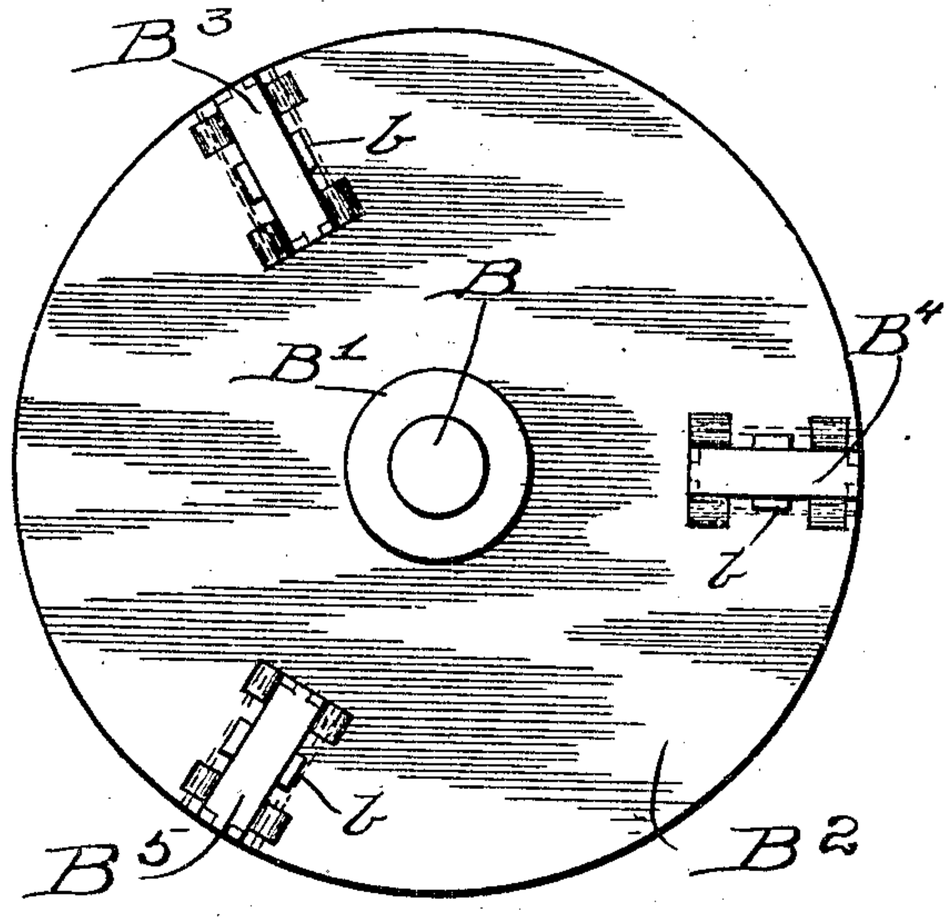


FIG. 13

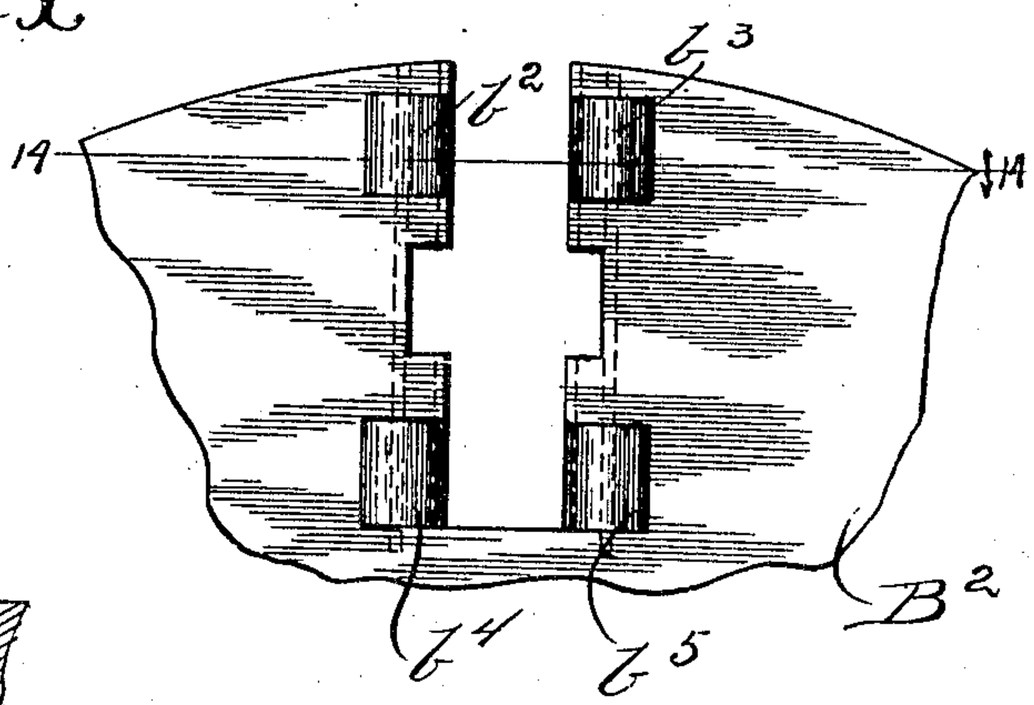
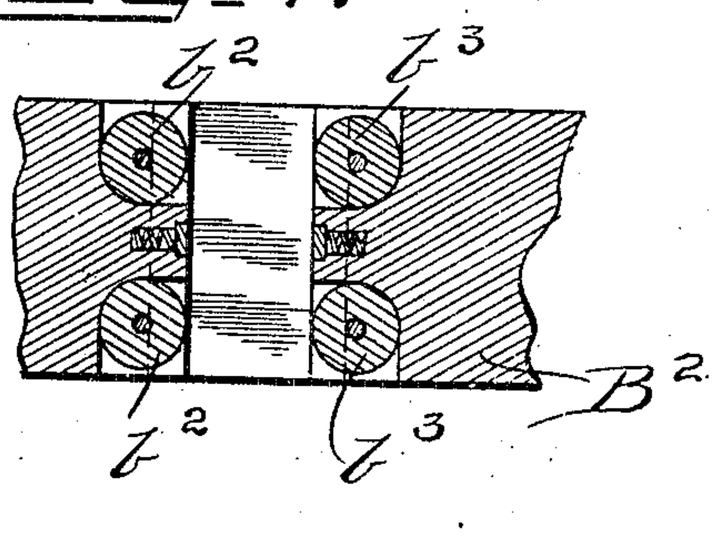


FIG. 14



Witnesses

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UNITED STATES PATENT OFFICE.

JESSE C. SIMMONS, OF SHELBY, MICHIGAN, ASSIGNOR OF ONE-HALF TO CHARLES L. CHURCHILL, OF SHELBY, MICHIGAN.

ROTARY ENGINE.

No. 844,758. Specification of Letters Patent. Patented Feb. 19, 1907.

Application filed September 9, 1905. Serial No. 277,660.

To all whom it may concern:

Be it known that I, JESSE C. SIMMONS, a citizen of the United States, and a resident of the city of Shelby, in the county of Oceana and State of Michigan, 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 same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in engines, and more particularly to rotary engines.

Heretofore the construction of rotary engines has been such that the resistance to rotation caused by the centrifugal tendency of certain moving parts has acted as a brake, and in many instances the efficiency has been seriously affected thereby. Furthermore, the valve construction of such engines is usually more or less complicated and the numerous parts must be timed to the rotation of the revolving element of the engine and in consequence unnecessary power is consumed thereby.

The object of this invention is to provide a rotary engine in which the rotation of the revolving element is performed with minimum resistance and in which the steam is taken alternately on opposite sides thereof.

It is also an object of the invention to afford a construction in which an exceedingly simple and automatically-operating valve is provided, rotatable with the head, and whereby the inlet and exhaust from the pressure-chamber is regulated with the least possible expenditure of power.

It is a further object of the invention to provide a cheap, simple, and extremely powerful and durable engine consisting of but few parts and those of such construction as not likely to get out of repair and in which the whole construction is of such a simple and direct-acting character as to enable the device to be operated by one without previous engineering experience.

The invention consists in the matters hereinafter described, and more fully pointed out and defined in the appended claims.

In the drawings, Figure 1 is an end elevation of a device embodying my invention. Fig. 2 is a section taken on line 2 2 of Fig. 1. Fig. 3 is a side elevation thereof. Fig. 4 is an end elevation with the head of the steam-chest removed and exposing the rotary valve. Fig. 5 is an enlarged fragmentary detail taken on line 5 5 of Fig. 4. Fig. 6 is an enlarged fragmentary detail taken on line 6 6 of Fig. 2. Fig. 7 is a section taken on line 7 7 of Fig. 2. Fig. 8 is a section taken on line 8 8 of Fig. 2 and showing the exhaust-chamber. Fig. 9 is an enlarged perspective view of one of the reciprocating abutments. Fig. 10 is a vertical section thereof. Fig. 11 is a transverse section of the same. Fig. 12 is a plan view of the revolving disk or head, showing the reciprocating heads or abutment therein. Fig. 13 is an enlarged fragmentary detail of the revolving head, illustrating the roller-bearings for the reciprocating abutment. Fig. 14 is a section taken on line 14 14 of Fig. 13. Fig. 15 is a somewhat diagrammatic view illustrating the travel of the abutments. Fig. 16 is a development of the steam and pressure cylinders.

As shown in said drawings, A and A′ indicate the cylinder-heads, which are peripherally flanged and the flanges of which are fitted together to afford a ground joint, as shown in Fig. 2, and between which is provided an annular steam-chamber arranged obliquely with the plane of the revolving element. Extending centrally through the cylinder is a shaft B, on which is secured the elongated hub B′ of the rotating head B^2, which, as shown, is circular and of a diameter equal to the diameter of the steam-chamber. Said pressure or steam chamber is shaped, as shown in Figs. 2, 5, 7, 8, and 15, to afford a plurality of pressure-chambers on opposite sides of the shaft and on opposite sides of the rotating head, or, in other words, the steam-chamber as a whole extends obliquely around the shaft with respect to the plane of rotation of the revoluble head B^2, thus affording a plurality of pressure-chambers on alternate sides of the head.

As shown, abutments B^3, B^4, and B^5 are carried by said head B^2 and reciprocate in slots in the periphery thereof to project into alternate pressure-chambers on opposite sides of the head. As shown, each of said abutments is provided centrally on each side of the same with a longitudinal rib *b*, which fits in a complemental groove in the head B^2, and, as shown, rollers b^2, b^3, b^4, and b^5 are pro-

vided on each side of said head adjacent the abutment-slots and two of which are at each side of the same. These afford roller-bearings for the abutments and permit the same to slide freely through said slots to project alternately into the pressure-chambers on either side of the same and, together with the ribs on said abutments and the grooves in the head, act to hold the abutments at all times firmly from any other movement. Said abutments are packed to afford steam-tight joints at all four walls of the feed-chamber. As shown in Figs. 9 to 15, inclusive, a strip of packing b^6 is secured on each side of each abutment and is provided with a central inwardly-directed web b^8, which projects into the side of the abutment. Said packing-strips are notched at their edges, affording serrations on the abutment and which act to hold said packing b^6 in operative position, while springs b^7 engage in the central webs b^8 and act to hold the packing firmly against the outer walls of the steam-chamber. Said packing-strips b^6 at their ends are provided with semicircular seats, as shown in Fig. 9, and supported thereon and resting in semicircular grooves in the end of the abutment are rounded packing-strips b^9, and, as shown, a web bar b^{10} is seated in a longitudinal groove in each end of each abutment and bears against the inner side of the packing-strips b^9 and is held firmly in contact thereagainst by means of springs b^{11}, thus affording a rolling bearing for said strips at the ends of each abutment where it bears against the cylinder-head of the engine.

As shown, the heads A and A′ are cored to provide induction and exhaust ports and passages leading thereto and therefrom, and, as shown, the head A is provided on its inner side with a cored passage a, which leads from the induction-port x, opening into the pressure-chamber X, and along the side of said head and communicates with a corresponding passage a' in the head A′, which opens from the inlet-port x' in said head, which opens into the steam-chest. A corresponding inlet-port x^2 is provided diametrically opposite the inlet-port x and on the opposite side of the revolving head B^2 and opens into the pressure-chamber X′ in the cylinder-head A′. A passage a^2 leads from said port x^2 to a port x^3, which opens through the outer face of the cylinder-head A′ into the steam-chest diametrically opposite the port x'.

Rigidly secured on the hub B′ of the revolving head B^2 and affording a ground joint with the outer face of the cylinder-head A′ is a valve-disk D, provided, as shown, with three inlet-apertures therethrough, which are arranged equal distances apart and near the periphery to register with the ports x' and x^3 through the cylinder-head A′. Said apertures are of a width corresponding with the radial length of the inlet-ports and of a length to permit inlet of the pressure fluid against the abutment closely in advance thereof for nearly the entire length of the respective pressure-chambers. The pressure inlet or supply pipe d opens into the steam-chest formed in the head A^2, bolted to the cylinder head A′ and chambered to contain the valve-disk D.

Exhaust-ports d^2 d^5 open from the end of each pressure-chamber in advance of the movement of the abutments. The port d^2 opens from the chamber X′ into a chamber d^3 in the cylinder-head A′ and from which opens an exhaust-pipe d^4. The exhaust-port on the opposite of the engine—namely, the port d^5 in the head A—discharges directly into the exhaust-pipe d^6, communicating through said head. Said exhaust-pipes may be connected, if desired, in a single pipe or may discharge to the atmosphere independently, as preferred.

Any suitable packing for the rotating head B^2 may be employed. As shown, an annular strip of packing d^7 is provided about the hub of the rotating head B^2 and a gland d^8 is provided at each end of said hub, as shown in Fig. 2, thus preventing any escape of the pressure fluid except through the exhaust-ports. As shown, a pipe G, provided with a valve g, connects the induction or supply pipe with inlet-passages a, a', and a^2 below the valve-disk D and permits admission of the pressure fluid to the pressure-chambers independently of said valve-disk.

The operation is as follows: In starting the engine the pressure fluid is admitted through the induction-pipe to the steam-chest. If the ports are both closed by the position of the valve-disk D, as may sometimes occur, the valve g in the pipe G is opened, admitting pressure to one or both pressure-chambers and starting the engine. The valve g may then be closed, and the steam or other pressure fluid will be admitted regularly and alternately through the oppositely-disposed ports x x^2 into the respective pressure-chambers against the abutments and the head B^2. As the head B^2 rotates, the abutments B^3, B^4, and B^5 reciprocate transversely of said rotating head B^2, first into the pressure-chamber X on one side of the head and then into the pressure-chamber X′ at the opposite side thereof, taking pressure alternately on opposite sides of the head at diametrically opposite points, and inasmuch as there are three of said abutments slidably carried on the revolving head, two of these are at all times subjected to pressure either direct or expansively. Said valve-ports through said valve-disk D are of such size and so arranged as to cut off the steam-supply after having filled the pressure-chamber behind one abutment just before another receives direct pressure. Thus for a part of the travel of each abutment the steam is acting

directly on the abutment by impact and for a portion of its travel is acting by expansion to drive the shaft. Inasmuch as said abutments are journaled to slide transversely of the head B^2 on roller-bearings it is obvious that but slight friction can occur, and, furthermore, inasmuch as the ports are arranged at the points where the abutments starts to move transversely of the head the pressure is relieved from the abutments approximately at the moment the transverse movement begins and is not again applied until inlet-pressure is received on the opposite side of the rotating head. In this manner the abutments reciprocate back and forward in the steam-chamber in one and then the other pressure-chamber thereof with but slight friction and, being carefully packed, with practically no loss of power.

Obviously while I have shown a rotary valve-disk on the shaft it is obvious that other valves may be employed, if desired, and that any suitable inlet or exhaust ports may be employed. I therefore do not purpose limiting this application for patent otherwise than necessitated by the prior art, as many details of the construction and arrangement may be varied without departing from the principles of my invention.

I claim as my invention—

1. A rotary engine comprising a steam-chamber, a rotating head therein dividing said chamber into pressure-chambers one on each side of said revolving head, an abutment fitting in the steam-chamber and carried by the revolving head and adapted to receive pressure alternately from said chambers and a guide on each side thereof engaged in complemental grooves in said head.

2. A rotary engine comprising a steam-chamber, a rotating head therein dividing said chamber into pressure-chambers one on each side of said revolving head, an abutment fitting in the steam-chamber and carried on said head and adapted to reciprocate alternately into said pressure-chamber, a steam-chest, ports opening therefrom into said pressure-chamber and a disk valve adapted to control said ports.

3. A rotary engine comprising a steam-chamber, a rotary head therein dividing said chamber into pressure-chambers one on each side of said revoluble head, a transversely-movable abutment engaged to said head and adapted to project alternately in said pressure-chambers, a disk valve rotatable with said revolving head having apertures therethrough adapted to regulate the admission of pressure.

4. In a rotating engine a revolving circular head, pressure-chambers on opposite sides thereof, one or more abutments carried near the periphery of said revolving head and slidable transversely thereof into said pressure-chambers, inlet and exhaust ports for said pressure-chambers, and an apertured disk valve rotatable with the rotating head and acting to admit pressure to the pressure-chambers alternately.

5. In a rotary engine, a revolving head, a pressure-chamber on each side thereof, a disk valve movable with the head, acting to admit pressure to the chambers alternately, reciprocating abutments on said head alternately projecting into said pressure-chambers and a packing-strip rotatively engaged in a groove in each end of said abutments.

6. In an engine of the class described, a rotating head, abutments thereon at the periphery thereof and slidably engaged therewith and adapted to reciprocate parallel with the engine-shaft and guides on said abutments adapted to seat in complemental grooves in said head.

7. In an engine of the class described, a rotating head, abutments thereon at the periphery thereof and slidably engaged therewith and adapted to reciprocate parallel with the engine-shaft, a semicylindric packing rotatively engaged in each end of said abutments and antifriction-bearings for said abutments.

8. An engine of the class described, a revolving head, one or more abutments slidably carried at the periphery thereof and adapted to reciprocate to project alternately beyond opposite faces of the disk, antifriction-rollers journaled in the head adapted to engage on each side of said abutments and rotative packing means seated in the ends of said abutments.

9. In an engine of the class described, a revolving head, one or more abutments slidably carried thereon at or near the periphery thereof, roller-bearings for said abutments, packing means between the head and the abutments and a rolling packing at each end of each abutment.

10. In an engine of the class described, a cylinder, a rotative head therein, abutments adapted to project on each side of the head alternately and a rotative disk valve admitting pressure alternately into opposite ends of the cylinder.

11. In a device of the class described, a rotating head, an annular steam-chamber surrounding the periphery thereof and arranged obliquely with the plane of rotation thereof, abutments carried near the periphery of the rotatable head and slidable alternately into the pressure-chambers afforded on each side of said head, packing means between the abutments and the head and a rotative disk valve controlling the steam-inlet to the pressure-chambers.

12. In a device of the class described, a rotating head, an annular steam-chamber surrounding the periphery thereof and arranged obliquely with the plane of rotation thereof, abutments carried near the periphery of the

rotatable head and slidable alternately into the pressure-chambers afforded on each side of said head, packing means between the abutments and the head and a rotary disk valve having apertures therethrough adapted to control the steam-inlet to the pressure-chambers.

13. In a device of the class described, a cylinder comprising a steam-chamber arranged to afford a plurality of pressure-chambers alternately arranged on opposite sides of a central plane and a rotary disk valve having apertures therethrough adapted to register with apertures in the side of said cylinder.

14. A rotary engine comprising a chamber, a head rotatable therein and dividing said chamber into a plurality of pressure-chambers, transversely-reciprocating means in said head adapted to alternately project into said pressure-chambers and receive the pressure for rotating said head, means revoluble with said head adapted to admit pressure into said chambers and means for admitting pressure into said chambers independently of the aforesaid means.

15. In a device of the class described a steam-cylinder affording a plurality of pressure-chambers obliquely arranged on opposite sides of a central plane, a rotating head between said chambers, a plurality of abutments thereon and slidable alternately into the pressure-chamber on each side thereof, antifriction-bearings for said abutments and a disk valve on the side of the cylinder and rotative with said head.

16. In a device of the class described a steam-cylinder affording a plurality of pressure-chambers obliquely arranged on opposite sides of a central plane, a rotating head between said chambers, a plurality of abutments thereon and slidable alternately into the pressure-chamber on each side thereof, guides on said head and abutments acting to hold the latter in operative position and antifriction-bearings for said abutments.

17. In an engine of the class described the combination with a rotating head of a plurality of abutments carried thereon and slidable transversely of the plane thereof at its periphery, guides thereon engaging the head and antifriction-bearings between said abutment and the head.

18. In a device of the class described the combination with the shaft of the head rigidly secured thereon and rotative therewith, abutments engaged on the head to slide transversely thereof at the periphery, a steam-chamber divided into pressure-chambers by the rotating head, one on each side of the head and oppositely disposed to the other, inlet and exhaust ports opening into and from the pressure-chambers, a disk valve rigidly secured on said shaft, and provided with apertures arranged out of alinement with the abutments on said head and adapted to control the inlet-ports.

19. In a device of the class described the combination with the shaft of the head rigidly secured thereon and rotative therewith, abutments engaged on the head to slide transversely thereof at the periphery, a steam-chamber divided into pressure-chambers by the rotating head one on each side of the head and oppositely disposed to the other, inlet and exhaust ports opening into and from the pressure-chambers, a disk valve rigidly secured on said shaft, provided with apertures arranged out of alinement with the abutments on said head and adapted to control the inlet-ports and an auxiliary pressure-pipe connected in the inlet-pipe and opening into one or both pressure-chambers.

20. In a steam-engine having therein an annular steam-chamber obliquely arranged therein, a rotating head carried on the shaft and dividing the steam-chamber into oppositely-disposed steam-chambers, one on each side of said head, oppositely-disposed inlet-ports communicating with the respective pressure-chambers opening through one of the heads of said cylinder on diametrically opposite sides thereof and a valve disk rigidly secured on the shaft and having apertures therein adapted to alternately open and close said ports as the disk revolves.

21. A rotary engine comprising a steam-chamber, a rotatable head therein dividing said steam-chamber into oppositely-disposed pressure-chambers, transversely-movable abutments engaged to said head, a shaft driven by said head, a steam-chest, ports opening therefrom into said pressure-chambers and an apertured disk valve rigidly engaged on said shaft and adapted to rotate in said steam-chest to control said ports.

22. In a rotary engine the combination with a steam-chamber of a rotatable head therein dividing said chamber into oppositely-disposed pressure-chambers, abutments slidably engaged in said head and adapted to receive pressure alternately from said pressure-chamber, a steam-chest, ports opening therefrom into said pressure-chambers, a rotative disk valve in said steam-chest adapted to open and to close said ports and means for admitting steam into the pressure-chambers independently of said valve in starting the engine.

23. A rotary engine comprising a steam-chamber, a head revoluble therein having a plurality of slots therethrough, rollers on said head adjacent said slots, grooves adjacent said slots, an abutment slidable in said slots and having guides adapted to engage said grooves and preventing said abutments from removal from said head.

24. A rotary engine comprising a steam-chamber, a head therein and dividing said chamber into a plurality of pressure-cham-

bers, a grooved slot in said head, a transversely-slidable abutment therein, packing means on said abutment, means for holding said packing means in close contact with the chamber-walls and antifriction-bearings in contact with said abutment.

25. In a device of the class described the combination with a steam-chamber of a head therein, a plurality of grooved slots in said head, rollers journaled adjacent each slot, abutments engaged in said slots and slidable transversely thereof and adapted to alternately project into said pressure-chambers, packing members on said abutments and means for holding the same in yielding engagement with the walls of said chambers.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

JESSE C. SIMMONS.

Witnesses:
MAMIE CHURCHILL,
INEZ WHITNEY.