(No Model.) 2 Sheets—Sheet 1.

W. E. PRALL, Jr.

CLUTCHING MECHANISM FOR ROTARY ENGINES.

No. 562,153. Patented June 16, 1896.

FIG. 1.

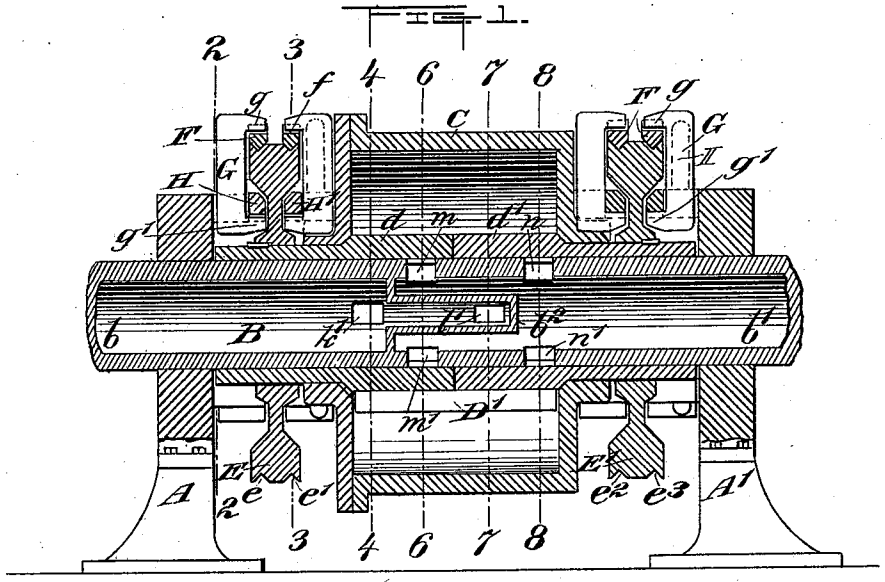


FIG. 2.

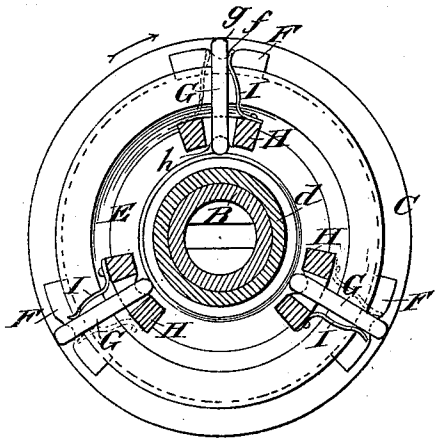
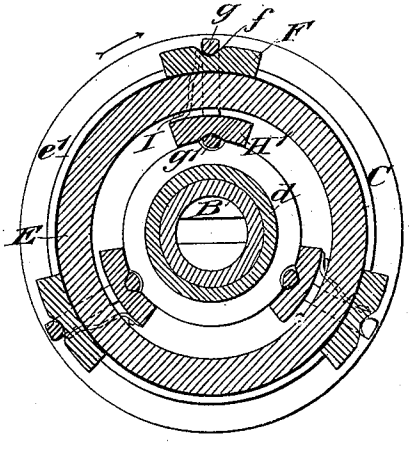


FIG. 3.



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Inventor
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(No Model.) 2 Sheets—Sheet 2.

W. E. PRALL, Jr.

CLUTCHING MECHANISM FOR ROTARY ENGINES.

No. 562,153. Patented June 16, 1896.

FIG. 4.

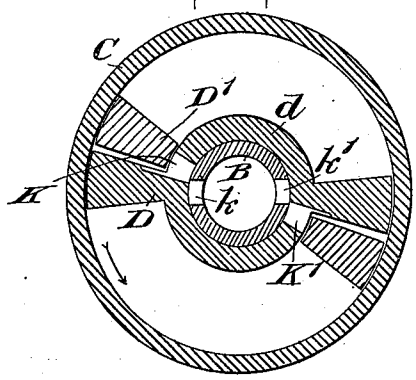


FIG. 5.

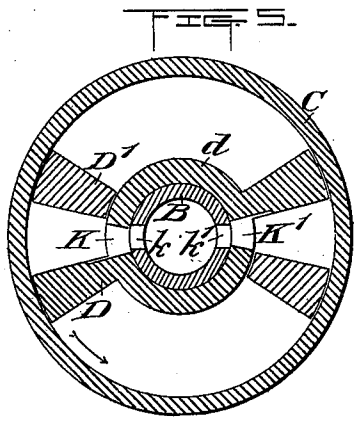


FIG. 6.

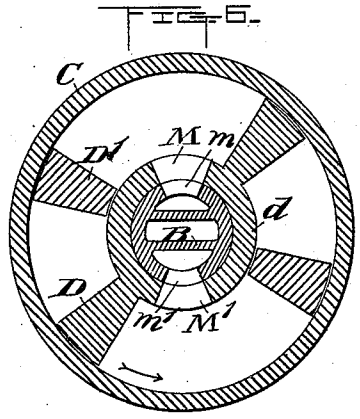


FIG. 7.

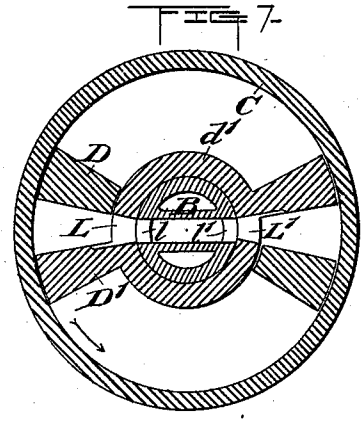
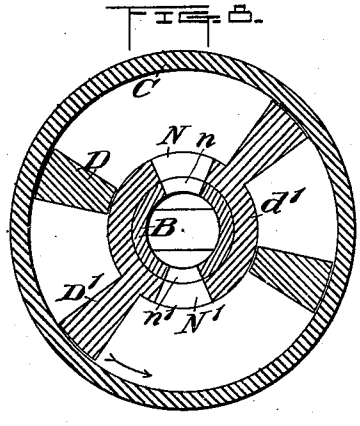


FIG. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM E. PRALL, JR., OF NEW YORK, N. Y.

CLUTCHING MECHANISM FOR ROTARY ENGINES.

SPECIFICATION forming part of Letters Patent No. 562,153, dated June 16, 1896.

Application filed March 14, 1896. Serial No. 583,172. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. PRALL, JR., of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Clutching Mechanism for Rotary Engines, of which the following is a specification.

My invention relates to an improvement in clutching mechanism for rotary engines in which a rotary part, either the cylinder or the shaft, in the present instance the cylinder, is constructed to be clutched to one of a plurality of rotary pistons within the cylinder, while another of said rotary pistons is clutched to a part fixed with respect to the rotary cylinder. The structure is such that the rotary pistons are forced alternately in the same direction under the pressure of the actuating fluid, which may be either steam or gas, and alternately clutched to the stationary part to form an abutment for the actuating fluid.

In the accompanying drawings, Figure 1 is a view of the engine in longitudinal vertical section. Fig. 2 is a view in transverse section on the plane of the line 2 2 of Fig. 1 looking toward the right as the drawing is held in reading. Fig. 3 is a transverse section on the plane of the line 3 3 of Fig. 1 looking in the same direction. Fig. 4 is a transverse section on the plane of line 4 4 of Fig. 1 looking toward the left as the drawing is held in reading. Fig. 5 is a similar view on the plane of the line 4 4 of Fig. 1 looking in the same direction and showing the position of the pistons when they have advanced from the position where one is about taking steam to the position of steam-port full open. Fig. 6 is a similar view on the plane of line 6 6 of Fig. 1, showing the position of the pistons when one of them is advanced to the position of full-open exhaust. Fig. 7 is a similar view on the plane of line 7 7 of Fig. 1, showing the companion piston in the position of steam-inlet port full open; and Fig. 8 is a similar view on the plane of line 8 8 of Fig. 1, showing the companion piston advanced to the position of full exhaust.

In using the word "steam" in connection with the description of the structure and operation of the parts, I wish to be understood as referring to the actuating fluid, whether it be steam or gas.

In suitable supports A A there is fixed a hollow shaft B, which is utilized for supporting the rotary pistons and the rotary cylinder mounted on the hubs of the pistons and also for the transmission of the actuating fluid and its escape from the interior of the cylinder. The end of the shaft B for the inlet of the actuating fluid is denoted by b and the outlet end by b'.

The cylinder C is mounted at its ends upon the hubs d d' of the pistons D D', which hubs are in turn mounted upon the shaft B and extend beyond the ends of the cylinder where they are provided with clutching wheels or disks E E', fixed to rotate with the pistons, the wheel or disk E with the piston D and the wheel or disk E' with the piston D'.

The peripheries of the disks E E' are each provided with a pair of annular grooves, in the present instance made V-shaped in cross-section, the grooves on the periphery of the disk E being denoted by e e' and those on the disk E' by e^2 e^3. Along these grooves e e' e^2 e^3 clutching-shoes F are located for the purpose of temporarily clutching the pistons alternately to the cylinder and to a stationary support. In the present instance I have prepared three of these clutching-shoes in each of the grooves in the peripheries of the clutching-disks; but the number may be greater or less than three, as may be found most desirable. The clutching-shoes are quite similar to one another and are each made with a V-shaped inner face to correspond to the groove in the clutching-disk and of a curved form corresponding to the arc of the periphery of the clutching-disk, and intermediate of their ends they are provided with a depression f for the reception of a loose connection, which I call a "toggle-clip." The so-called "toggle-clip" consists of a body portion G, provided with laterally-extending noses g g', one at its upper and one at its lower end, the nose g at its upper end being adapted to rest within the depression f in the back of the clutching-shoe and the nose g' being adapted to rest within a depression h in the inner side of the cross-head of a loop projecting either from the cylinder-head or from the fixed support, those

projecting from the fixed support being denoted by II and those projecting from the heads of the cylinder being denoted by II'. As a matter of convenience and economy in structure, I make the rims of the clutching-disks E E' broader than the web portion, so that the heads of the loops II II' may be located in the same transverse plane as the clutching-shoes in the grooves on the peripheries of the clutching-disks, as clearly shown in Fig. 1.

The toggle-clips have sufficient play in their engagement with the clutching-shoes and the loops II II' to permit the clutching-shoes to ride loosely along the grooves in the peripheries of the clutching-disks when the toggle-clips occupy positions along radial lines with respect to the axis of rotation; but when the said toggle-clips are thrown into an oblique position the tendency is to promptly draw the clutching-shoe inwardly into snug frictional contact with the periphery of the clutching-disk and thereby lock the clutching-disk either to the cylinder or to the stationary support depending upon the particular set of toggle-clips which, for the moment, are brought into oblique positions.

Each toggle-clip has its upper portion normally pressed slightly to one side by means of a spring I, the springs for pressing the clips for locking the clutching-disk to the fixed support being fixed to the loops II and those for tilting the clips for locking the clutching-disk to the cylinder being fixed to the loops II' and compressed upon the clips in the opposite direction from that in which the springs fixed to the loops II press. The object of this arrangement and action of the springs is to hold the clutch-shoes in such relation to the periphery of the clutching-disk that when the clutching-disk is operated in the direction corresponding to that in which the springs press the tendency will be to throw the shoe into snug contact with the disk and cause it to drag after it, in its rotary movement, the part to which the toggle-clips are secured. If such part be the rotary part, in the present instance the cylinder, it will be carried along with the clutching-disk, but if it be the stationary part the clutching-disk will be held against a rotary movement by such clutching action. When, however, the clutching-disk is rotated in a direction opposite that in which the springs press, the tendency will be to prevent the clutching-shoe from coming into snug contact with the periphery of the clutching-disk and it will be permitted to rotate freely in that direction.

As there are sets of toggle-clips at each end of the cylinder, one set for locking the cylinder to one of the rotary pistons and the other set for locking the cylinder to the other rotary piston, and in connection with these sets of toggle-clips for locking the pistons to the cylinder there are also located, at the opposite ends of the cylinder, sets of clips—one set for locking one of the pistons to the fixed support and the other set for locking the other piston to the fixed support. It follows that one of the pistons may be, by means of its clutching-disk, locked to the cylinder, while the other piston, by means of its clutching-disk, is locked to the fixed support, and the remaining sets of clutching-shoes may be, for the time being, released from the peripheries of the clutching-disks, and such an arrangement is practically carried into effect by the location of the springs I, as shown in the drawings, which tend to press the sets of toggle-clips for locking the clutching-disks to the cylinders in the opposite direction from that in which the toggle-clips are pressed for locking the clutching-disks to the fixed support.

The actuating fluid for advancing the pistons within the cylinder is admitted from the interior of the shaft B to the space between the pistons in the cylinder and discharged from said space by ports formed in the wall of the shaft B and in the hubs of the pistons as follows: The interior of the shaft B is provided with a diaphragm b^2, which separates the high-pressure actuating fluid from the low pressure or exhaust, the diaphragm b^2 being provided with a centrally-elongated loop, as clearly shown in Fig. 1, so as to admit of the location of the inlet-ports within the transverse planes through the hubs of the two pistons. The inlet-ports through the hub of the piston D are denoted by K K' (see Fig. 4) and the corresponding inlet-ports in the shaft B by k k'. The inlet-ports through the hub of the piston D' are denoted by L L' (see Fig. 7) and the corresponding inlet-ports in the shaft B by l l'. The exhaust-ports in the hub of the piston D are denoted by M M' (see Fig. 6) and the corresponding ports in the shaft B by m m'. The exhaust-ports in the hub of the piston D' are denoted by N N' and the corresponding outlet-ports in the shaft B by n n'.

The operation is as follows: Referring to the sections, (shown in Figs. 4, 5, 6, 7, and 8,) as the piston D moves in the direction of the arrow to admit the actuating fluid through the ports k k' K K' into the spaces between the two pistons it will have a tendency to rotate them in opposite directions. The piston D' is prevented from rotating in the direction in which it is pressed by the actuating fluid, because of the tendency of the toggle-clips in engagement with its clutching-disk to hold it tightly to the fixed support; but the piston D is free to advance in the direction in which it is pressed, because of the tendency of the toggle-clips on its clutching-disk to release it from the fixed support. The movement of the disk D in the direction of the arrow tends, however, to lock its clutching-disk to the cylinder and it will therefore drag around with it, in its rotary movement, the cylinder C. As it approaches the position of the piston D', it will after passing the position of full-open inlet (shown in Fig. 5) and the full-open exhaust (shown in Fig. 6) cushion against the

piston D′, tending to start it upon a rotary movement in the same direction in which the piston D was rotated. This will free the piston D′ from the fixed support to which it was clutched and will, by its rotary movement, open the inlet-ports L L′ *l l′* (see Fig. 7) for the admission of the actuating fluid, which will continue to press it forward in the direction in which it started and will, at the same time, tend to press the piston D in the opposite direction from that in which it was rotating. The piston D will in turn, however, be clutched to the fixed support when any tendency is exerted upon it to rotate it in the opposite direction and the effect will be to force the piston D′ forward and it will, in turn, be clutched to the cylinder to drag it around in the same direction in which it was started by the piston D. As the piston D′ approaches the piston D, after passing the full-open exhaust, (shown in Fig. 8,) it will in turn cushion against the piston D and force it forwardly to open the inlet and repeat the operation.

It will be observed that each piston carries with it the cylinder throughout one-half or more of its revolution, so that there is no frictional wear between the piston and the cylinder throughout at least one-half of the revolution of the piston and when the engine is running under a light load the mechanism of the cylinder and piston will tend to carry the pistons, both of them, along the cylinder, making such a common opening and closing of the inlet-ports as to prevent useless admission and exhaust of the actuating fluid; but as soon as the load upon the engine requires additional force to carry it the inlet of the actuating fluid will be provided, without any care on the part of the operator.

It will be observed that the clutching is effected by drawing the clutching-shoes toward the axis of the part to be clutched by them, instead of pushing them away from said axis. This admits of pulling the clutching-shoe to the periphery of the part to be operated, instead of to an inner and less advantageous portion.

What I claim is—

1. The combination with a cylinder and a shaft on which the cylinder is mounted, the shaft and the cylinder being the one fixed and the other mounted to rotate, of pistons mounted to rotate freely within the cylinder, means for preventing the rotary movement of the pistons in one direction, clutching-shoes carried by the aforesaid rotary part and means for drawing the clutching-shoes toward the axis of rotation of the pistons for locking the rotary part of the pistons, substantially as set forth.

2. The combination with the cylinder, the pistons mounted within the cylinder, to rotate freely in one direction and means for preventing the pistons from rotating in the opposite direction, of clutching wheels or disks fixed to rotate with the pistons, clutching-shoes carried by the cylinder and means for drawing the clutching-shoes toward the axis of rotation of the pistons to lock the cylinder to the pistons, substantially as set forth.

3. The combination with the shaft, the pistons mounted to rotate freely on the shaft and the cylinder mounted to rotate freely on the hubs of the pistons, of clutching-disks carried by the hubs of the pistons, a set of clutching-shoes secured to a fixed support, a set of clutching-shoes secured to the cylinder and means for drawing the clutching-shoes toward the periphery of the clutching-disks as the pistons are forced in the one or the other direction, substantially as set forth.

4. The combination with a shaft, pistons mounted to rotate freely on the shaft, a cylinder mounted to rotate freely on the hubs of the pistons and clutching-disks carried by the hubs of the pistons, of different sets of clutching-shoes in position to engage the periphery of each clutching-disk, toggle-clips engaged with the clutching-shoes and with a fixed support and the cylinder respectively for locking the shoes to the clutching-disks and means for tilting the toggle-clips to determine the direction in which they shall clutch the disk, substantially as set forth.

WILLIAM E. PRALL, JR.

Witnesses:
FREDK. HAYNES,
GEORGE BARRY, JR.

Correction in Letters Patent No. 562,153.

It is hereby certified that in Letters Patent No. 562,153, granted June 16, 1896, upon the application of William E. Prall, jr., of New York, N. Y., for an improvement in "Clutching Mechanism for Rotary Engines," an error appears in the printed specification requiring correction as follows, viz: In line 60, page 3, the word "of" should read *to;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 30th day of June, A. D. 1896.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

S. T. FISHER,
Acting Commissioner of Patents.