3 Sheets--Sheet 1.

C. F. MURDOCK.

Improvement in Rotary Steam-Engines.

No. 130,063. Patented July 30, 1872.

Fig 1.

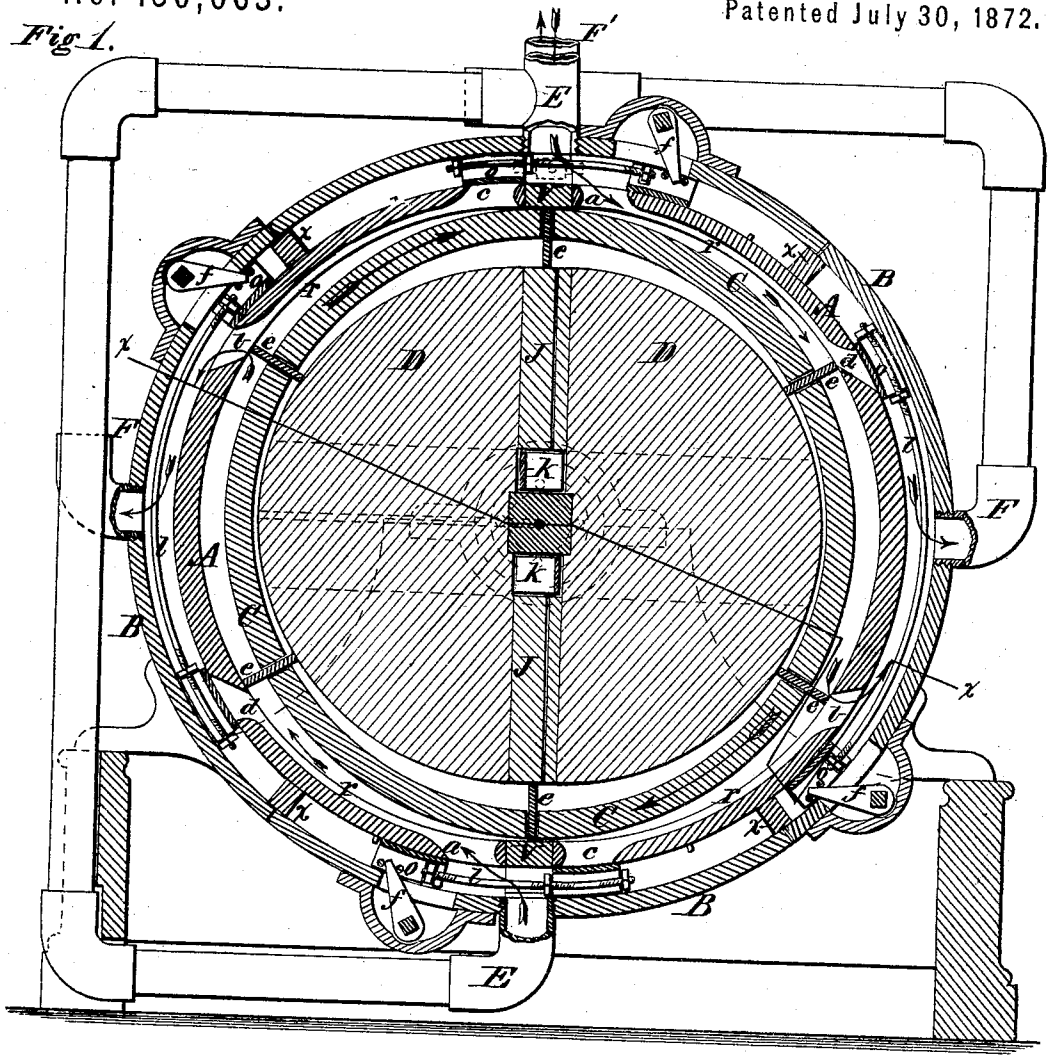
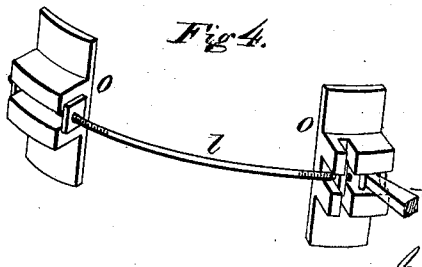


Fig 4.



Witnesses.

Harry King.

W. L. P. King

Inventor.

C. F. Murdock

by Dodgeson

Atty.

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C. F. MURDOCK.

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Fig 2.

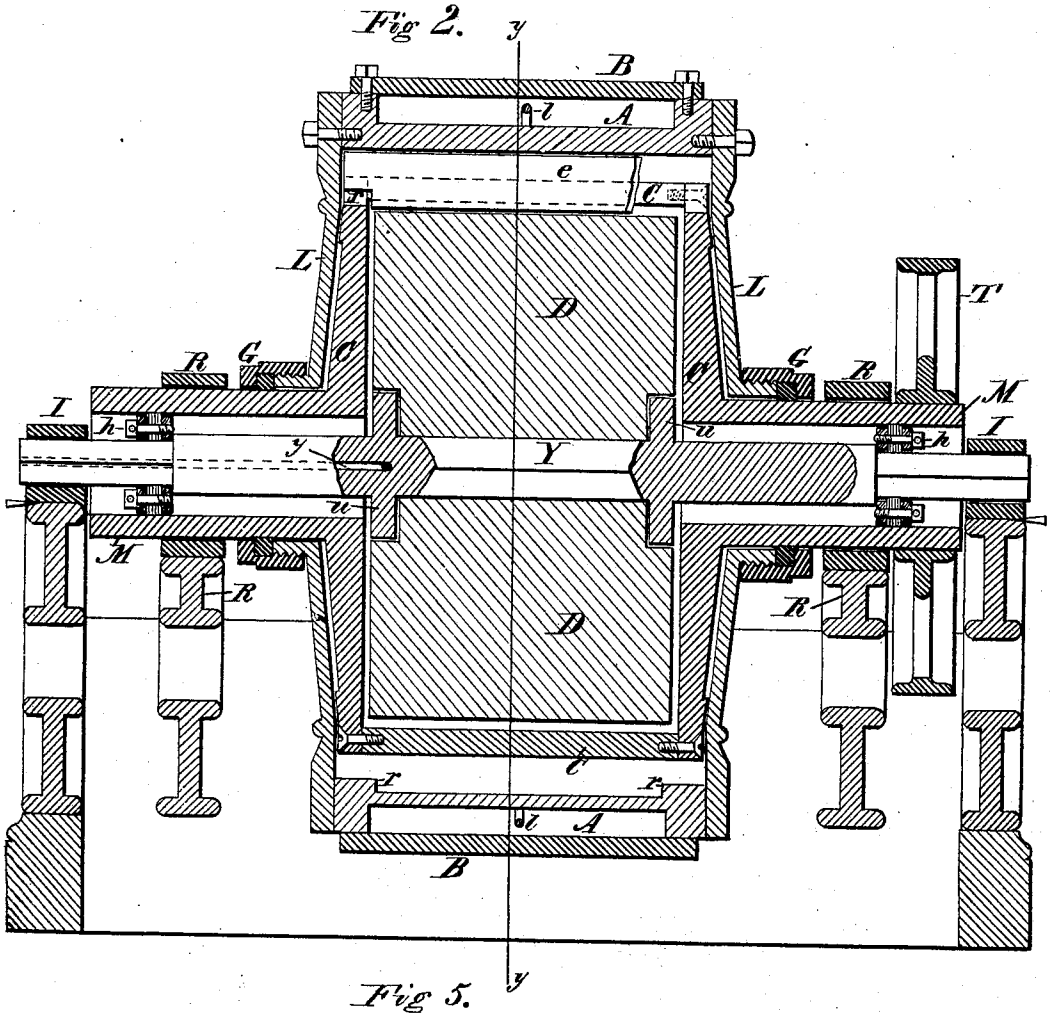
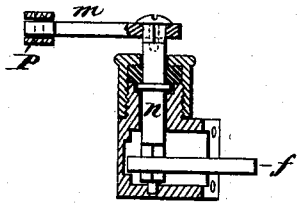


Fig 5.



Witnesses.

Harry King.

W. K. P. King

Inventor.

C. F. Murdock

by Dodgeson

Attys.

3 Sheets--Sheet 3.

C. F. MURDOCK.

Improvement in Rotary Steam-Engines.

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Fig 3.

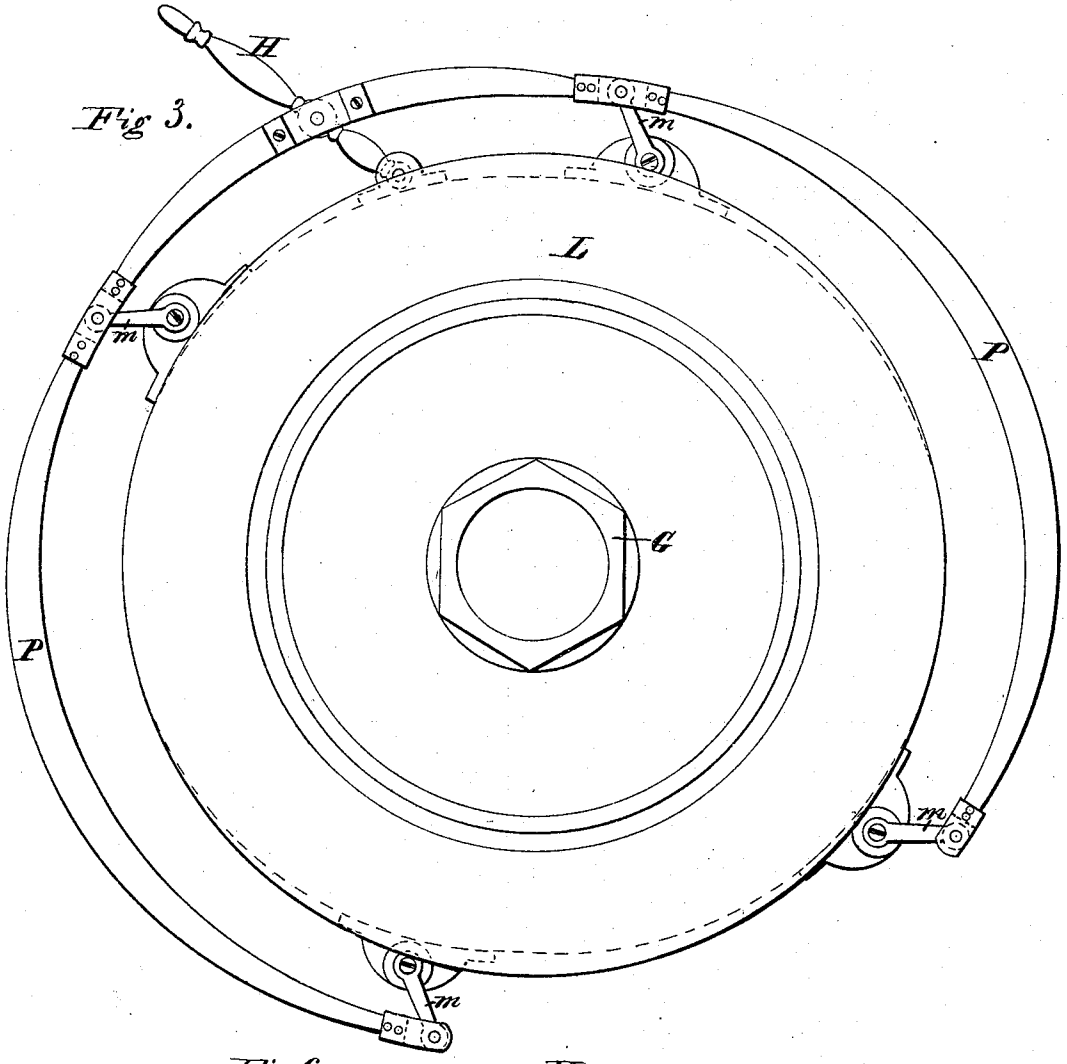


Fig 6.

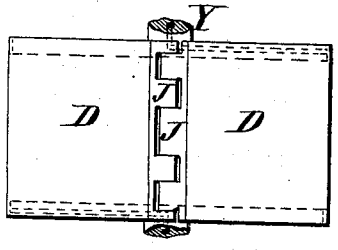
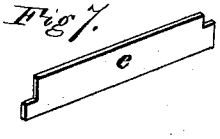


Fig 7.



Witnesses.

Harry King.

W. W. P King

Inventor.

C. F. Murdock

by Dodgeson

Attys.

UNITED STATES PATENT OFFICE.

CHARLES F. MURDOCK, OF CASEVILLE, MICHIGAN.

IMPROVEMENT IN ROTARY STEAM-ENGINES.

Specification forming part of Letters Patent No. **130,063**, dated July 30, 1872.

SPECIFICATION.

To all whom it may concern:

Be it known that I, CHARLES F. MURDOCK, of Caseville, in the county of Huron and State of Michigan, have invented certain Improvements in Rotary Steam-Engines, of which the following is a specification, reference being had to the accompanying drawing.

My invention consists in a novel construction of a rotary steam-engine, as hereinafter more fully explained.

Figure 1 is a vertical section on the line *y y* of Fig. 2. Fig. 2 is a vertical section at right angles to the line of Fig. 1. Fig. 3 is a side elevation; and Figs. 4, 5, and 6 are views of portions shown detached.

My invention consists essentially of a cylindrical revolving case, having a series of pistons or abutments arranged to slide through radial openings therein, and to travel in an elliptical chamber formed by inserting an elliptical center or hub within a correspondingly-formed shell or case, A representing the case, C the revolving cylinder, *e* the piston or sliding abutments, and D the center or hub, acting as a guide or cam to force the pistons *e* outward at the required intervals. In constructing my engine I first form the center or hub D by taking two semicircular pieces and turning off their outer faces so as to form, when put together, a true cylinder. I then secure to their inner or flat faces pieces J, as shown in Fig. 1, these pieces extending out flush at the periphery and sides, and thus converting the cylinder into an elliptical body, its diameter on its longer line being as much greater than its shorter diameter as the thickness of the inserted pieces J. Where these pieces J meet at the center their faces are made to interlock, as represented in Fig. 6, whereby the pistons are furnished a continuous bearing in passing the joint. This central hub D is represented in the drawing as being made solid; but it may be hollow, and will be so made in large engines. It is mounted on a rectangular shaft, Y, on each side of which recesses are formed in the segments D, in which recesses are placed two flat springs, *k*, to press the segments outward. The shaft Y is stationary, and serves as a support for the center, and is provided with two cross-arms, *r*, which fit in recesses in the outer sides of the segments, at right angles to their line of junction, thereby supporting and holding them in place, the segments resting and sliding on these arms *r* when moved at all. I then construct a cylindrical case, C, with solid or tight heads or ends, and having a tubular journal, M, projecting from each end, as shown in Fig. 2, which is mounted in suitable bearings R and made to completely inclose the center or hub D, the tubular journals inclosing the shaft Y and being packed thereon, as represented at *h*, Fig. 2. Through the periphery of this case C a series of slots is cut radially, and extending across its face from side to side, in which I fit sliding pistons or abutments *e*, as shown in Fig. 1, one of the slides or pistons being shown detached at Fig. 7. These parts being thus arranged, I then surround or inclose them in an outer case or shell, A, which, in turn, is supported on the main frame, and has packing-glands G, where the tubular journals M pass out through its sides, as shown in Fig. 2. This outer shell A is made elliptical in the same manner and to the same extent as the center or hub D is, but of larger diameter, so as to leave a space all around between them for the pistons *e* with their cylinder C to travel in, the pistons *e* being of such a width as to exactly fill this space transversely, as shown in Fig. 1. The annular body of this shell A has its outer edges raised or projected radially so as to form a depression between them, which, being covered by plates B, as represented in Fig. 2, leaves an annular space or chamber extending all around the shell or case A, this space being divided, by partitions *x*, into a series of chambers, as shown in Fig. 1. Through the periphery or annular body of this shell A a series of openings or ports is cut, they being arranged at equal distances apart on each side, as shown in Fig. 1, and being designated by the letters *a*, *b*, *c*, and *d*. A series of slide-valves, *o*, is arranged to close these ports by sliding between the shell A and the outer plates B, these valves being all connected, by arms *f*, to rock-shafts *n* mounted in suitable bearings upon the plates B, these rock-shafts, in turn, being connected, by arms *m*, to curved rods P, which are connected and operated by a hand-lever, H, as represented in Fig. 3. The steam is admitted to the engine upon opposite sides at the same time, it being conveyed through pipes

E in at both top and bottom, the escape steam passing off at both sides, at right angles to the points at which it enters, through the pipes F, as represented in Fig. 1. In the drawing, I have represented the ports so arranged as to divide the case A into six equal parts, there being eight ports in all—four on each side. It will be observed, by examining Fig. 1, that the inner face of the shell A is recessed or cut away centrally along each alternate space between the ports, thus leaving along each side of this cut-away portion a shoulder, *r*, as shown in Fig. 1, and also at the lower side of Fig. 2, so that, while the pistons *e* are passing along past these places, they do not entirely fill the steam-space, there being an opening behind them, through which the steam flows past the piston, and thus onward to the next one. It will also be observed that the ports are arranged to open into the chambers between the shell A and the plates B, and that the supply and exhaust pipes connect with these chambers, the steam passing in and out through them, and serving in connection therewith to keep the shell A jacketed with steam. The valves *o* are arranged in pairs, connected by a rod, *l*, as shown in Fig. 4, and can be adjusted to fit the ports, as shown, their function being to reverse the engine when desired.

The operation is as follows: The engine being constructed as described, and the valves set as in Fig. 1, the steam will rush in through the ports *a a*, and, striking against the pistons *e*, will cause the cylinder C to revolve. As it moves, the steam will rush past the pistons *e* nearest the inlet-ports, while the latter are passing from the ports *a* to the ports *d;* but as soon as the pistons reach or pass the ports *d*, the pistons *e* fill the space between the cylinder C and the case A, and from thence on to the exhaust-ports *b*. On each side the steam is exerting its full force against the pistons, the steam beginning to escape from in front of the piston the moment it arrives, where it fills the entire space by the piston in front of it just then reaching the exhaust-port *b*. As each piston is in turn brought round by the cylinder C, it is shoved entirely in, or nearly so, as it passes the point V just in front of the inlet-port, and is then forced gradually outward as it passes along until it has made a quarter revolution, after which it is drawn gradually inward during the next quarter of a revolution; and this is repeated during the latter half of the revolution, these movements of the pistons being caused by the elliptical form of the center D and case A. The steam, as it escapes through the ports *b*, is discharged at a reverse angle into the outer chamber, from whence it flows off through the pipes F on each side, which may be united in one escape-pipe, F′, as represented in Fig. 1, or may each discharge separately, as preferred. It will be seen that the ports and chambers are alike on each side, and, as the steam enters at two opposite points, it operates on both sides at the same time, and in the same manner, by which the friction on the center bearings is greatly lessened. To reverse the engine the valves are moved to the opposite side, closing the ports that were open, and opening those that were closed, when the steam will enter at the ports *c* and escape at the ports *d*. In order to compensate for wear the center or hub D is made slightly conical, and has a little space for being moved endwise, as shown in Fig. 2, so that by such movement the pistons *e* can be set out against the case A to render them steam-tight. As previously intimated the case A is constructed on the same plan as the center—that is to say, it is formed of two semicircular segments, turned up so as to form a true circle, and then is made elliptical by inserting between their ends a piece, V, as shown in Fig. 1, the ends of the circular or segmental pieces being united by a bolt having a right-and-left-hand thread on its ends, which draws the ends of the segments tight against the pieces V, as indicated by dotted lines in the top of Fig. 1, these bolts being loosened when it is desired to set up the pieces V to compensate for wear. It will be seen that the steam-space, and consequently the power of the engine, may be increased at any time by simply inserting wider pieces V in the shell A, thus making it more elliptical, and increasing the size of the steam-space between the cylinder C and the shell A, the center D being correspondingly elongated by inserting thicker piece J, there being some space left between the elongated faces of the center D and the cylinder C for this purpose, and also to permit the pistons or slides *e* to be of sufficient width to allow of their being thus set out to fill the thus enlarged steam-space.

In this way I am enabled to produce a very simple, cheap, and efficient rotary engine, having but few moving parts, and those of the simplest kind.

Having thus described my invention, what I claim is—

1. A rotary steam-engine, consisting of a stationary elliptical center or hub, D, in combination with the rotating cylindrical case C having the sliding pistons *e*, and the elliptical case A having ports and valves, arranged substantially as described.

2. The case A and central hub D, each composed of two semicircular segments, with the interposed pieces J V, whereby the capacity of the engine may be increased, substantially as set forth.

3. The case A, having recesses on its inner face between the inlet and the next adjoining ports, for the purpose of permitting the steam to flow past the piston against the one in front while the piston is passing along said space, as set forth.

CHARLES F. MURDOCK.

Witnesses:

W. C. DODGE,

PHIL. T. DODGE.