

B. I. HENDERSON.

Improvement in Rotary Engines.

No. 115,854.

Patented June 13, 1871.

Fig. 3.

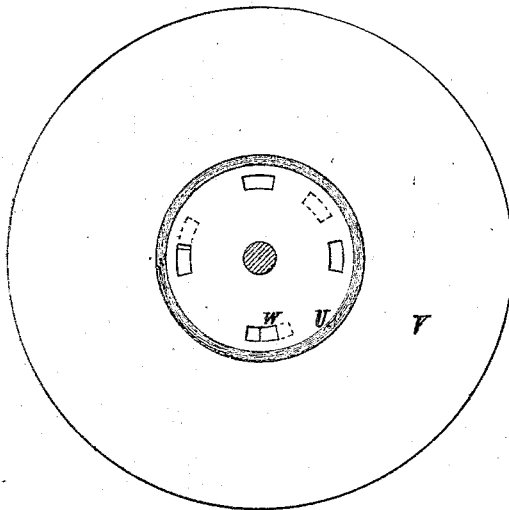


Fig. 1.

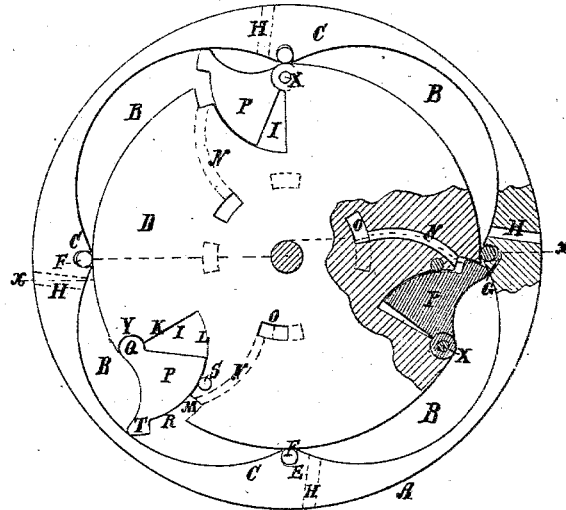


Fig. 2.

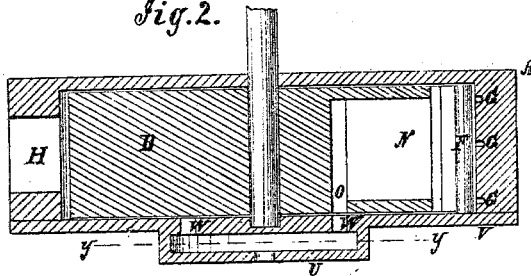
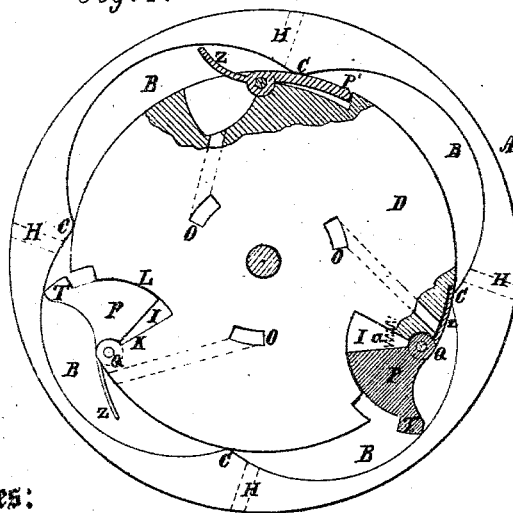


Fig. 4.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. 115,854, dated June 13, 1871.

*To all whom it may concern:*

Be it known that I, BENJAMIN I. HENDERSON, of Salem, in the county of Essex and State of Massachusetts, have invented a new and useful Improvement in Rotary Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification.

My invention consists in improving rotary engines, as hereinafter fully described and subsequently pointed out in the claims.

Figure 1 is an elevation of the engine, with one end removed and a part sectioned. Fig. 2 is a transverse section taken on the line *x x* of Fig. 1. Fig. 3 is a section on the line *y y* of Fig. 2; and Fig. 4 is an elevation, with one side removed and partly sectioned, showing a modification by which the engine is adapted for use as a rotary pump.

Similar letters of reference indicate corresponding parts.

A is the circular case, preferably of cast metal, with a thick rim, in the inner wall of which there are four concave spaces, B, divided by the projections C, the inner faces of which lie in the true circle, coinciding with the face of the disk or drum D, and they have circular grooves E extending across the rim, in which are placed cylindrical metal pieces F, which are intended to bear against the rim of disk D for preventing the escape of steam from one space, B, to another. They are to be pressed against the said disk by steam admitted to the grooves behind them through the small holes G. Being cylindrical, and the friction of their contact with the disk being greater than that of the contact with the walls of the grooves, they will revolve, and thereby wear less than if stationary, and the resistance to the disk will be less. H represents exhaust-ports, of which there are as many as there are projections C and cavities B, and each is placed a little in advance of a projection. In a case having four cavities, B, the disk will have three notches, I, in the face, with one radial wall, K, and a curved wall, L, the latter being struck from a center near the outer end of the wall K. A recess, M, is formed in the radial

wall near the outer end, into which the steam-port N opens, said port beginning at the port O, in the side of the disk, near the center. A port, N, is provided for each notch I. P represents the blocks, pivoted at the centers Q, from which the lines L are struck. They are provided with a circular end, R, working steam-tight against the wall L, or packing-cylinder S, fitted thereon, or other suitable packing, and have a projection, T, at the outer corner, fitting the recess M. U is the steam-chest, placed on the outside of the end plate V of the case. It has as many ports W as there are recesses B, and the plate V is applied to the case so that the ports will be in the radial lines of the projections C, or thereabout, so that, when a block is passing the projections C, or as soon as it has completely passed its port O, N will be opened, and steam will be admitted behind the projection T, and it will be forced out against the wall of the recess B, taking the pressure thereof, and imparting it to the disk until the projection passes the exhaust and the steam escapes, at which time the block will be forced back into the notch I so far, by the wall of recess B, that the mouth N of the port will be closed till the part T passes the projection, when the port O will again take steam from the next port W of plate V, and so on. It will be observed that, by the employment of these blocks in a case having four cavities and ports, there will be steam on two blocks while one is passing from the point where steam exhausts to where it takes steam again, and the area of the blocks under pressure will at all times be equal or very nearly so. These blocks may be hinged to the disk D, as shown at X, or they may have circular ribs fitting in corresponding recesses in the disk, as indicated at Y. In either case, it is not important that these joints be steam-tight, for they are not surrounded by live steam. The ports W may be so placed as to cut off the steam before the blocks have arrived at the exhaust-ports to work it expansively, and a variable cut-off may be had by arranging gates or valves with these ports to open or close them, so that the ports O will take steam sooner or later.

This engine is alike applicable for being propelled by water or compressed air, and by

slight modifications, indicated in Fig. 4, it may be used as a pump. In this case the disk will be turned in the opposite direction, the ports N will open to the spaces B, behind the joints Q, and the blocks will have arms Z extending behind the joints to be acted on by the walls of the cavities B to force the blocks out after passing the projections C; or springs may be introduced between the radial walls K of the notches and the said blocks to force them out, as indicated at *a*, Fig. 4. By this plan a vacuum will be formed behind the block, into which the water will flow, and it will be forced out through the exhaust by the next block. The suction-pipe will be attached to the chest U and the ports will be made larger.

By another plan I may substitute valves P' for the blocks P, for it is not necessary for the purposes of a pump that a water-tight joint be had between the end of the valve or block and the wall of the recess into which it shuts, as in the case of using the machine as a steam-engine. When either form of valve or block

is used, the projection Z is intended both to throw out the other end by coming in contact with the projections C, and to cover the exhaust until the next block or valve behind passes the projections and begins to force the water through the said exhaust.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A circular case having inner concavities B and convexities C, packing F, and outlet-ports H, combined with a drum having pivoted blocks P T, recesses I M, and inlet-ports N, all constructed and arranged as and for the purpose specified.

2. The arrangement of the small steam-inlet channels G, with respect to the cylindrical packings F, to cause them to make a steam-tight joint with the drum, as specified.

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Witnesses:

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