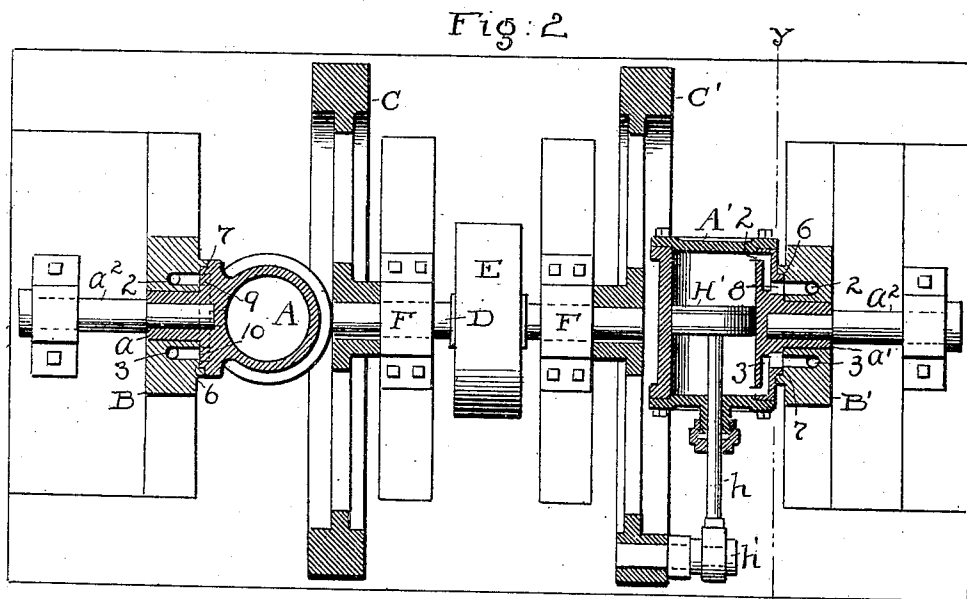
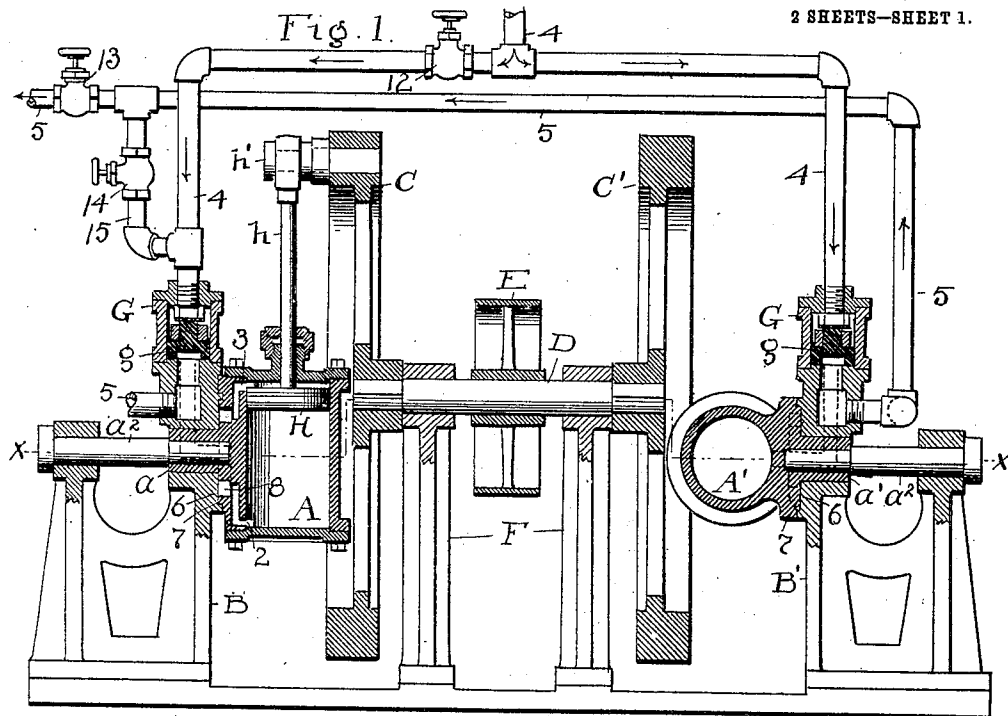


No. 838,713.

PATENTED DEC. 18, 1906.

M. J. HINDEN.
 ROTARY RECIPROCATING ENGINE.
 APPLICATION FILED JUNE 19, 1905.

2 SHEETS—SHEET 1.



ATTEST.
 R. B. M. out
 C. A. Sell

INVENTOR
 Mathias J. Hinden
 BY H. J. Fisher
 ATTY.

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2 SHEETS—SHEET 2.

Fig: 3.

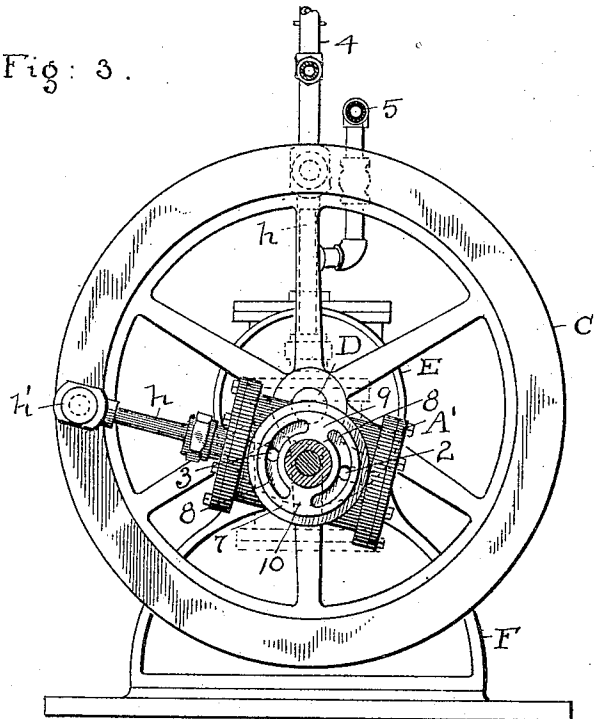
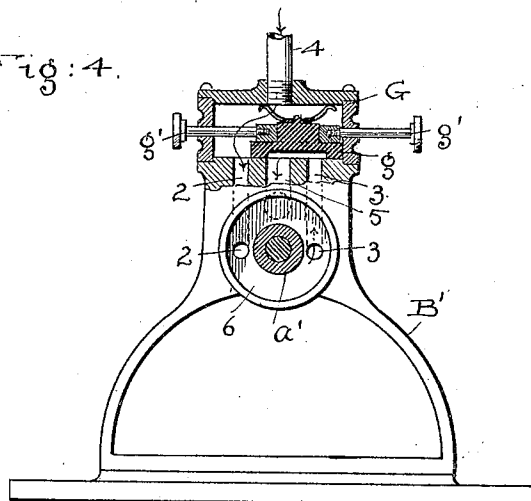


Fig: 4.



ATTEST

R. B. Moser

C. A. Sell

INVENTOR

Mathias J. Hinden

By *H. J. Fisher*

ATTY.

UNITED STATES PATENT OFFICE.

MATHIAS J. HINDEN, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO
C. C. SIGLER, OF CLEVELAND, OHIO.

ROTARY RECIPROCATING ENGINE.

No. 838,713.

Specification of Letters Patent.

Patented Dec. 18, 1906.

Application filed June 19, 1905. Serial No. 266,017.

To all whom it may concern:

Be it known that I, MATHIAS J. HINDEN, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Rotary Reciprocating Engines; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in rotary reciprocating engines; and the invention consists in the construction and arrangement of parts substantially as shown and described, and particularly pointed out in the claim.

In the accompanying drawings, Figure 1 is a vertical sectional elevation of the engine on the line of its axis; and Fig. 2 is a plan view of the engine on line $x x$, Fig. 1, and with the parts advanced a quarter-turn as compared therewith. Fig. 3 is an elevation on line $y y$, Fig. 2, looking to the left, which also is the dividing-line between the two-faced parts 6 and 7; and Fig. 4 is an elevation in section on line $y y$, Fig. 2, looking to the right and across the bearing 6 substantially.

As thus shown, the engine comprises two rotary reciprocating cylinder-engines A and A', separately mounted on suitable supports B and B', and two balance or fly wheels C and C', mounted, respectively, upon opposite ends of power-shaft D. A pulley or band wheel E is fixed upon shaft D centrally between its two supporting-standards F, and the power derived from the engines is transmitted through this shaft and pulley.

Each engine or engine-cylinder is provided with its own reversing-valve mechanism, the same comprising a valve-chamber G and a slide-valve g therein, having a stem g' on one or both sides to shift the valve according to the direction the parts are to turn, and ducts or passages 2 and 3, respectively, communicate between said chamber and the corresponding ducts in the said engines. A piston H or H' in each engine has a rod h connected at its outer end with the corresponding balance-wheel C or C', and a wrist-pin h' serves to make such engagement through the side and periphery of said wheel, thereby delivering power thereto at the greatest advantage. The said connections of the piston with said

wheels, furthermore, are about a quarter-turn apart in order that there will be no stop of both on possible dead-centers at the same time, and the engines themselves have each a pivot-trunnion a and a' , respectively, working in suitable bearings in the supports or uprights which carry the same and on which said engines or cylinders revolve in conjunction with the balance-wheels with which they are operatively connected. The said trunnions are provided with extensions a^2 , by which they are made more steady than they would otherwise be, especially as the said trunnions come only on one side of the engine and not on both.

Steam enters valve-chest G through supply-pipe 4 and exhausts through pipe 5, and the engines are so constructed as to take steam on both sides of the piston alternately, according to its position in its orbit. To these ends also a close steam-tight fit is made between the ground-face of the side 7 of the cylinder through which steam-ducts 2 and 3 pass and which carries the trunnion a or a' and the abutting face 6 of the trunnion-bearing standard. (Seen in Fig. 2.) Grooves or channels 8 in the said face 7 extend on opposite sides of the ports 2 and 3, Fig. 3, and serve to open communication with said ports as they are seen in Fig. 4, opposite the axis a^2 of the engine equally at all points in the rotation of the engine except as the lands 9 and 10 cut off or close both ports. The engine is on the dead-center point as this cut-off occurs; but both engines do not reach this point at the same time and are arranged to help each other over this point, as seen in Fig. 2. In this figure engine A is cut off, as shown, while engine A' is midway of its stroke under full head of steam. Both engines operate alike, and steam is admitted to one end and then to the other end of each cylinder, and thus a practically continuous exercise of power is obtained which is equalized by the two balance-wheels C and C'.

Only one of the engines may be run at a time, if desired, and a compound effect may be obtained by using the exhaust from one engine to run the other. This is effected by closing valve 12 in live-steam pipe 4, leading to engine A, and also closing valve 13 in the exhaust-pipe and opening valve 14 in pipe 4. The exhaust from engine A' will then flow through pipe 5 and branch pipe 15 into the

lower portion of live-steam pipe 4 and enter engine A.

It will be observed that this machine is wholly without valves in its operation and
5 that the construction of each engine is such as to be self-regulating as to supply a cut-off of steam. It will also be observed that the two engines are eccentrically mounted as to
10 the axis of the balance or fly wheels, but are mounted in line with each other axially on independent supports outside said wheels.

What I claim is—

15 In rotary reciprocating engines, a power-shaft and a balance-wheel on each end thereof, in combination with an engine eccentrically mounted on a separate support at each end of said shaft, a piston-rod in each engine connected with the corresponding fly-wheel

to apply power thereto, each of said engines having a trunnion on its side and center and
20 a faced portion about said trunnions provided with passages for the steam and a correspondingly-faced bearing for said trunnion having steam-passages, whereby steam is
25 controlled through the rotation of said engine and valves are rendered unnecessary, and the said engines set at right angles to each other as to said shaft, whereby dead-centers are avoided.

In testimony whereof I sign this specification in the presence of two witnesses.

MATHIAS J. HINDEN.

Witnesses:

R. B. MOSER,
C. A. SELL.