

(No Model.)

2 Sheets—Sheet 1.

W. E. PRALL, Jr.

REVERSING MECHANISM FOR ROTARY ENGINES.

No. 572,716.

Patented Dec. 8, 1896.

Fig. 1.

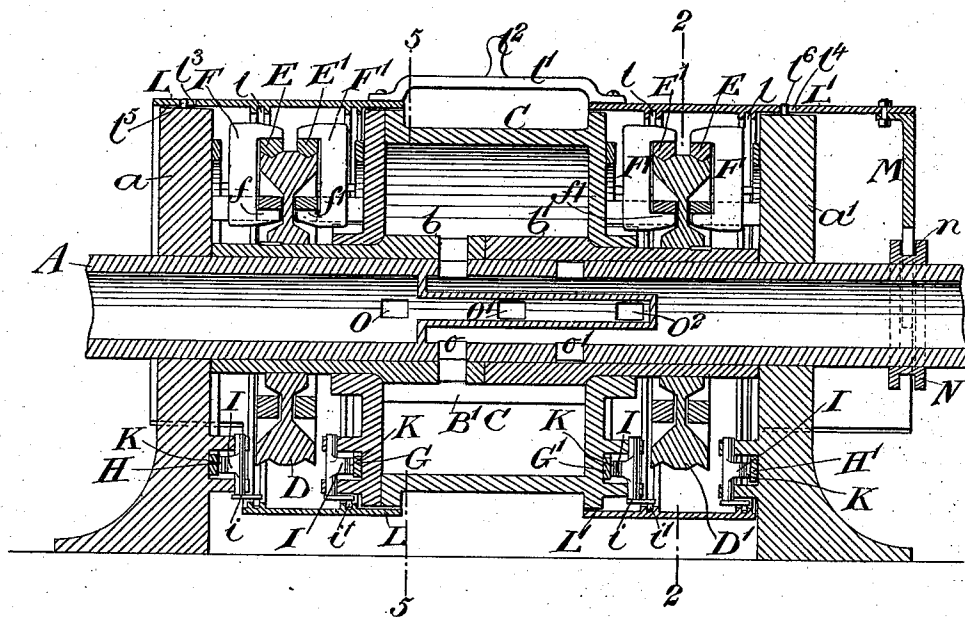


Fig. 2.

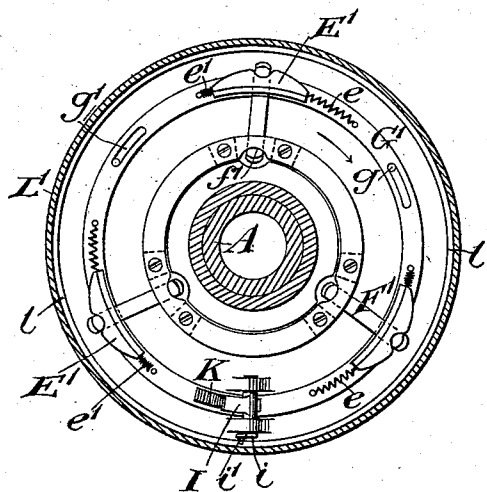
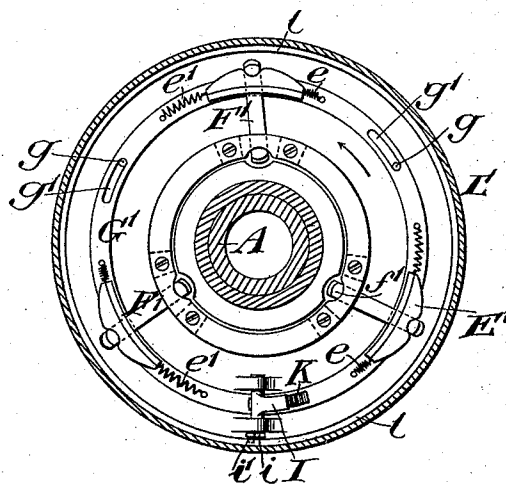


Fig. 3.



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Fig. 4.

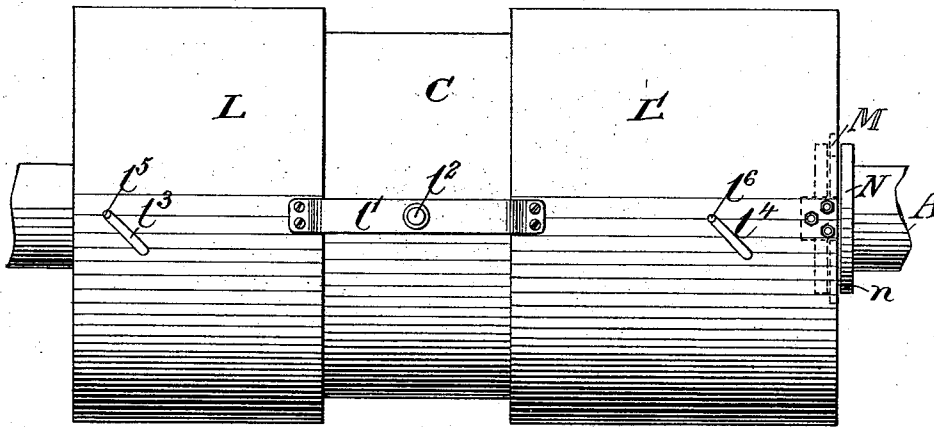
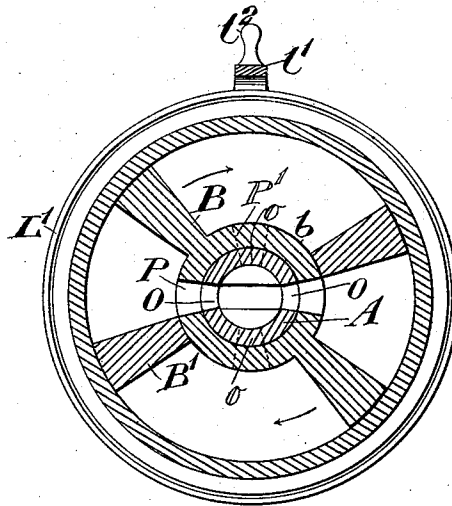


Fig. 5.



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REVERSING MECHANISM FOR ROTARY ENGINES.

SPECIFICATION forming part of Letters Patent No. 572,716, dated December 8, 1896.

Application filed April 8, 1896. Serial No. 586,675. (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 Reverse Mechanism for Rotary Engines, of which the following is a specification.

My invention relates to an improvement in reverse mechanism for rotary engines, and more particularly intended for use in connection with rotary engines of the type shown, described, and claimed in my pending application, Serial No. 583,172, filed March 14, 1896, in which toggle-clips are employed for drawing the clutching-shoes into engagement with the peripheries of rings carried by the hubs of pistons free to rotate within the cylinder and actuated by a fluid under head or pressure admitted between the pistons through the shaft about which the pistons rotate.

The gist of the invention lies in mechanism for giving the toggle-clips a normal slant in either of two opposite directions, in order to enable the pistons to alternately become clutched to the cylinder and stationary support when moved in one direction or the opposite, according as the engine is to be driven in the one or the other of two directions, and it obviously follows that the same principle might, with slight modification, be applied to the reversal of a rotary engine of the type shown in my pending application, Serial No. 581,693, filed March 3, 1896, in which the toggle-dogs are employed for throwing the clutching-shoes into engagement with the inner faces of rings carried by the hubs of the pistons, such modification simply requiring that the toggle-dogs be changed from one normal inclination to another, instead of changing the toggle-clips from one inclination to another.

In the accompanying drawings, Figure 1 shows a vertical longitudinal section through a rotary engine of the type first above referred to, in which the toggle-clips are employed, showing the reversing mechanism in connection therewith as it appears in use. Fig. 2 is a transverse vertical section on line 2 2 of Fig. 1, looking toward the left as the drawing is held in reading, with the clutching-ring removed and showing the toggle-clips thrown to the limit of their slanting movement in one

direction. Fig. 3 is a similar view showing the toggle-clips thrown to the limit of their slanting movement in the opposite direction. Fig. 4 is a top plan view of the engine; and Fig. 5 is a transverse vertical section through line 5 5 of Fig. 1, showing the positions of the pistons and the relation of the ports in their hubs to the ports in the shaft.

In the form in which I have illustrated my invention the hollow shaft A, through which the actuating fluid is admitted to the cylinder, is stationary. The pistons B B' are mounted to rotate freely on the shaft A, and have their hubs b b' projected beyond the ends of the cylinder, and the cylinder C is loosely mounted on the hubs of the pistons. The rings D D', by means of which the pistons are clutched either to the stationary supports or to the cylinder, are fixed, one to the hub b of the cylinder B and the other to the hub b' of the cylinder B', at points outside of the ends of the cylinder, and the clutching-shoes E E', which engage the periphery of the clutching-rings D D' are actuated, the former by toggle-clips F for clutching the pistons to the stationary support and the latter by toggle-clips F' for clutching the pistons to the cylinder. The inner ends of the toggle-clips F are engaged with loops f, fixed to the stationary supports, and the inner ends of the clips F' are engaged with loops f', fixed to the cylinder-hubs.

As thus far described the parts referred to are quite similar in their structure, arrangement, and operation to the corresponding parts shown, described, and claimed in my pending application, Serial No. 583,172, filed March 14, 1896.

The reversing mechanism is constructed and arranged as follows: On the opposite ends of the cylinder C rings G G' are supported, one on each end, and so mounted as to permit of a limited rotary movement. The particular means of securing the rings to the cylinder-head consists in the present instance of pins g, projecting outwardly from the cylinder-head, which are received in elongated slots g', formed in the ring at suitable intervals. The outer faces of the rings are intended to be at substantially the same radial distance from the axis of rotation of the pistons as the clutching-shoes E', and the said

clutching-shoes E' are each connected at their opposite ends with the rings G G' adjacent thereto by means of coil-springs *e e'*, the tensions of which tend to hold the clutching-shoes E' normally in position to cause the toggle-clips to assume the positions of radial lines. When, however, the ring G or G' is rotated to the limit of its movement in one direction, as shown in Fig. 2, it will tend to compress the spring *e'* at one end of the clutching-shoe and extend the spring *e* at the opposite end of the clutching-shoe, thereby moving the clutching-shoe into such position as to cause the toggle-clip to assume a position oblique to the radial line, and when the ring G or G' is moved to the opposite limit of its movement it will tend to compress the opposite spring *e* and extend the spring *e'*, and thereby move the clutching-shoe into a position to cause the toggle-clip to assume an oppositely-inclined position with respect to the radial line, as shown in Fig. 3. There are also provided rings H H', corresponding in all respects to the rings G G', hereinabove described, and mounted on the faces of the stationary supports *a a'* in position to operate the clutching-shoes E, in the same manner as the rings G G' operate the clutching-shoes E'.

The several rings G G' H H' are simultaneously operated to set the different sets of clutch-shoes in position to cause the engine to run in one direction or the reverse, as may be desired, by means of toothed segments I, mounted—those for operating the disks G G' on the ends of the cylinder and those for operating the rings H H' on the faces of the supports *a a'*, with their toothed faces engaged with racks K on the faces of the several rings. The toothed segments I are mounted in such a manner that they may be rocked in their bearings, and they are operated by means of cranks *i*, attached to their journals and provided with crank-pins *i'*, which are loosely received in grooves *l*, formed on their inner faces of sleeves L L', which surround the opposite ends of the cylinder C and rest upon the rounded upper ends of the supports *a a'*. The sleeves L L' are connected by means of the bridge-piece *l'*, to be operated together as one whole, the bridge-piece being provided with a handle *l''* for convenience in operating the sleeves. The rotary movement of the sleeves is limited by diagonal slots *l³ l⁴*, formed therein, in which are received pins *l⁵ l⁶*, fixed to the tops of the supports *a a'*, so that when the sleeves L L' are rotated the engagement of the pins *l⁵ l⁶* with the diagonal slots *l³ l⁴* will move the sleeves L L' longitudinally in the one direction or the other, parallel with the axis of the rotation of the engine, and in so doing will, by their engagement with the crank-pins *i'* on the cranks *i*, rock the segments I and thereby rotate the rings G G' H H' to change the slanting positions of the several sets of toggle-clips.

Assuming the parts to be in the position shown in Fig. 1, with the sleeves L L' moved

to the right, the rings G G', carried by the ends of the cylinder, will have been thereby rotated in a direction to shift the clutching-shoes E' into the position shown in Fig. 2, so as to permit the engine-cylinder to rotate in the direction shown by the arrow in Fig. 2. The same movement of the sleeves will have rotated the rings H H' in a position the reverse of that shown in Fig. 2, so as to prevent the pistons from moving in a direction opposite that in which the cylinder is to move. Under these conditions the pistons, as the actuating fluid is admitted between them, will be, the one clutched to the cylinder because of its tendency to move in the direction of the arrow, Fig. 2, thereby drawing the clutching-shoe at the periphery of its ring D D' into close contact with the ring and carrying the cylinder along with it, while the other piston will be temporarily prevented from rotating in the opposite direction by the engagement of its clutching-ring D' or D with the clutching-shoes E, held by the toggle-clips on the stationary supports, and, in turn, the pistons so clutched to the stationary supports will be clutched to the cylinder and released from the stationary supports, while the opposite piston is released from the cylinder and clutched to the stationary supports as the piston first clutched to the cylinder approaches the limit of its half-rotary movement.

When the sleeves L L' are moved in the opposite direction or to the left, the several toothed segments I will be rocked in the opposite direction and the toggle-clips carried by the cylinder will be given a slant in the opposite direction, as shown in Fig. 3, while those on the stationary supports will at the same time be reversed in inclination, so that the pistons will no longer be permitted to move in the direction of the arrow shown in Fig. 2, but will be free to move in the direction of the arrow shown in Fig. 3, and will, in the manner hereinabove described, be alternately clutched to the cylinder and to the stationary supports to rotate the cylinder in the reverse direction.

The shifting of the inlet and outlet ports to correspond to the reverse movement of the pistons is effected simultaneously with the changing of the inclination of the toggle-clips, as follows: The shaft A is mounted to move longitudinally together with the sleeves L L', and it is connected to move simultaneously with the sleeves by means of a shifter-arm M, fixed to the end of the sleeve L' and having a loose engagement in an annular groove *n* in a collar N, fixed to the shaft A. The shaft A is provided with three sets of inlet-ports O O', occupying different transverse planes corresponding to the planes in which the inlet-ports through the hubs of the pistons are located, so that when the shaft is moved in the direction shown in Fig. 1 the sets of inlet-ports O O' will be in use to supply the actuating fluid through one set of ports in each of the piston-heads, while another set of ports

in the piston-heads located upon the opposite sides of the pistons will be in position to exhaust the actuating fluid through the sets of exhaust-ports *o o'* in the shaft A, and when the shaft A is moved, together with the sleeves L L', to the left to reverse the engine the inlet-port O will be thrown out of use and the inlet-ports O' O² will be brought into the same transverse plane that the sets of ports in the hubs of the pistons through which the actuating fluid was previously exhausted, while the outlet-ports *o o'* in the shaft will have been brought into transverse planes corresponding to the sets of ports in the hubs through which the actuating fluid was previously admitted, thereby making inlet-ports of those ports which were before exhaust-ports and exhaust-ports of those ports in the hub which were before inlet-ports.

The relation of the ports in the piston-hubs which become either inlet or exhaust ports, according to the direction in which the engine is to be run, is shown in Fig. 5, in which the two sets of ports in different transverse planes in the hub *b* are denoted, respectively, by P and P'.

What I claim is—

1. The combination with a cylinder, rotary pistons within the cylinder, clutching-shoes for locking the rotary pistons to the cylinder and toggle devices for holding the clutching-shoes in position of means for changing the normal inclination of the toggle devices with respect to the radial line of rotation, to reverse the engine, substantially as set forth.

2. The combination with the rotary cylinder, the rotary pistons within the cylinder and clutching devices carried by the cylinder for locking the cylinder to and releasing it from the pistons, of sleeves having their inner faces connected with the clutching devices and means for moving the sleeves and

thereby changing the normal inclination of the clutching devices to reverse the movement of the pistons, substantially as set forth.

3. The combination with a longitudinally-movable shaft, a rotary cylinder, rotary pistons within the cylinder and means for clutching the pistons to and releasing them from the cylinder, the longitudinally-movable shaft and the hubs of the pistons being provided with inlet and exhaust ports for the actuating fluid, of means for simultaneously moving the shaft and changing the inclinations of the clutching devices to reverse the movement of the pistons, substantially as set forth.

4. The combination with the longitudinally-movable shaft provided with inlet and outlet ports, the pistons mounted to rotate on the shaft and provided with inlet and outlet ports in their heads, and the cylinder mounted to rotate freely, of clutching devices for locking the pistons alternately to a stationary support and to the cylinder and means for simultaneously shifting the inclination of the clutching devices and moving the shaft, substantially as set forth.

5. The combination with a shaft, pistons loosely mounted on the shaft, a cylinder loosely mounted on the pistons and means for admitting the actuating fluid to and exhausting it from between the pistons, of a set of clutching-shoes for locking the pistons to and releasing them from the cylinder, toggle-clips for holding the shoes in position, a rotary ring yieldingly connected with the clutching-shoes and means for rotating the ring in opposite directions to change the inclinations of the toggle-clips, substantially as set forth.

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Witnesses:

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