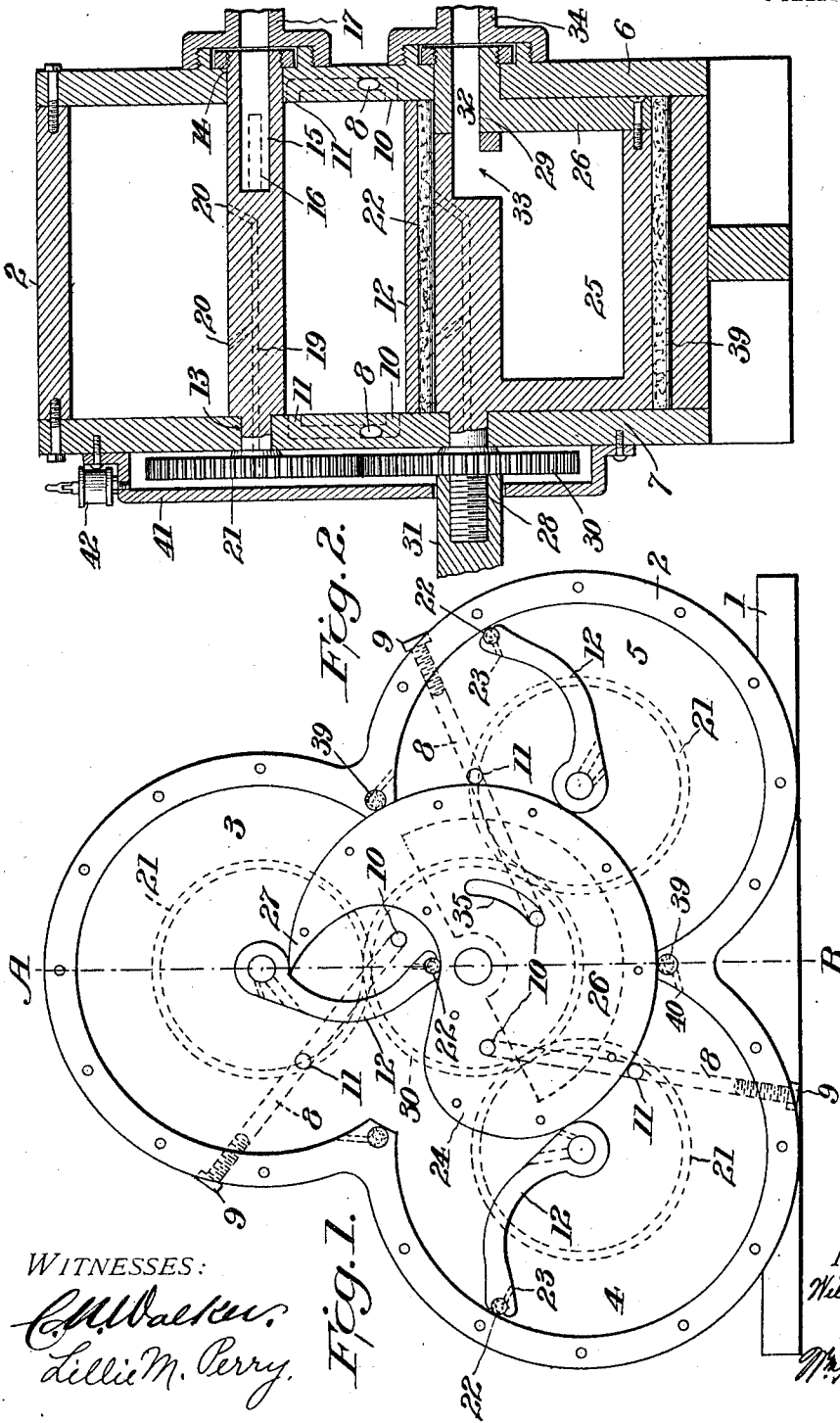


W. H. OGDEN.
 ROTARY STEAM ENGINE.
 APPLICATION FILED MAY 16, 1911.

1,020,841.

Patented Mar. 19, 1912.

3 SHEETS—SHEET 1.



WITNESSES:

C. M. Walker.
Lillie M. Perry.

Fig. 1.

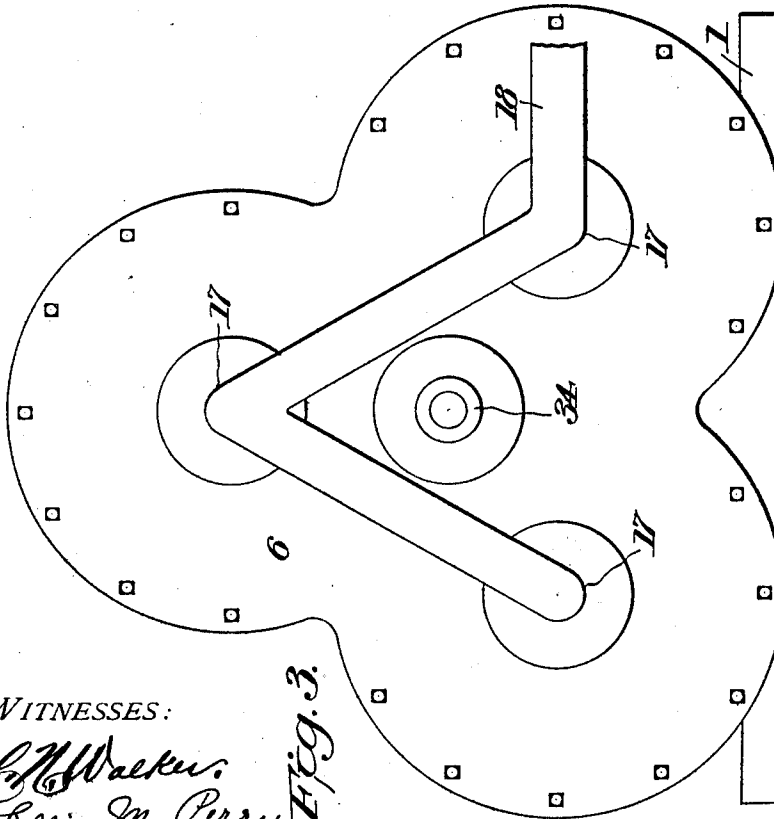
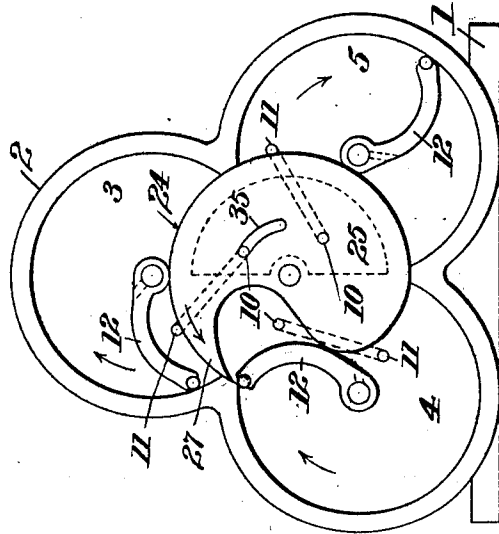
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Fig. 4.



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Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 5.

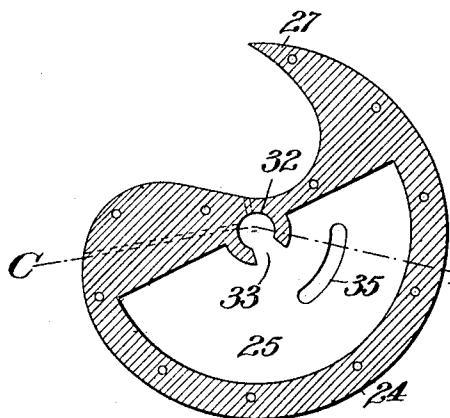


Fig. 6.

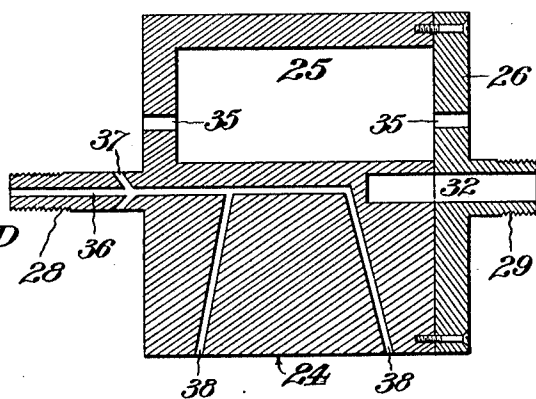


Fig. 7.

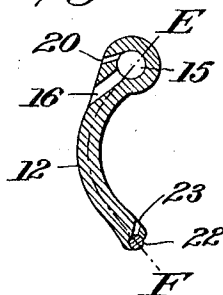
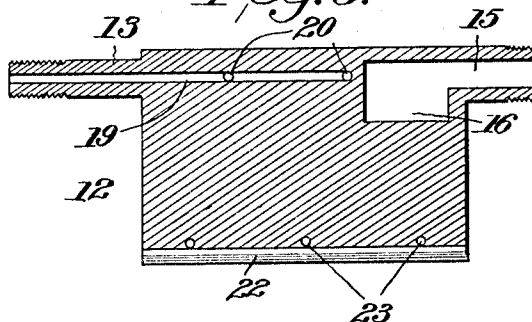


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM H. OGDEN, OF BINGHAMTON, NEW YORK.

ROTARY STEAM-ENGINE.

1,020,841.

Specification of Letters Patent.

Patented Mar. 19, 1912.

Application filed May 16, 1911. Serial No. 627,579.

To all whom it may concern:

Be it known that I, WILLIAM H. OGDEN, a citizen of the United States, residing at Binghamton, in the county of Broome and State of New York, have invented a certain new and useful Improvement in Rotary Steam-Engines, of which the following is a full, clear, and exact description.

The object of this invention is to provide what may be designated a three-cylinder rotary engine having a cumulative pressure effect in operation. A single casing is employed, divided into three chambers or cylinders, in a trefoil arrangement, each of which has a piston in the form of a hinged leaf, and all coöperating with a rotary abutment and steam chest which also serves as a valve to control the steam supply successively to the cylinders, so that one cylinder will be operating under live steam, the next will be operating under expansion, and the next will be exhausting while still under a lower pressure than that last preceding in the cycle.

The invention consists in a rotary steam engine having the characteristics just described; and it further consists in the gearing and steam-supplying or controlling means by which the combinations are effected.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a side elevation, with the near head of the casing removed. Fig. 2 is a vertical section taken in the plane of line A B, Fig. 1. Fig. 3 is a side elevation showing the exhaust arrangement. Fig. 4 is a diagrammatic view like Fig. 1, but with the pistons in position illustrating their respective and relative movements when live steam is being admitted to the uppermost cylinder. Fig. 5 is a cross-section of the steam chest detached. Fig. 6 is a section of the steam chest taken substantially in the plane of line C D, Fig. 5. Fig. 7 is a cross-section of the piston. Fig. 8 is a section of the piston taken substantially in the plane of line E F, Fig. 7.

Upon the base 1 is erected the cylinder casing 2, having the three cylinders 3, 4 and 5. Heads 6 and 7 are bolted or otherwise secured to opposite sides of the casing in any suitable way, to form a steam-tight interior. The heads are provided with similar channels 8, for each cylinder, and these

channels are closed by removable plugs 9, and each of these channels has two lateral ports 10 and 11 opening into the respective cylinders. Each cylinder is provided with a leaf-like concavo-convex piston 12 having trunnions 13 and 14 at opposite ends, and these trunnions have bearings in the heads 6 and 7 whereby each piston is, as it were, hinged in the heads concentrically and is capable of rotary motion within its respective cylinder. That portion of each piston having the trunnions in line forms a sort of knuckle and is herein so designated. Each piston has its end 14 made hollow longitudinally, as at 15, with a lateral port 16 opening into the cylinder, the hollow portions of the several pistons extending outside of the adjacent head 6 and opening into connected pipes 17 for conveying away the exhaust pressure; and these exhaust pipes may open into a common pipe 18 leading to a condenser or other receptacle as desired. Each piston may also have ducts 19 extending longitudinally therein and opening at 20 for lubricating purposes. The trunnion 13 of each piston is supplied with a gear wheel 21. The free end of each piston is supplied with a roller bearing or other antifriction device 22; and in order to make a steam-tight joint between the bearing and the wall of the cylinder the piston is provided with ducts 23 beneath the antifriction device, so as to permit steam to act against the antifriction device, so as to force it against the cylinder wall.

24 is the steam chest, of volute outline in cross-section, having the steam space 25 and the head 26 to inclose it. This steam chest has a hook-like leading end 27. The steam chest is mounted centrally in the casing upon trunnions 28 and 29. Upon the trunnion 28 is mounted a gear wheel 30 which meshes with the gear wheels 21 of the several pistons; and this trunnion 28 also has attached to it the power transmitting shaft 31. The trunnion 29 is provided with a longitudinal channel 32 having a lateral port 33 opening into the steam chest 25, and this trunnion may be connected in any suitable way with a steam supply pipe 34. As shown in Figs. 1, 5 and 6, each head of the steam chest is supplied with a segmental port 35 arranged to communicate with the ports 10 of the channels 8. The trunnion 28 of the steam chest is supplied with ducts 36, from which

open lateral ducts 37 and 38 for the distribution of lubricant. The steam chest makes a steam-tight connection with the dividing walls of the three cylinders by means of the antifriction bearings 39, which serve also as packing, and which may be held up to their work by steam pressure admitted from the cylinders through ducts 40 arranged back of the devices 39.

The gears are preferably inclosed in the casing 41 secured in a fluid-tight manner to the head 7, so as to form an oil chamber, which may be supplied from an oiler 42, and from which chamber the oil is distributed to the parts needing lubrication.

Referring now to Fig. 4, it will be seen that the steam chest has its ports 35 in communication with the port 10 of the cylinder 3, and consequently live steam is escaping from the steam chest through that port and out through port 11 into the steam chamber beneath the concave side of the piston in cylinder 3. This steam chamber is formed, in the first instance, as shown in Fig. 4, by and between the leading end 27 of the steam chest engaging the point of convergence of the walls of cylinders 3 and 4, and the free end of the piston in cylinder 3 engaging the wall of said cylinder. This live steam exerting its pressure against that piston moves it to the right, in the direction of the arrow, while the steam chest itself, assuming that motion is started, moves in the opposite direction. As the motion of the piston in cylinder 3 and the steam chest progresses, the other pistons will be correspondingly moved in the same direction by virtue of the gearing, and when the steam chest is moved sufficiently far to cover the port 10 leading to the cylinder 3, it will uncover the port 10 leading into the cylinder 4, at which time the piston in cylinder 4 will occupy relatively the same position to the steam chest that the piston in cylinder 3 occupied at the start, and admit live steam to the cylinder 4, while the steam in cylinder 3 will be expanding. In the further progress of the motion, the piston in cylinder 5 will be similarly supplied with live steam and the piston in cylinder 4 will be acting under expansion, while the piston in cylinder 3 will be exhausting and resuming its position to receive live steam. In this way steam pressure is present and active in all of the cylinders simultaneously after the initial cycle is completed, and the parts are kept in uninterrupted motion thereafter. The steam chest serves thus as a valve for controlling the steam supply successively to each cylinder.

As illustrated in Fig. 1, the volute outline of the steam chest affords a recess beneath its leading end to afford clearance for the pistons as they successively come opposite the same in their revolutions, the free

ends of these pistons having their antifriction or packing devices in rolling, steam-tight contact with the curved wall of the steam chest, at such times, while at all other times the knuckles of the pistons are in rolling contact with the concentric circular wall of the steam chest. When the pistons successively enter that stage of their motion shown in cylinder 4, Fig. 4, the exhaust becomes fully operative. It will be understood that the exhaust ports are always open ahead of the direction of motion of the pistons and consequently the cylinders are freed from back pressure, and not only so, but the pull of the condenser in taking the exhaust aids the live steam in working the pistons.

I have shown my invention as utilized in a cluster of three cylinders, arranged so that they become active successively, but wish it understood that I do not limit the invention to the number of cylinders employed. The three-cylinder arrangement would seem to afford the most economical and effective use of steam.

It will be observed that the steam chest is in rolling contact with the knuckles of the pistons, and this contact is sufficiently close to form a substantially steam-tight joint, this characteristic of the joint being enhanced by the constant lubrication of the parts in the manner already described.

What I claim is:—

1. A rotary steam engine, having a cluster of cylinders, a steam chest common to the several cylinders, means to admit steam into said steam chest, and a steam outlet port opening out of said chest, a revolving piston in each cylinder, independent steam ports for the several cylinders, and means to turn the steam chest and the pistons in unison, said steam chest serving to deliver its contained steam to the cylinders and to control the steam ports leading into the several cylinders and as an abutment for said pistons.

2. A rotary steam engine, comprising a single casing having three cylinders in a trefoil arrangement, a hinged leaf rotary piston in each cylinder, a rotary steam chest, means to admit steam into said steam chest, and a steam outlet port opening out of said chest, gears connecting the pistons and steam chest to turn in unison, the pistons turning in one direction and the steam chest in the reverse direction, and steam ports leading separately into the several cylinders and through which the steam supply from the steam chest to the cylinders is controlled by the steam chest, said steam chest serving also as an abutment for the pistons.

3. A rotary steam engine, comprising a single casing having three cylinders in a trefoil arrangement, a hinged leaf rotary piston in each cylinder, a rotary steam chest

and abutment mounted centrally between the three cylinders and geared to turn in the opposite direction to the pistons, means to admit steam into said steam chest, and a steam outlet port opening out of said chest, a separate steam channel opening into each cylinder and having its intake in the path of movement of the steam chest, the said steam chest successively admitting its live steam to the several cylinders through said channels, so that while live steam is entering one cylinder, steam previously admitted into the next successive cylinder in the direction of movement of the steam chest will be expanding, and the next succeeding cylinder will be exhausting.

4. A rotary steam engine, having a cluster of cylinders, a revolving piston in each cylinder, a steam chest of volute shape in cross-section arranged between the several cylinders and in steam-tight contact at all times with the several pistons, a casing common to said cylinders and steam chest, means to turn the pistons and steam chest in unison but in opposite directions, and independent steam inlets for the several cylinders, the steam chest serving to control said inlets successively.

5. A rotary steam engine, having a cluster of cylinders, a revolving piston in each cylinder, a rotary steam chest mounted between the several pistons and in steam-tight con-

tact at all times with said pistons either through their knuckles or their free ends during the cycle of movement of each, independent steam inlets for each cylinder, independent exhausts for each cylinder, and a casing common to all of these parts, the steam chest rotating within the casing and serving as a valve to control the admission of steam successively to the cylinders.

6. A rotary steam engine, having a cluster of cylinders in a single casing with heads common to all, a revolving leaf-like piston in each cylinder, said pistons mounted to turn in said heads and having axially arranged exhausts, a volute-shaped rotary steam chest mounted to turn in said heads between the pistons and in steam-tight connection with the pistons, casing and heads, the pistons and steam chest being connected to turn in unison but in opposite directions, an independent steam inlet for each cylinder, and means to supply steam to the steam chest, said steam chest in its rotation serving to successively admit steam to and cut it off from the cylinders.

In testimony whereof I have hereunto set my hand this 15th day of May, A. D. 1911.

WILLIAM H. OGDEN.

Witnesses:

WILLIAM H. RILEY,
J. A. CAMPBELL.