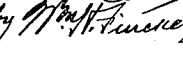
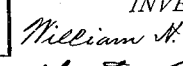
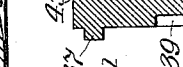
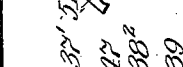
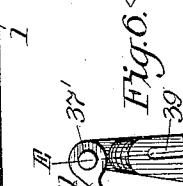
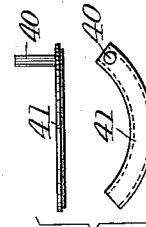
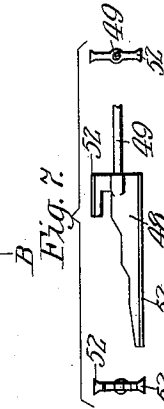
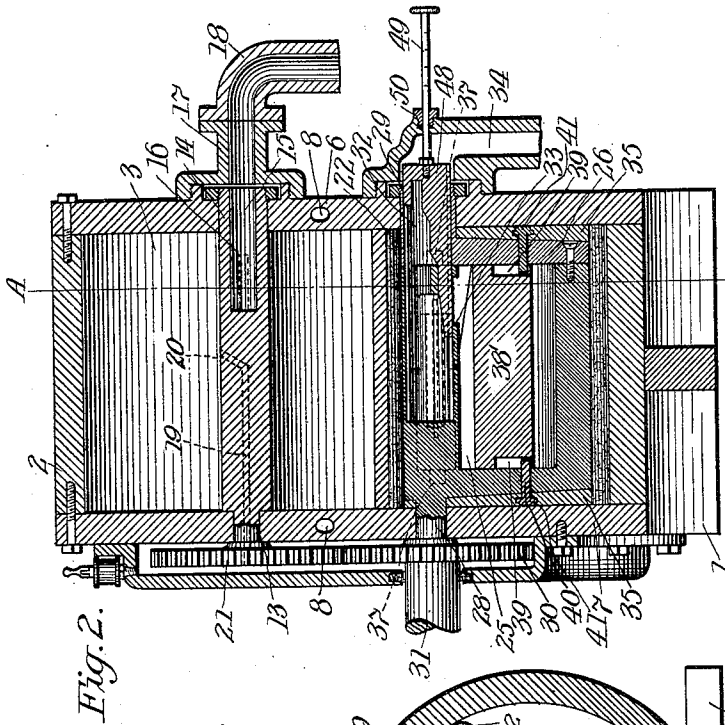


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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

1,060,699.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed June 6, 1912. Serial No. 702,081.

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 Automatic Cut-Offs and Governors for Rotary Engines, of which the following is a full, clear, and exact description.

10 This invention relates to steam engines of the rotary type, and more particularly to engines such as that shown in my Patent No. 1,020,841, dated March 19, 1912, and has for its object to provide means whereby the admission of steam and the speed of the engine may be governed and controlled.

Without thereby limiting the applicability of the invention, but for the purposes of a concrete example, I will state the nature of the invention as used in the rotary engine of the patent mentioned, wherein a rotary abutment and steam chest combined in one structure operates in conjunction with leaf-like pistons to admit steam successively to said pistons and cut it off, the combined abutment and steam chest and the pistons being geared together.

20 The invention consists in a centrifugally acting cut-off and governor hung eccentrically within the steam chamber of the combined abutment and steam chest, by means of independently movable trunnions, one of which has a sleeve-like bearing within the other and the two adapted to turn together and also axially with relation one to the other. Interposed between and connecting these two trunnion parts is a torsion spring which is put under tension by the relative movement of the two parts. The throw of the cut-off and governor is regulated by means of a device which coöperates with one of the trunnion members to vary the tension of the torsion spring and to serve as a sort of throttle. The lower end of the cut-off and governor is connected by means of radial recesses with the inwardly projecting fingers of two slides which tend upon the oscillation of the cut-off and governor to open or close the oppositely disposed ports of the steam chest, all as I will proceed now more particularly to explain and finally claim.

55 In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a vertical longitudinal section

through the engine, taken in the plane of line A B, Fig. 2. Fig. 2 is a vertical transverse section taken in the plane of line C D, Fig. 1, and looking in the direction of the arrow. Fig. 3 is a longitudinal section of the cut-off and governor, taken in the plane of line E F, Fig. 4. Fig. 4 is a side elevation of the cut-off and governor. Fig. 5 is a cross-section in the plane of line G H, Fig. 3, and showing in dotted lines its two parts moved relatively to each other and the spring under tension. Fig. 6 shows in side elevation and plan view the adjusting slide. Fig. 7 shows, reading from left to right, an inner end view, a side view and an outer end view of the spring tensioning wedge.

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 de-

vice, so as to force it against the cylinder wall.

24 is the device herein referred to as the abutment and steam chest. This device, for brevity, will be hereinafter referred to simply as the steam chest. This steam chest is of volute outline in cross-section, having the steam space 25 and the head 26 to inclose it, and the 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 space 25, and this trunnion may be connected in any suitable way with a steam supply pipe 34. As shown in Fig. 2, the steam chest 24 is provided with a spiral packing 35 at either side, of the type shown and described in my Patent No. 1,020,842, of March 19, 1912. The steam chest 24 is provided with segmental ports 36 which register during the rotation of the steam chest 24 with the ports 10 leading into the cylinders.

Supported by trunnions 37, 37', having bearings in opposite sides of the steam chamber 25 of the steam chest 24, is the device 38 herein referred to as the cut-off and governor, which operates by centrifugal force during the rotation of the steam chest. This device comprises three connected members, namely, the main body 38' and its integral trunnion 37; the dogging member 38² and its trunnion 37', and the connecting torsion spring presently mentioned. At the sides of the swinging end of the device 38 are two recesses 39. These recesses engage the fingers 40 of segmental plates 41 which seat in the guideways 42 of the ports 36 and operate as slide valves. When the device 38 moves it pulls these plates 41 with it and thereby either opens or closes the ports 36, in this way increasing or diminishing the amount of port opening and hence the length of time in which it registers with the ports 10 of the cylinders, thus increasing or diminishing the time of taking steam for the cylinders and increasing or diminishing the expansion of steam in the cylinders.

The trunnions 37, 37' which suspend the device 38 are on separate members, as shown most clearly in Fig. 3. Trunnion 37 is integral with the member 38' while trunnion 37' is integral with the member 38². The member 38² has a tubular extension 43 which forms a bearing for the tubular extension 44 of the member 38'. The extension 44 has at its inner end a rectangular recess 45 in which is snugly fitted one end of a torsion spring 46, here shown as a piece of flat

spring steel. The other end of this spring is fitted in a similar recess 47 in the member 38². Any relative movement of the members 38' and 38² will add tension to the spring 46 and the greater the relative movement of the members 38' and 38² the greater the torque on the spring 46.

For the purpose of manually controlling the tension of the spring 46, I have provided the stepped wedge 48 which is operated by the rod 49, extending through the gland 50 in the steam inlet pipe 34. This wedge acts upon a dog 51 on or made integral with the member 38². The wedge 48 has at its top and bottom, beveled flanges 52 which register with corresponding grooves in the interior of the steam passage 32. Thus it will be seen that the wedge and its rod 49 will turn with the steam chest 24. As shown in Fig. 2, the rod 49 may be graduated to indicate the positions of the wedge. The dog 51 of the cut-off and governor overhangs port 33 and as the wedge lifts or lowers it, it may open and close this port 33, thus forming a kind of throttle, which regulates the pressure of steam in the steam chest.

The operation of the device is as follows:—Assuming that the engine is running, and that the wedge is in the position shown in Fig. 2, when there is no tension on the spring, then the cut-off and governor will tend to swing forward in the direction of motion of the steam chest 24 and close the valve port 36. Now the movement of the cut-off and governor will cause its member 38' to move with relation to the member 38² and the tendency of the spring 46 will be to push the parts back to their normal or wide open position. Of course, the closing or partial closing of the port 36 will tend to lower the speed of the engine, and if it is desired to let the engine run slowly, the wedge will be left in its withdrawn position, as shown in Fig. 2. If it is desired that the engine run at a higher speed, the wedge is pushed in to its next step, which puts the spring under tension and makes it more difficult for the cut-off and governor to close the port 36 by centrifugal force. If a higher speed is desired, the wedge is pushed in to its next step, giving an increase of speed in a manner similar to that just described. Of course there may be any desired number of steps on the wedge, and it may be stopped in a position where the dog 51 is on one of the elevating inclines. As shown in Fig. 2, the rod 49 may be graduated to indicate the various speeds to which the engine may be set by the movement of the wedge 48 with relation to the dog. The wedge herein explained operates through the dog not only to regulate the torque of the spring, but also to open and close the intake port 33

leading from the intake passage to the steam chest, and this action increases or decreases the pressure of steam in the steam chest very much like a throttle. Furthermore, the sliding plates 41 in the heads of the steam chest (or in the spiral packing when the latter is used), serve as valves which without affecting the steam pressure serve to regulate the time during which the cylinders receive live steam at the steam chest pressure. This permits a cut-off for each cylinder varying from one-third to complete. From the action of these two features of the invention, in combination with outside throttle valve, it is possible to have a very large variation in both speed and power, or in either, and adjustable at will. Thus, one may automatically maintain the same power at various speeds, or the same speed at various powers. The segmental plates 41 in their movement act as cut-off. In a three cylinder machine the ports 36 are one-third stroke (to avoid dead center). The plates 41 acted upon by member 38' cut off from one-third to complete. This cut-off would act in accordance with the load of the machine, maintaining the same speed at various powers required, and using steam only as needed to maintain the speed, with greatest efficiency of expansion. The action of the wedge on the torsion spring multiplies the possible variations in speed and expansion. These parts in combination with the usual intake throttle valve afford great variation in speed, power and steam economy. One may have the same power at various speeds through outside throttle, wedge and torsion of spring, or the same speed at various powers through the action of cut-off of sliding plates 41.

I do not wish to limit my invention to the exact structure shown, for various changes may be made in construction without departing from the invention.

What I claim is:—

1. In an engine, the combination with the cylinder and a piston therein, of a combined abutment and steam chest, means to rotate said abutment and steam chest, and means mounted within and turning with said abutment and steam chest and capable of independent movement to regulate the speed of the engine.

2. In an engine, the combination with the cylinders and pistons therein, of a combined abutment and steam chest having port openings, means to rotate said abutment and steam chest, and means mounted within and turning with said abutment and steam chest and cooperating with said port openings to regulate the speed of the engine.

3. In a rotary engine, the combination with the cylinders and pistons therein, of a combined rotary abutment and steam chest coacting with said pistons having a centrif-

ugal governor mounted therein and means controlled by said governor for regulating the speed of the engine.

4. In a rotary engine, the combination with the cylinders and pistons therein, of a combined abutment and steam chest having segmental ports, valves applied to said ports, means to rotate said abutment and steam chest, and means mounted within said abutment and steam chest and connected with said valves and adapted to automatically control the area of said ports.

5. In a rotary steam engine, the combination with the cylinders and pistons therein, of a steam chest having segmental ports, segmental slide valves adapted to slide in ways formed in said ports, a governor adapted to swing on an eccentric axis within said steam chest, a spring tensioning device embodied in said governor, and connections between said governor and said valves, whereby the length of port opening is varied according to the tension of said spring for controlling the admission of steam to the cylinders.

6. In a rotary engine, the combination with a piston, a cylinder, and a rotary steam chest having a steam chamber, of a cut-off and governor pivotally mounted in said steam chest and comprising two members and a connecting torsion spring, and valves actuated by the cut-off and governor to control the supply of steam from the steam chest to the piston.

7. In a rotary engine, the combination with several cylinders, a piston in each cylinder, and a rotary steam chest common to all of the cylinders, a steam intake being provided for the steam chest, and said steam chest having ports to admit steam to the several cylinders successively, of a cut-off and governor pivotally mounted in the steam chest, and slide valves covering the outlet ports of the steam chest and connected with and operated by the cut-off and governor.

8. In a rotary engine, the combination with several cylinders, a piston in each cylinder, and a rotary steam chest common to all of said cylinders, a steam intake being arranged axially of the steam chest, and said steam chest having ports to admit steam to the several cylinders successively, of a cut-off and governor pivotally mounted in the steam chest, and slide valves covering the outlet ports of the steam chest and connected with and operated by the cut-off and governor, said cut-off and governor comprising two members movably connected and one of said members having a dog projecting into the intake, and an adjusting device arranged in the intake and cooperating with said dog to position the cut-off and governor.

9. In a rotary engine, a rotary steam chest having inlet and outlet ports, combined with a governor eccentrically pivoted there-

in and comprising two members movable with relation to one another, and a spring connection torsionally uniting said members.

- 5 10. In a rotary engine, a rotary steam chest having inlet and outlet ports, combined with a governor eccentrically pivoted therein and comprising two relatively movable members and a spring connection torsionally uniting said members, one of said mem-
10 bers having a laterally extended dog projecting into the intake, and an adjusting device coöperating with said dog.

11. In a rotary engine, a rotary steam

chest having inlet and outlet ports, com- 15
bined with a governor eccentrically pivoted therein and comprising two relatively movable members and a spring connection torsionally uniting said members, slide valves applied to the outlet ports of the steam chest, 20
and means to connect said slide valves with said governor.

In testimony whereof I have hereunto set my hand this 5th day of June A. D. 1912.

WILLIAM H. OGDEN.

Witnesses:

E. DAY CLARK,
OUIDA JENISON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."