2 Sheets--Sheet 1.

D. G. ROLLIN.

Rotary-Engines.

No. 157,297. Patented Dec. 1, 1874.

Fig. 1.

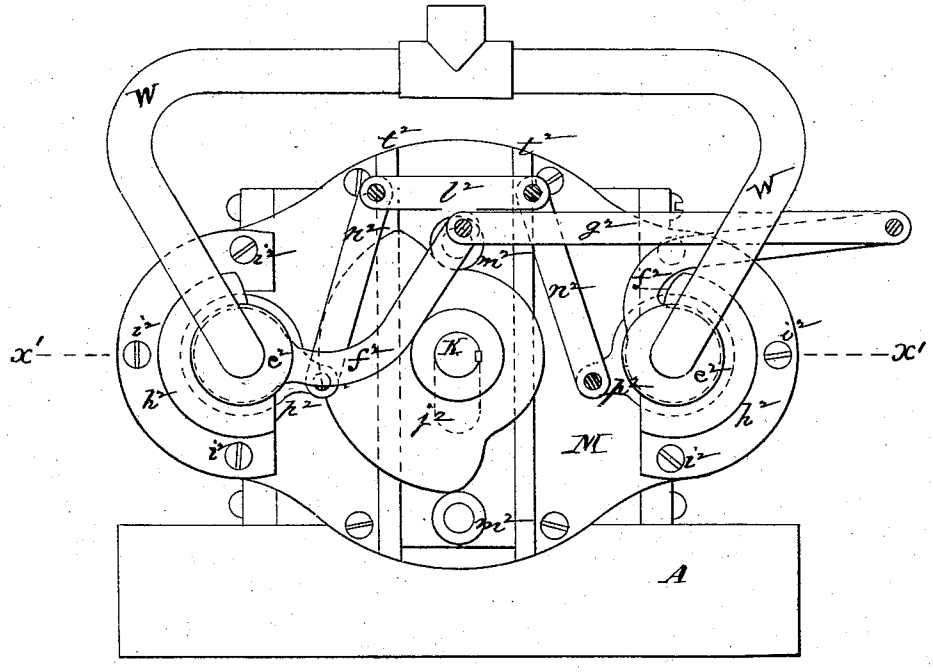
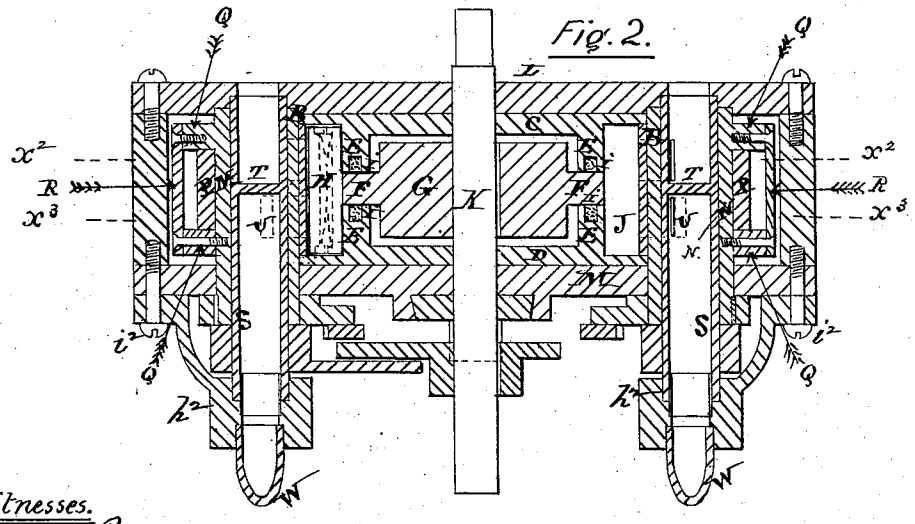


Fig. 2.



Witnesses.
Charles L. Davis
A. B. Chalmers

Daniel G. Rollin
Inventor.

2 Sheets--Sheet 2.

D. G. ROLLIN.

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Fig. 5.

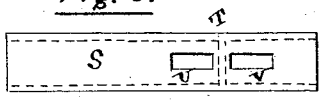

Fig. 6.

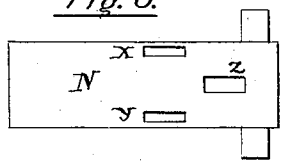

Fig. 7

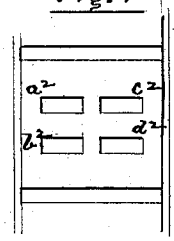

Fig. 3.

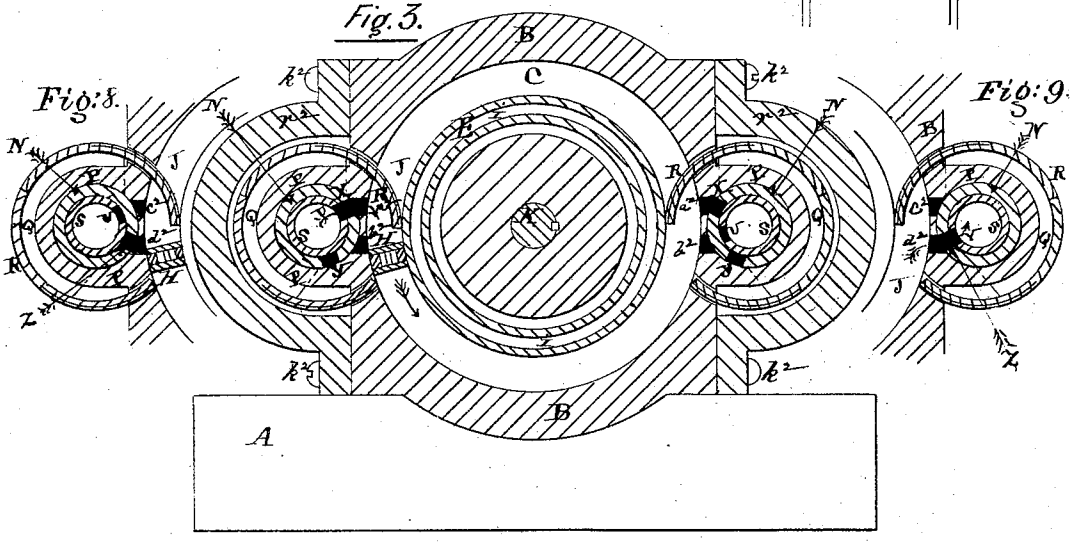

Fig. 8.

Fig. 9.

Fig. 4

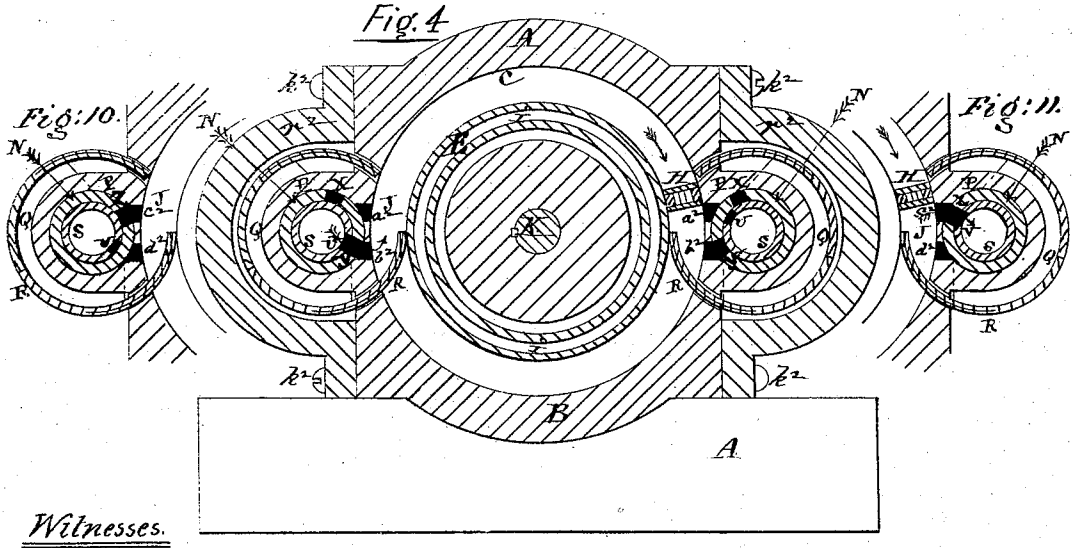

Fig. 10.

Fig. 11.

Witnesses.

Charles L. Barrett

A. B. Chalmers

Daniel G. Rollin

Inventor.

UNITED STATES PATENT OFFICE.

DANIEL G. ROLLIN, OF BROOKLYN, NEW YORK, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO CHARLES W. TROTTER AND EZRA L. BUSHNELL, OF SAME PLACE.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **157,297**, dated December 1, 1874; application file February 16, 1874.

To all whom it may concern:

Be it known that I, DANIEL G. ROLLIN, of Brooklyn, Kings county, State of New York, have invented an Improved Rotary Steam-Engine, of which the following is a specification:

The object of my invention is to make a rotary steam-engine reversible in action by means of a compound tubular induction and eduction pipe and semi-rotary steam-abutment, whereby great economy in construction and saving of power are obtained to operate the engine, as well as facility in reversing it. But to describe my invention more particularly I will refer to the accompanying drawings forming a part of this specification, the same letters of reference, wherever they occur, referring to like parts.

Figure 1, Sheet 1, is a front elevation of the engine, showing its connection with the induction steam-pipes and levers for operating the reversing tubular valves, and also the cam and levers for operating the semi-rotary steam-abutment and induction and eduction valves for the admission of steam to the annular cylinder or chamber. Fig. 2, Sheet 1, is a cut-sectional view of the engine through the line $x\ x$, Fig. 1. Fig. 3, Sheet 2, is a vertical cut-sectional view of the engine through the line $x^2\ x^2$, Fig. 2, showing the valves for the induction and eduction steam in opposite positions for making the stroke of the piston on the line of the induction-ports of U X Y and a^2 and b^2 of Figs. 5, 6, and 7. Figs. 8 and 9, Sheet 2, are detached cut-sectional views of the rotary valves and steam-chests on the line of the eduction-ports V Z and c^2 and d^2 of Figs. 5, 6, and 7. Fig. 4, Sheet 2, is a vertical cut-sectional view of the engine through the line $x^3\ x^3$, Fig. 2, showing the valves for the induction and eduction of the steam in position when the engine has been reversed. Figs. 10 and 11, Sheet 2, are detached cut-sectional views of the rotary valves and steam-chests in reverse, and on the same line as shown in Figs. 8 and 9. Fig. 5, Sheet 2, is a detached view of the reversing induction and eduction tubular steam-pipe. Fig. 6, Sheet 2, is a detached view of the semi-rotary steam-valve, showing the reversing induction-ports and exhaust port therefrom. Fig. 7, Sheet 2, is a detached view of the induction and eduction ports in or through the shell of the steam-cylinder, to admit steam to and from the front and back side of the piston.

Letter A represents a bed, upon which the engine is secured by any suitable means; B, the barrel or drum of the engine, which forms what may be called the frame of the engine, as all the working and other parts are secured upon it. This barrel or drum forms only the outer wall of the annular steam cylinder or chamber, the two side walls C and D being formed by circular cheek-pieces let into recesses cut in the edges of the annular chamber, and secured therein solidly to the barrel by screw-bolts and packing, to be perfectly steam-tight. These cheek-pieces have on their inner faces, as shown at E, Fig. 2, an annular flange, of such depth as nearly to meet each other, and yet leave space enough between their opposing edges to admit of a narrow flange, F, projecting from the center of the periphery of the revolving hub G, having the piston H attached thereto to pass between them. The edges of the annular flanges E are ground, so as to form a steam-tight joint with the sides of the flange F; but to guard against any escape of steam by the wear of the parts in contact, channels I are cut in the opposing edges of the flanges and packing inserted therein, as shown at I, Fig. 2. It will thus be seen that the walls of the annular steam cylinder or chamber J are perfectly solid, and, except at the narrow opening for the passage of the flange F, having the piston attached thereto, the full pressure of the steam is exerted against the face of the piston to rotate it in as effectual a manner as is the case with the piston in the cylinder of a reciprocating steam-engine. This is due to the fact that the expanding force of the steam being confined laterally by solid stationary walls, and the piston fitting accurately the annular chamber, no inward radial pressure can be exerted upon the axis K of the revolving piston to retard its motion. The bearings of the axis K are first through the cheek pieces C and D,

and thence through the cap-plates L and M, fitting steam-tight upon the cheek-pieces and upon the edges of the barrel B, thus forming a perfectly solid and secure bearing for the axis to rotate in, and at the same time great strength to sustain any required amount of pressure of steam to operate the engine. It will be obvious that, to compensate the wear on the piston, packing will be used, and for that purpose the outer and inner, or under, edges of the piston are channeled, and metal packing secured therein by means of suitable springs, so as to keep the packing always in contact with its opposing surfaces, to cut off the leakage of steam.

For the purpose of admitting and exhausting the steam to and from the engine, and cutting it off behind the piston in the annular cylinder or chamber, a semi-rotating tubular plug-valve, N, is secured to the opposite ends of the barrel or drum by means of metal lugs or bearings P, solidly attached to the sides of the barrel, and inclosed within a semicircular steam chest or box, r^2, and solidly secured to the barrel by screw-bolts k^2, as shown in Figs. 3 and 4, Sheet 2. Upon the outer sides of the semi-rotating tubular plug-valve two flanges, Q, are attached, so as to form bearings for the tube-valve upon the bearings P, and rotate therein, to admit and exhaust the steam to and from the annular chamber, and at the same time cut off the escape of the steam behind the piston when performing its duty. This is effected by means of a vertically-slotted tubular metal case, R, secured upon the flanges Q, as shown in Fig. 2, Sheet 1. This case forms, when rotated, the steam-abutments in the annular chamber. In shape it is circular, and of such diameter, and so secured upon the flanges Q of the plug-valve N, as, when alternately rotated in the hollow axis of the metal bearings P, to admit and exhaust the steam to and from the engine, its open ends will be projected through slots in the periphery of the barrel B into and across the annular steam cylinder or chamber, thus forming the abutments for the steam to react against, to propel the piston. In Figs. 3, 8, and 9 the abutment is shown projected into and across the annular steam cylinder or chamber, for the induction and eduction of the steam behind and before the piston when rotating from left to right, and in Figs. 4 and 10 and 11 the same in reverse when rotating the piston from right to left. The ends of the steam-abutments are intended to be faced with babbitt or other suitable composition metal, attached in such manner as to be slightly elastic at their outer ends, so as to form a metallic packing against the inner surface of the annular cylinder or chamber. Within the core of the tubular plug-valve N is inserted another tubular plug-valve, S, having, at the upper and lower sides of a partition-wall, T, (see Figs. 2 and 5, Sheets 1 and 2,) induction and eduction ports U and V therein, as shown in Fig. 5, Sheet 2, for the admission of steam to the engine from the boiler through the connecting-pipe W, Fig. 1, by the port U, and the exhaustion of it therefrom by way of the port V, below the wall T, and thence out through the open end of the tube, at the back of the engine, to any suitable condenser, or into the open atmosphere, as may be desired. Besides the office of admitting and discharging the steam to and from the engine, the internal tubular valve S is used also, in combination with the induction and eduction ports X, Y, and Z, Fig. 6, Sheet 2, in the semi-rotating tubular valve-plug N, as a means of reversing the engine. Thus the ports X and Y are reversing induction-ports, and the port Z the common exhaust-port, of the engine, in either direction of its rotation. These ports communicate with the annular steam cylinder or chamber through the ports a^2 and b^2 as induction-ports, and out by the ports c^2 and d^2 as exhaust-ports, (see Fig. 7,) cut through the shell of the annular steam cylinder or chamber, and directly in contact with the sides of the plug-valve N. The reversing tubular valves S have a solid collar, e^2, attached to their front ends, from which projects an arm, f^2, to about half-way across the face of the engine, and with a slight curve in it, so as to permit their ends being linked together by a connecting-rod, g^2, above, and out of the way of the axis of the engine. The edges of the tube S are inserted in a steam-tight cap, h^2, Fig. 2, to which the steam-pipe W from the boiler is coupled. When thus adjusted, the cap is then screwed solidly to the face of the engine by screw-bolts i^2, or other suitable means.

Now, when steam is turned on through the pipe W, and the tubular plug-valve S is set or adjusted, as shown in Fig. 1, the engine will rotate from left to right, Fig. 3, the steam passes into the tube S and out through the port U therein, thence through the port X of the plug-valve N, and thence, through the port a^2 of Fig. 7, into the annular steam-cylinder, to rotate the piston, as seen by the arrow in Fig. 3. When the steam has carried the piston a half-stroke, and past the opposite valve, it then escapes, from the front of it, out through the port d^2, Figs. 7 and 9, thence through the common exhaust-port Z of the plug N, Figs. 6 and 9, and thence into the exhaust-port V of valve-plug S, Fig. 5, and escapes therefrom at its open back end to the condenser, or into the atmosphere, as may be desired.

To rotate the engine in a reverse way, the arm f^2, attached to the reversing tubular valve S, is shifted over from right to left by means of the rod g^2, connecting them together. By this operation the steam from the engine, by the pipe W and valve S, will pass out therefrom through the port U, thence into and through the port Y of the valve N, then through the port b^2 of the shell or case of the steam-cylinder behind the piston H, as shown in Figs. 4 and 11, which will cause it to rotate

from right to left, as indicated by the arrow. When the steam has done its work, it then escapes, by the port C^2, Figs. 7 and 11, port Z, Figs. 6 and 11, and the common exhaust-port V, Figs. 5 and 11, to the condenser, or into the atmosphere, as before described.

For the purpose of operating the tubular valve N for the induction and eduction of the steam, a cam, j^2, is secured upon the axis K, Fig. 1. Underneath the cam is arranged in vertical guideways t^2, secured to the face of the engine, a sliding plate, l^2, having at or near its upper and lower ends friction-rollers m^2, so adjusted upon the face of the sliding plate that they will follow the curved outlines of the cam at every part of its rotation, to oscillate the tubular valves N, for the induction and eduction of the steam to and from the engine. This is effected by means of links n^2, jointed at their upper ends to the upper opposite ends of the sliding plate l^2, and at their lower ends to lugs p^2, attached solidly to the inner sides of the upper ends of the tubular plug-valves N. Thus, as will be readily seen by reference to Fig. 1, when the cam rotates, the sliding plate l^2 is vertically reciprocated, and as a matter of course, by means of its connection with the tubular valves N through the lugs p^2 and links n^2, oscillates them upon the tubular induction reversing valve-plug S, to admit and exhaust the steam to and from the engine at opposite sides simultaneously. The engine having but one piston, it will be obvious that the steam has to be admitted and exhausted at half-revolutions. The position of the induction and eduction ports in the valves, and the abutment R into and across the steam-cylinder at opposite ends of the engine, are, therefore, complements of each other, with equal simultaneous motions in opposite directions in their respective steam-chests.

In the marginal cut-sectional views, Figs. 8 and 9, and 10 and 11, the valves or ports are shown on the line x^3 x^3, Fig. 2, while the Figs. 3 and 4 show them on the line x^2 x^2, Fig. 2.

In reversing the engine, the levers f^2 and g^2 are simply shifted from side to side. It will be obvious, therefore, that, except when reversing the engine, the induction tubular valve S is always stationary, as a hollow axis upon which the tubular valve N has a semi-rotary motion to admit and exhaust the steam to and from the steam-cylinder.

Having now described my invention and its operations, I will proceed to set forth what I claim and desire to secure by Letters Patent of the United States.

1. The combination of the induction and eduction internal tubular plug-valve S, having a partition-wall, T, therein between the induction and eduction ports U and V, with the reversers or levers e^2, f^2, and g^2 attached thereto, valve N, and ports a^2 b^2 and c^2 d^2, and steam-pipe W, all arranged and operating as and for the purposes described.

2. The combination of the tubular plug-valve N, having two alternating induction-ports, X and Y, and one common eduction-port, Z, therein, with the internal tubular plug-valve S, and induction and eduction-ports a^2 b^2 and c^2 d^2, in the shell of the steam-cylinder, substantially as described, and operating in manner and for the purposes set forth.

3. The combination of the slotted tubular steam-abutment R with the tubular plug-valve, N steam-chest r^2, and piston H, substantially as described, and operating in the manner and for the purposes set forth.

4. The combination of the lugs p^2, solidly attached to the ends of the tubular plug-valve N, with the links n^2, reciprocating sliding plate l^2, and cam j^2, all arranged and operating in connection with the compound tubular plug-valves N and S, as and for the purposes set forth.

DANIEL G. ROLLIN.

Witnesses:
CHARLES L. BARRITT,
A. B. CHALMERS.