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Z. B. FARRINGTON.

ROTARY STEAM ENGINE.

No. 397,707. Patented Feb. 12, 1889.

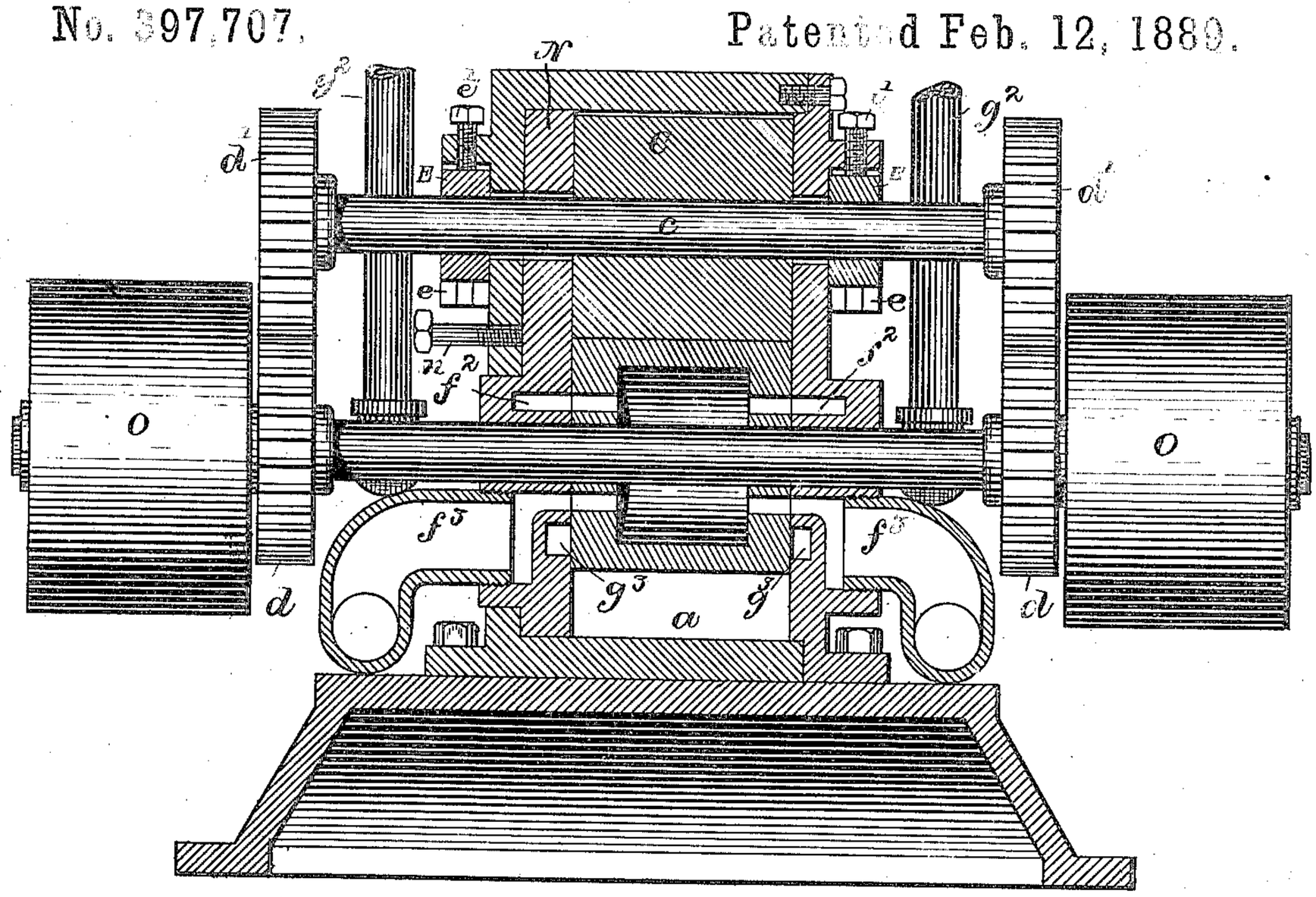

Fig. 1.

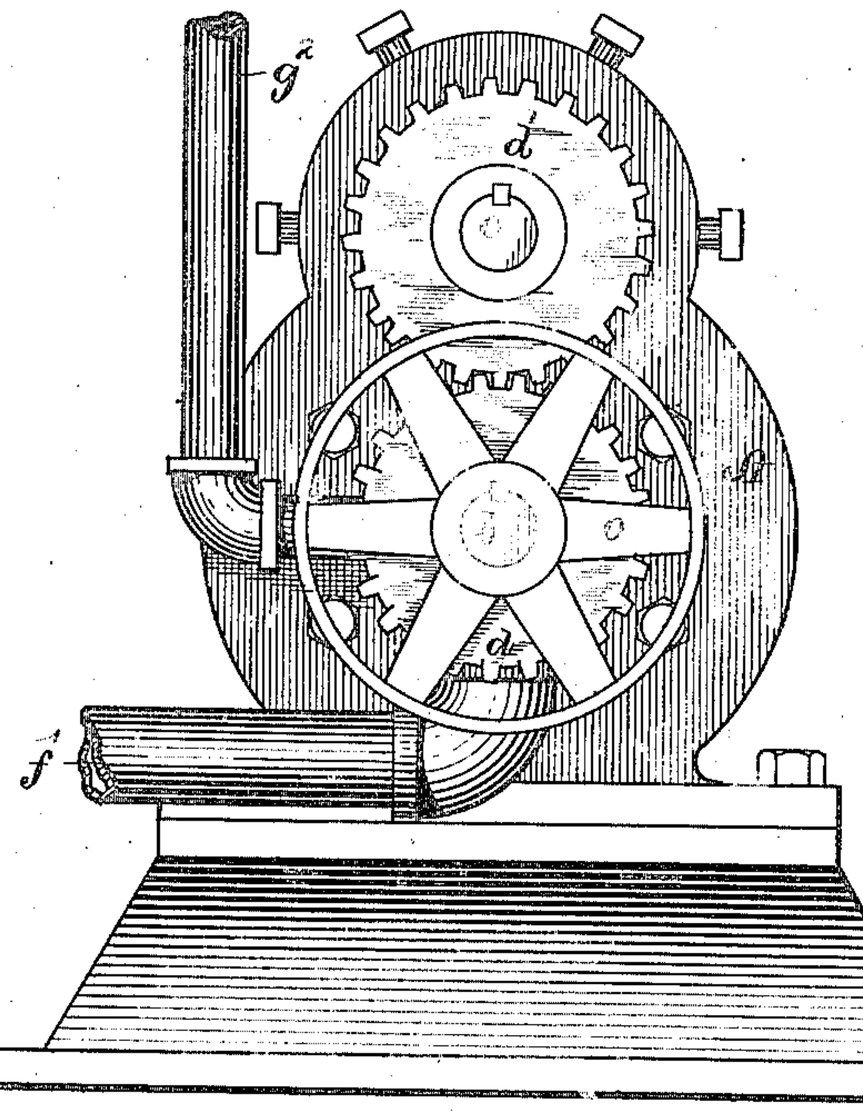

Fig. 2.

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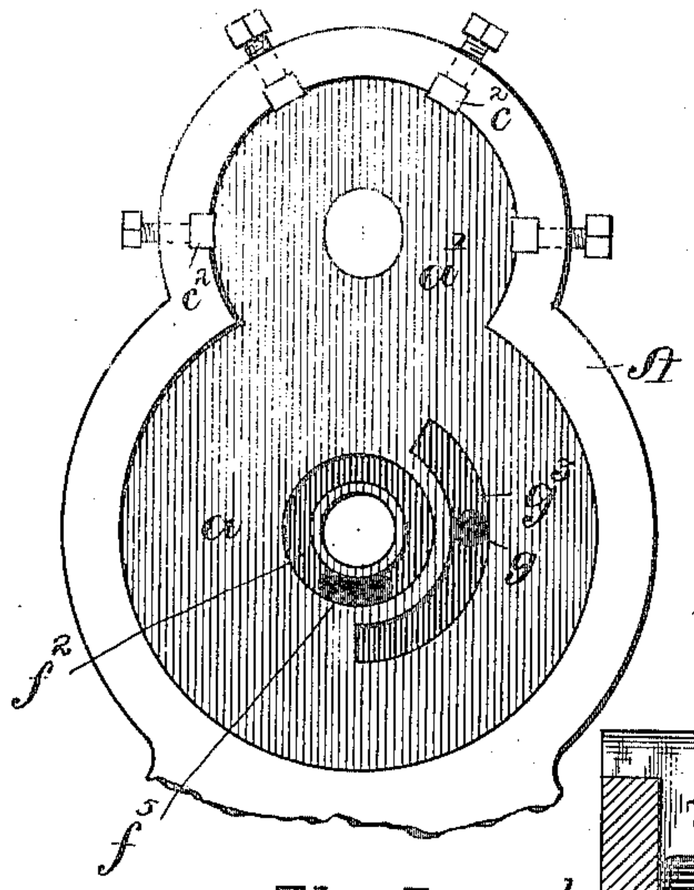

Fig. 3.

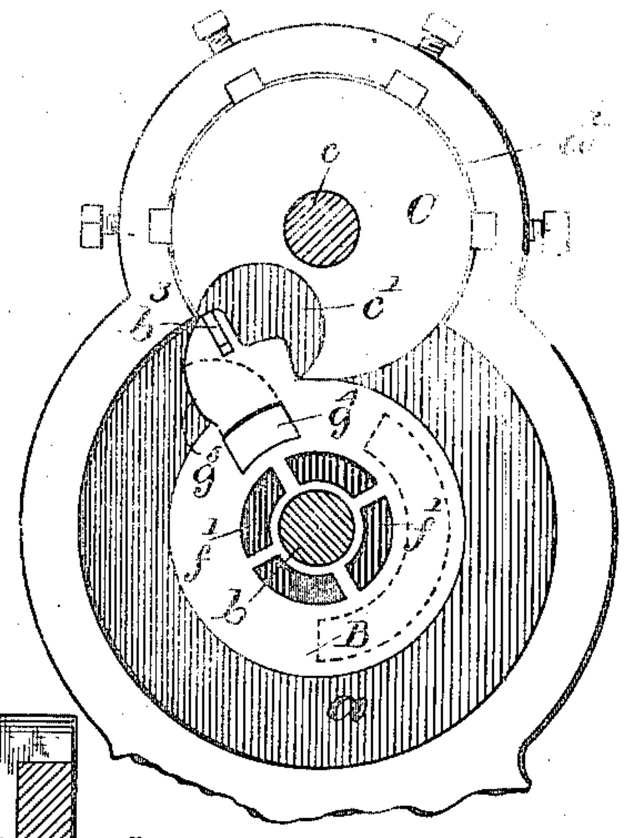

Fig. 4.

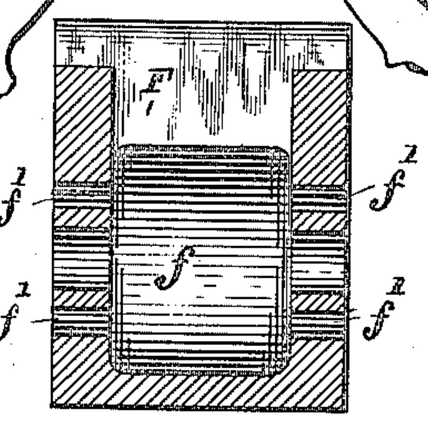

Fig. 8.

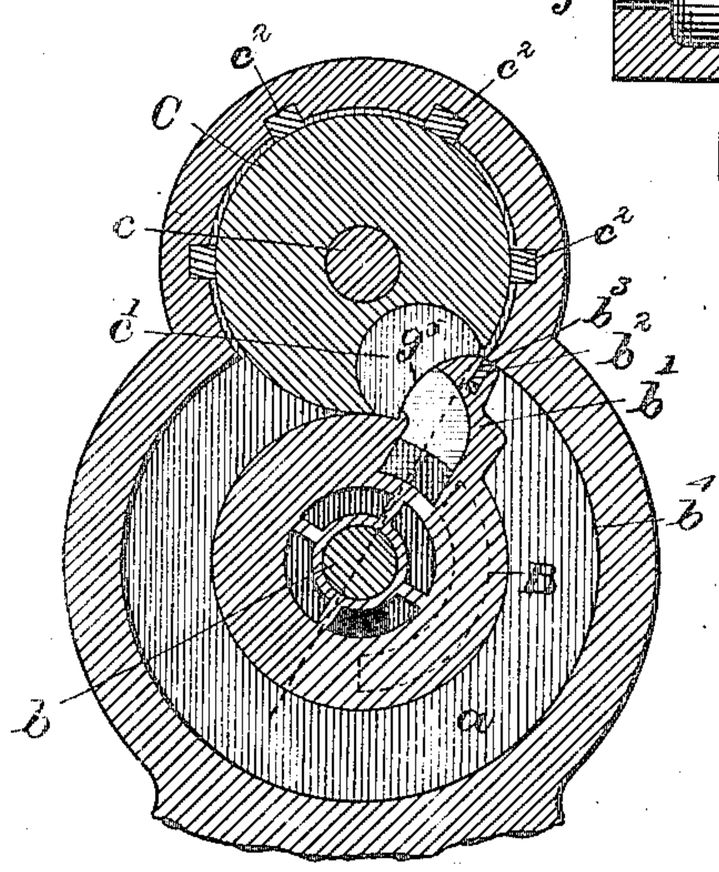

Fig. 5.

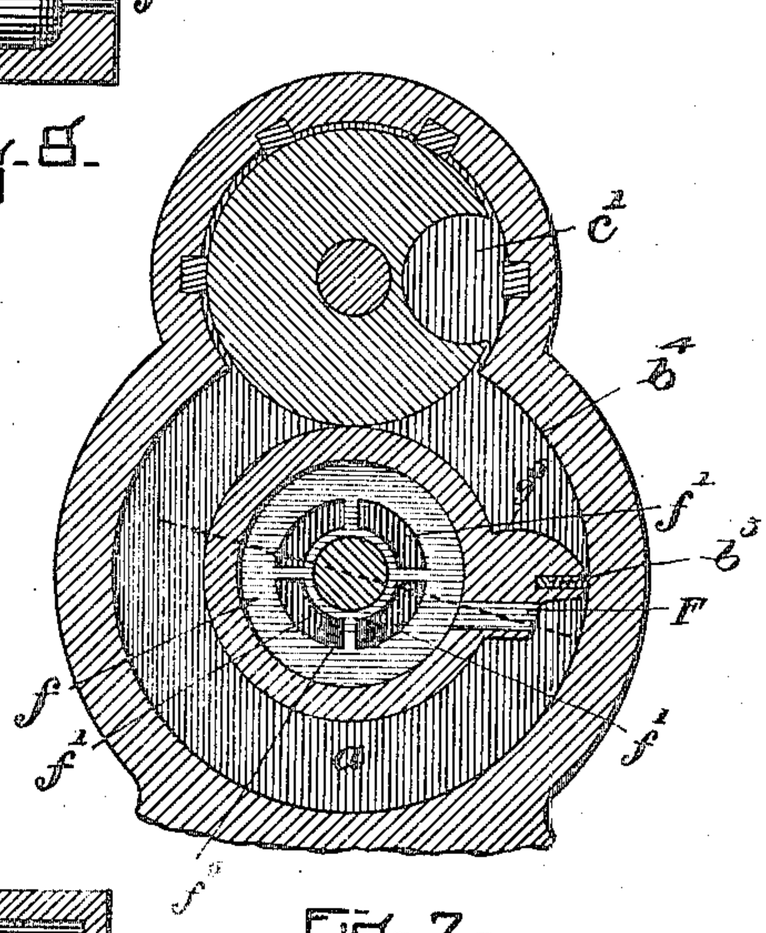

Fig. 7.

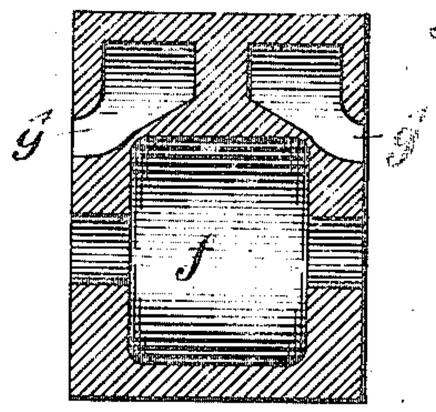

Fig. 6.

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ROTARY STEAM ENGINE.

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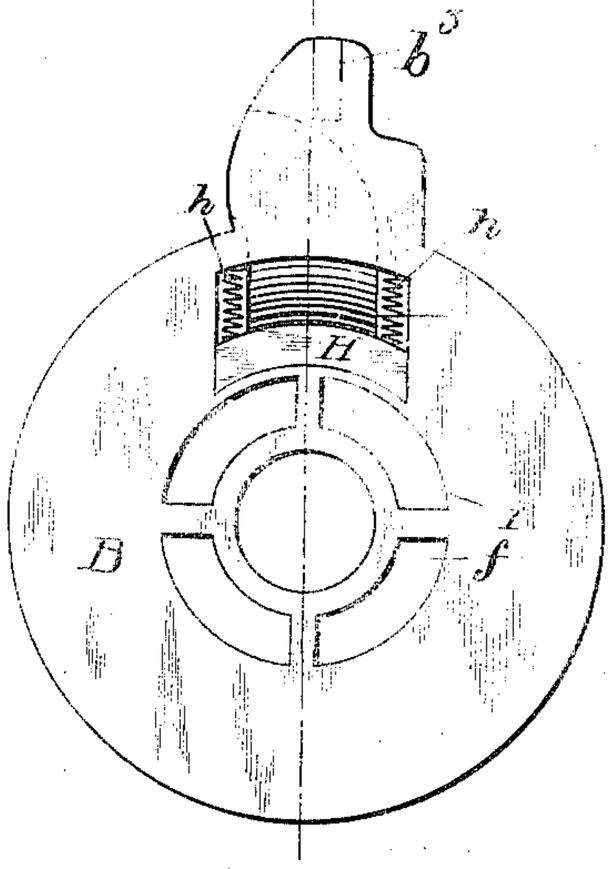

Fig. 9.

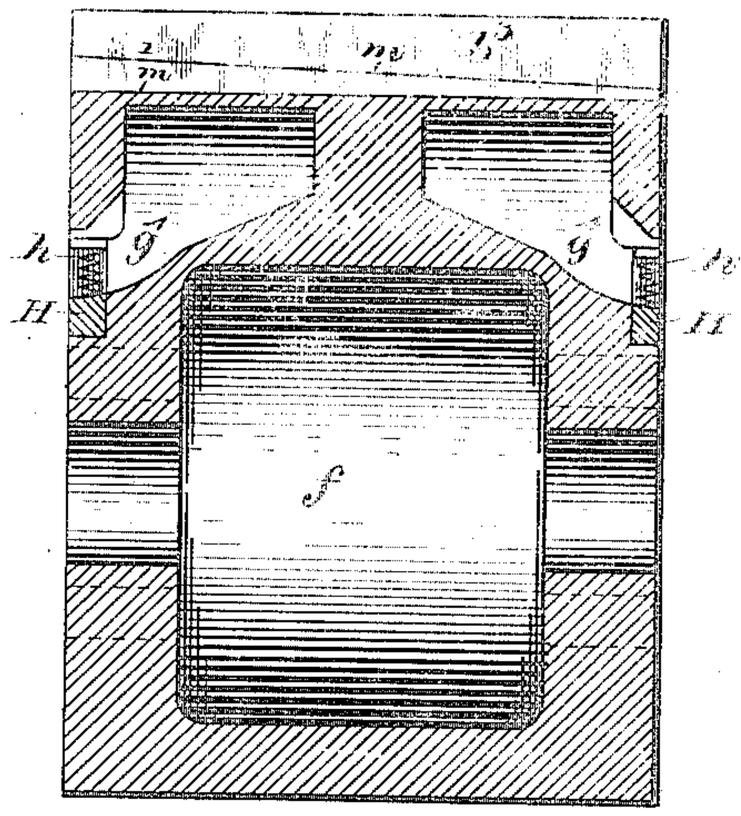

Fig. 10.

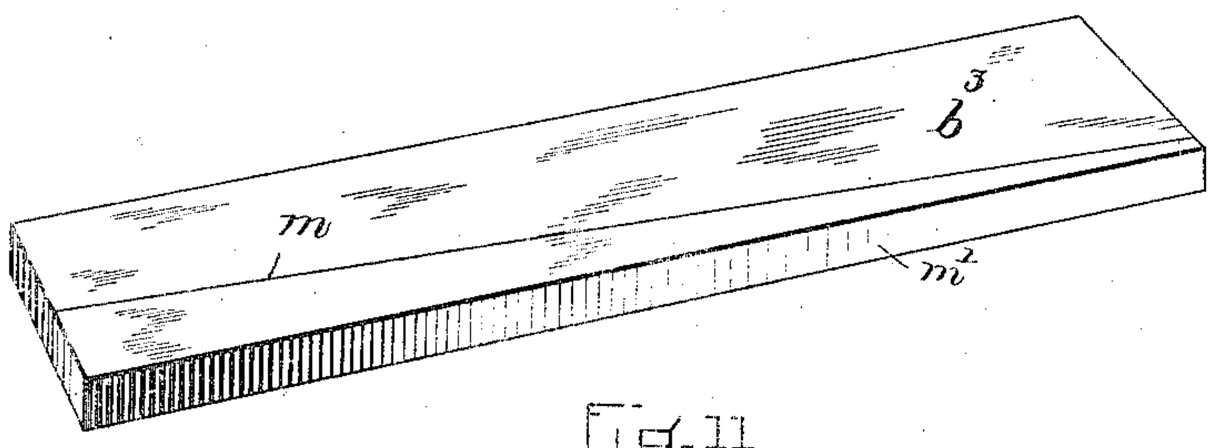

Fig. 11.

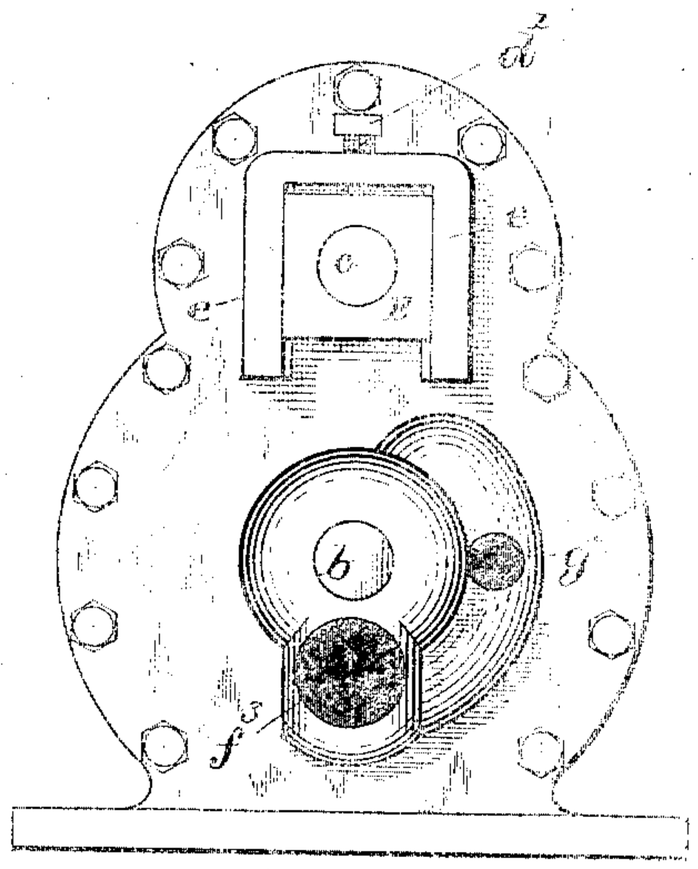

Fig. 12.

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ROTARY STEAM ENGINE.

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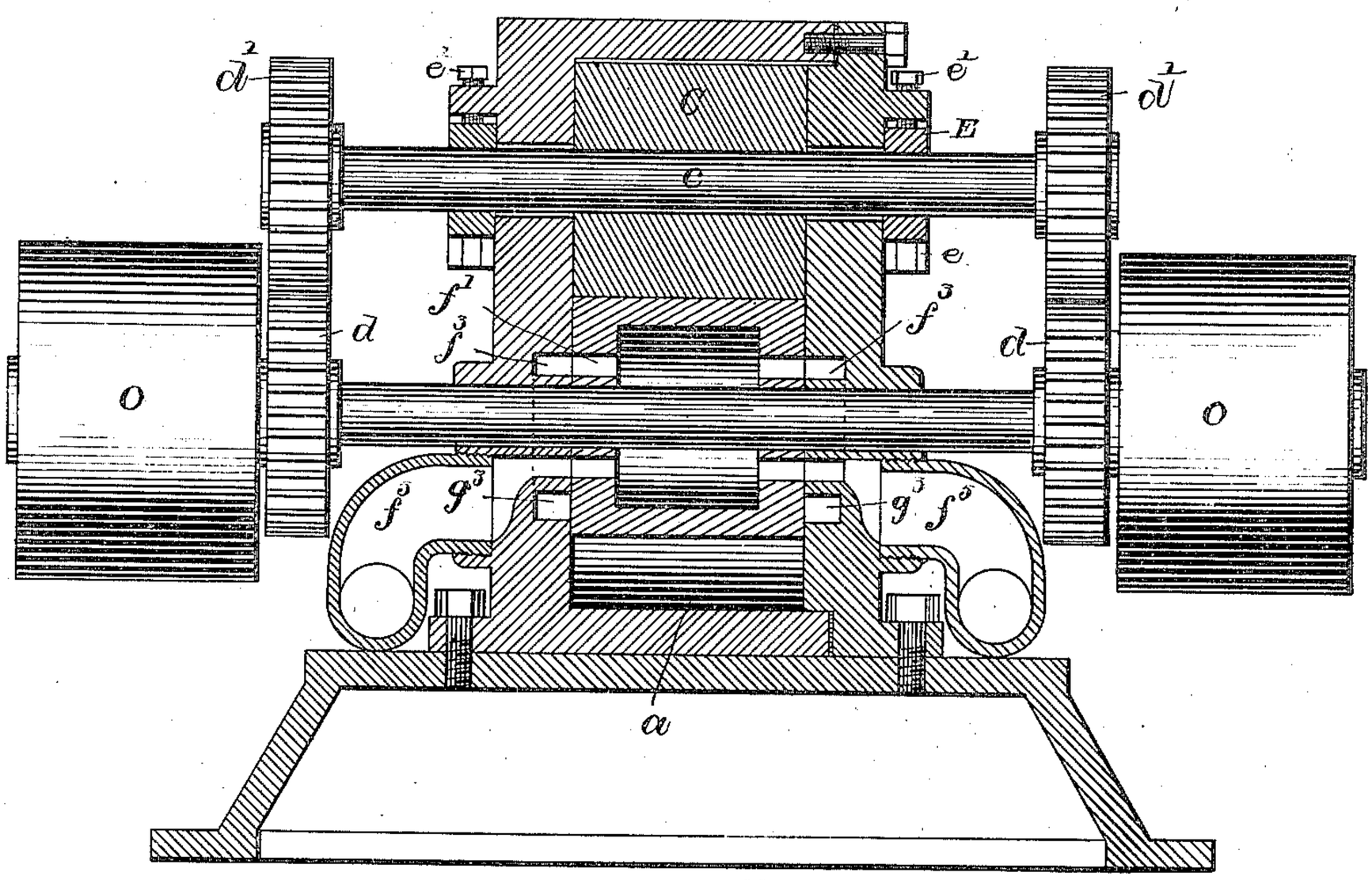

Fig. 13.

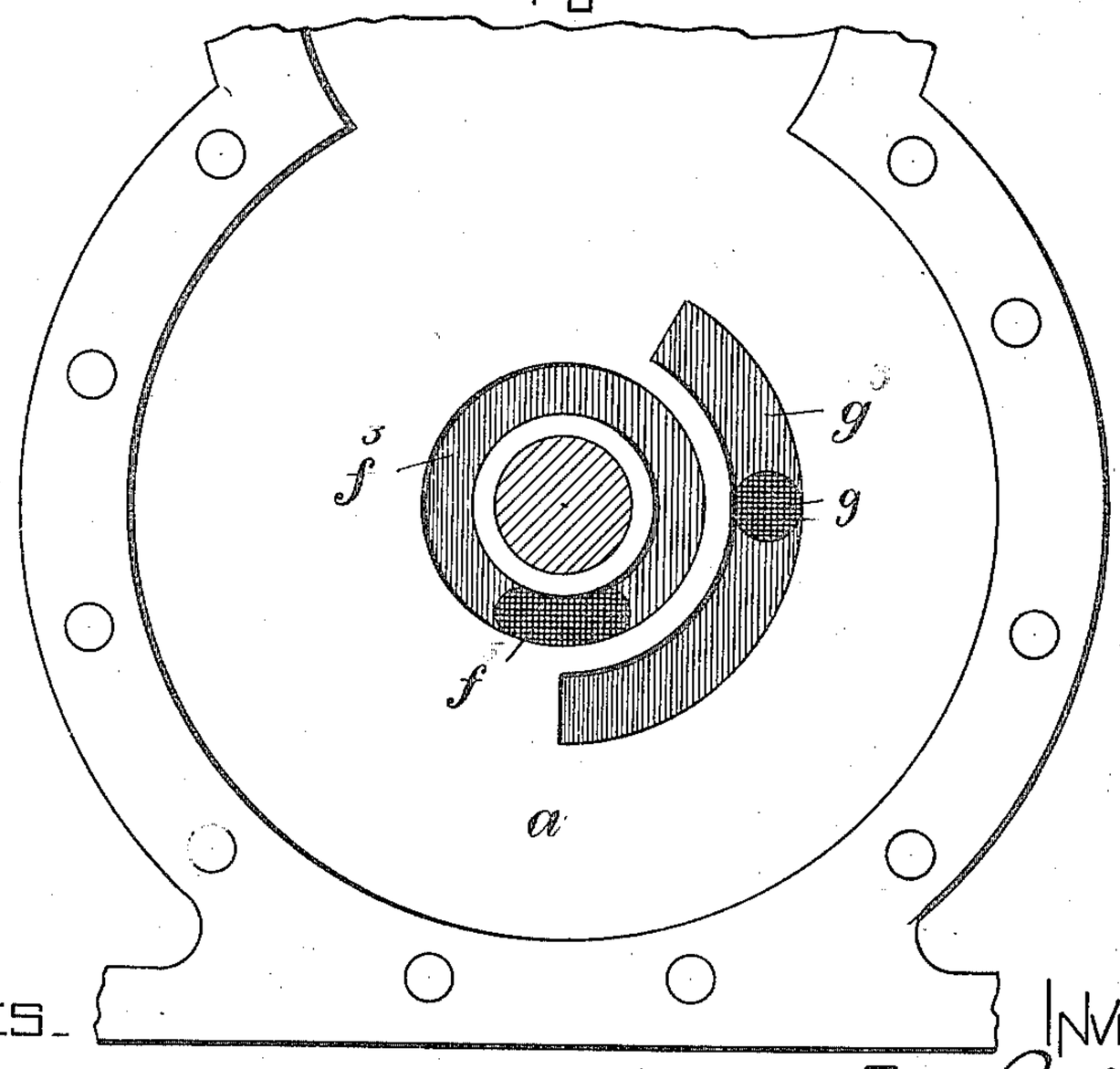

Fig. 14.

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UNITED STATES PATENT OFFICE.

ZENAS R. FARRINGTON, OF PORTLAND, MAINE.

ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 397,707, dated February 12, 1889.

Application filed August 13, 1888. Serial No. 282,603. (No model.)

To all whom it may concern:

Be it known that I, ZENAS R. FARRINGTON, of Portland, in the county of Cumberland and State of Maine, a citizen of the United States, have invented a new and useful Improvement in Rotary Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention relates to a rotary steam-engine having various novel features of construction and organization, all of which will be hereinafter described.

Referring to the drawings, Figure 1 is a vertical central section of the engine. Fig. 2 is a view in elevation thereof. Fig. 3 is a view in elevation of the interior of the case to show the form and arrangement of the ports. Fig. 4 is an elevation of the casing with the piston and abutment in position. Fig. 5 is a vertical section through the casing and drum. Fig. 6 is a section of the piston upon the dotted line of Fig. 5. Fig. 7 is also a vertical section of the casing, piston, and drum. Fig. 8 is a section of the piston upon the dotted line of Fig. 7. Fig. 9 is a view in elevation enlarged, and Fig. 10 in vertical cross-section enlarged, of the piston to illustrate the steam-ports and automatic cut-off hereinafter specified. Fig. 11 is a view enlarged to illustrate the manner of packing the piston projection. Fig. 12 is a view in end elevation illustrating the method of supporting the drum. Fig. 13 illustrates slight modifications in the construction of case of the engine, to which reference will be made. Fig. 14 illustrates an enlarged view to show the inlet and exhaust ports more clearly.

A is the casing of the engine, and it forms the two chambers *a a'*, the first of which forms the piston-chamber and the second of which holds a recessed abutment. The chambers are in the main cylindrical.

B is the piston. It is mounted upon the shaft *b*, and it is cylindrical in form and is centrally mounted in the piston-chamber *a*, and has extending from its surface a projection, *b'*, in which is a packing-holding recess, b^2, holding the packing b^3, the projection extending sufficiently to hold the packing in contact with the surface b^4 of the piston-chamber.

The abutment C is mounted upon the shaft *c* in its chamber *a'*, and has the recess *c'* formed to extend from its edge. The abutment is otherwise cylindrical in shape. The recess *c'* is of a size to receive the projection *b* on the piston as it comes opposite the recess, and the piston and abutment are geared together by gears *d* on the piston-shaft and the gears *d'* on the drum-shaft. (See Fig. 1.) The abutment is of a size to closely fit the chamber *a'*, and packings c^2 are set in recesses in the casing of this chamber to bear against the surface of the abutment. The shaft of the drum preferably is mounted upon the bearing-blocks E, which are vertically movable in guideways *e* upon each end of the case, and there are adjusting-screws *e'* arranged to bear against the slide-blocks E, whereby the blocks are caused to be moved and held in any desired position, thereby moving and holding the shaft *c* and the abutment C into required relation to the piston B. The exhaust from the piston-chamber *a* is through the exhaust-port F in the piston projection *b'*, (see Fig. 7,) the port extending or opening into the cavity *f* in the piston, which extends through the piston and communicates by means of openings *f'* in each end of the piston with the escape exhaust-passages f^2 through the ends or heads of the piston-casing, the said passages f^2 being represented in Fig. 1 as opening into the escape-passages f^3 in the pipes f^5. The pipes are represented as connected with the cylinder-head in the one instance, and an adjustable plate, N, forming the other head of the cylinder in the other instance by screwing into bosses formed or projected therefrom. (See Fig. 1.)

In the construction represented in Fig. 13, where no adjusting plate or head to the cylinder is employed, each head of the cylinder has a boss to receive the end of the exhaust-pipe. The engine exhausts continuously—that is, the exhaust-passage from the piston-chamber is always open or uncontrolled. The steam is supplied the chamber from the steam-supply passages *g g'*, which are represented as formed in the casting to extend from the common opening or inlet g^2. These

passages open into the curved passage g^3 in the inner surface of each head of the piston-chamber, and they deliver steam to the passages g^4, extending from each end of the piston (see Figs. 4 and 6) into the piston projection b', the outlets g^5 being at the rear side of said projection. (See Fig. 5.) By this construction steam is supplied the piston-chamber so long as the ports g^4 are in communication or connection with the curved supply-passages g^3. These supply-passages are represented as formed to furnish steam immediately after the piston projection b' has entered the recess c' of the abutment and to supply steam from that point during as much of the rotation of the piston as may be desired. I prefer that it be supplied for something less than half of the rotation, and that it then be cut off, and that for the remainder of the rotation of the piston the steam act only expansively in the piston-chamber, and not directly. It will thus be seen that, in addition to having a free and continuous exhaust through the piston, the piston also acts as its own valve or cut-off in regulating the feeding of direct steam to the piston-chamber. To automatically regulate the size of the opening, I have mounted in each end of the piston, over or in the port g^4, a slide-regulating valve, H, which is adapted to slide or move in radial ways formed in the end of the piston and to be moved outwardly in opposition to the pressure of the springs h. These slide-valves are balanced by the springs, so that at a certain rate of rotation of the piston they are held in their inmost position and the valves are then wide open. An increase in the speed of the piston tends to throw them outward against the pressure of the spring, the centrifugal force overcoming the tension of the springs sufficiently to permit the plates to diminish the size of the ports and in that way regulate the supply of steam which is being fed to the piston-chamber and the speed of the piston. I prefer that the packing b^3 in the piston projection b' be adjustable to take up for wear and maintain a tight joint, and this I accomplish by making its under surface, m, wedge-shaped or inclined, as represented in Fig. 11, from end to end, and mounting in the groove in the projection which holds it a wedge, m', of less length than the packing, and which is adapted to be driven longitudinally in the recess from time to time, as it is required to set or drive out the packing. I have also represented in Fig. 1 an end plate, N, set in the piston and abutment-chamber, adapted to be moved or set by screws n against the ends of the piston and abutment for the purpose of making a tight joint between their ends and the surfaces of the casing; and where such an adjusting-plate is employed it of course has a passage for the exhaust, and also has the curved passage g^3 connected with the steam-inlet upon its inner surface. Where an adjustable cylinder-head is used, as represented in Fig. 1, each steam-pipe is connected with each head by screwing into a hole formed in a boss extending from each head, and in Fig. 13, which represents the cylinder as having two stationary heads, this boss extends from each head. (See Fig. 12.)

The main shaft carries the pulleys or driving-wheels O O'.

The operation of the engine is as follows: Steam enters the piston-chamber through the steam-supply passages g' g^3 and the ports g^4 of the piston, entering the piston-chamber through the outlet g^5, and the pressure, acting upon the piston projection b', rotates the piston and the abutment C, the surface of the abutment maintaining a continuous contact with the surface of the piston, and the direct steam-supply is continued until the piston rotates sufficiently to bring the ports g^4 beyond the curved passages g^3, when the steam acts expansively for the remainder of the rotation of the piston, or until the piston takes steam again, and the exhaust-steam escapes from the piston-chamber continuously through the exhaust-passage F in the piston projection and the openings f f' in the piston into the passages in the piston-case and connecting-pipes. This rotation of the piston causes the abutment to be rotated in unison with it, and also operates the fly-wheels or driving-pulleys.

The advantages of the invention arise from the simplicity of the construction, from the organization of the exhaust and supply ports, and the construction of the piston, whereby it is made to control its own porting in a cheap, simple, and effective way.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a rotary steam-engine, the combination of the recessed abutment C, the piston B, having the projection b', exhaust-passage F, steam-inlet g^5, and the opening and exhaust-passages f f', extending through the piston, and having also the steam-supply passages g^4, with the casing A, having the ports f^2 f^3 and the curved supply-passages g^3, substantially as described.

2. In a rotary engine, the combination of the casing having the chambers a a', the piston B in the chamber a, the abutment C in the chamber a', having the recess c', the piston-shaft b, abutment-shaft c, and connecting-gearing d d', the projection b' from the piston, the steam-exhaust passage upon one side of said projection extending through the cylinder to its ends, the steam-supply passage upon the other side of said projection extending through the piston to its ends, and the uncontrolled exhaust-outlets through the ends of the casing arranged in line with the exhaust-outlets in the ends of the piston, and the curved supply-passages in the casing ends arranged in line with the openings in the piston ends in the steam-supply passages, substantially as described.

3. The combination, with the rotary piston

having a supply-port, g^4, and radial guides for the segment-shaped valve H, of said valve H and springs h, fitted in recesses in the piston and bearing on said valve, substantially as described.

4. The combination, in a rotary engine, of the casing A, piston-chamber a, piston B, having a projection, b', and the steam-supply passages g^5, extending from the ends of the piston and opening back of the projection b', with the segment-shaped spring-balanced valves H, fitted to radial guides in said piston, substantially as described.

ZENAS R. FARRINGTON.

Witnesses:
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