No. 754,672. PATENTED MAR. 15, 1904.

H. C. MITCHELL.

ROTARY STEAM ENGINE.

APPLICATION FILED JUNE 23, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 2.

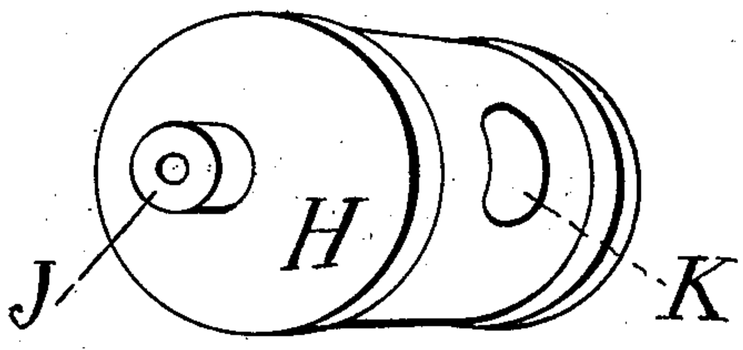


Fig. 3.

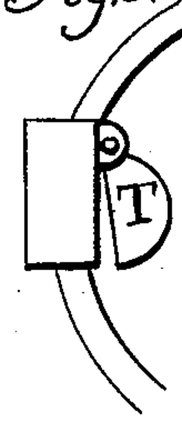
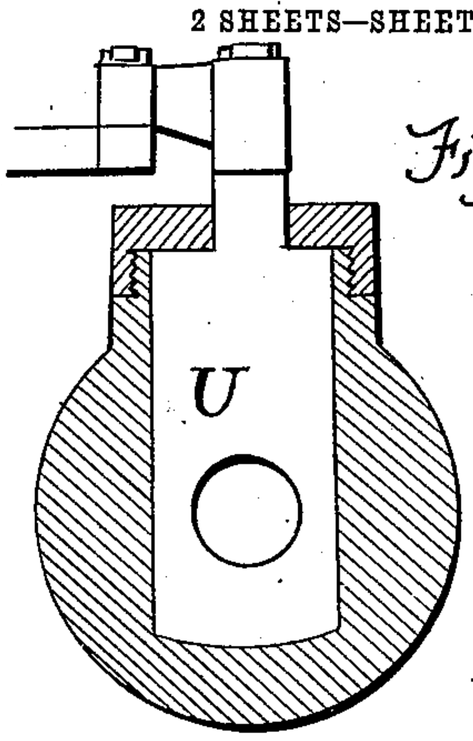


Fig. 4.



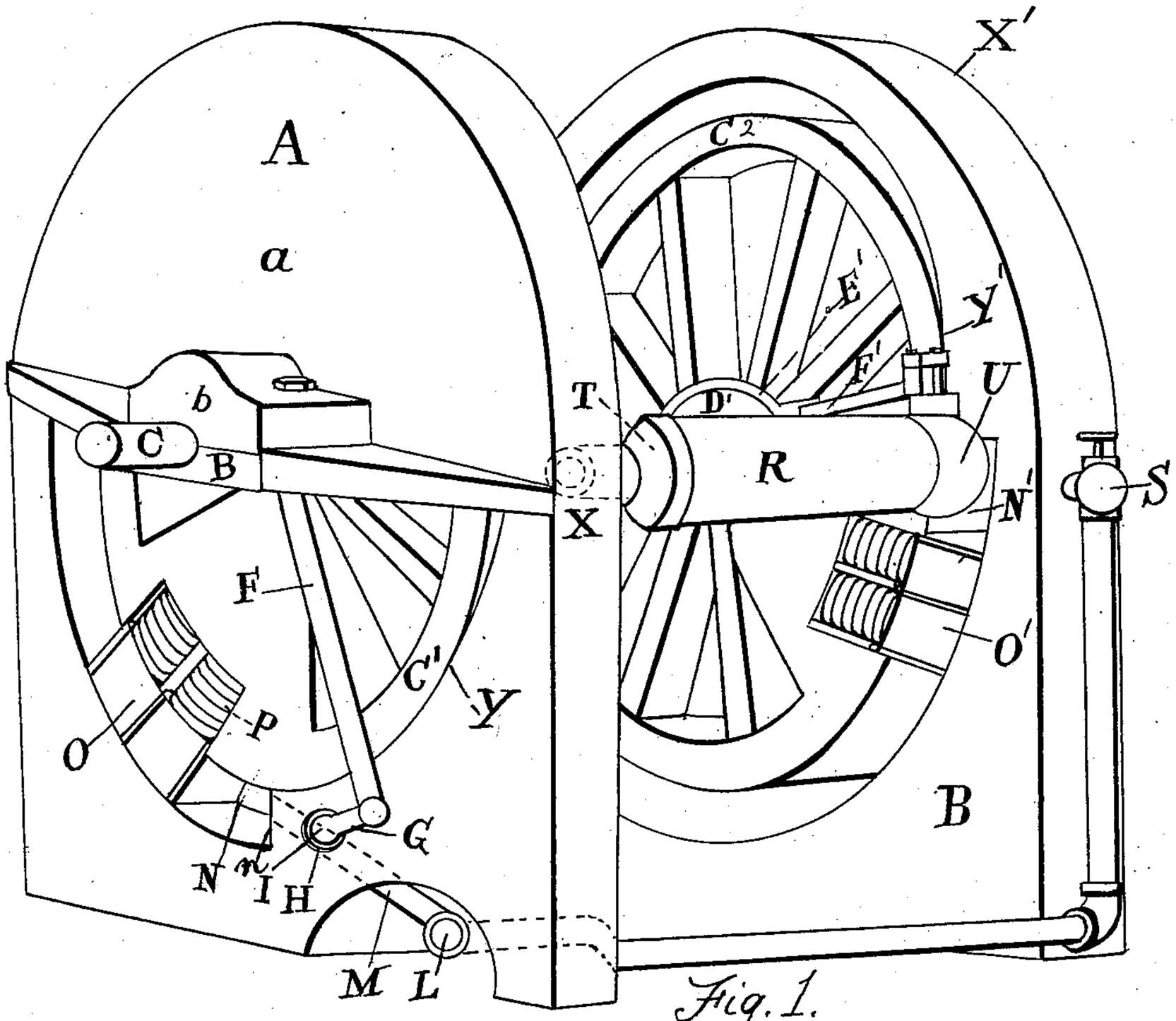


Fig. 1.

WITNESSES:

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NO MODEL. 2 SHEETS—SHEET 2.

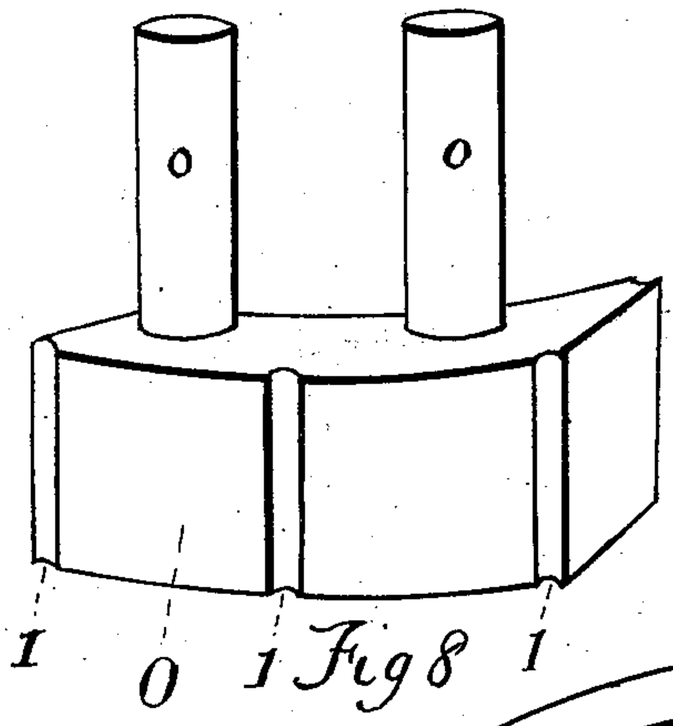

Fig 8

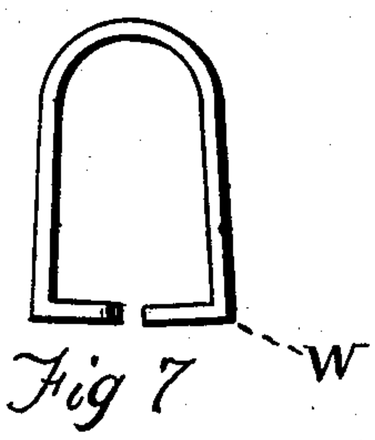

Fig 7

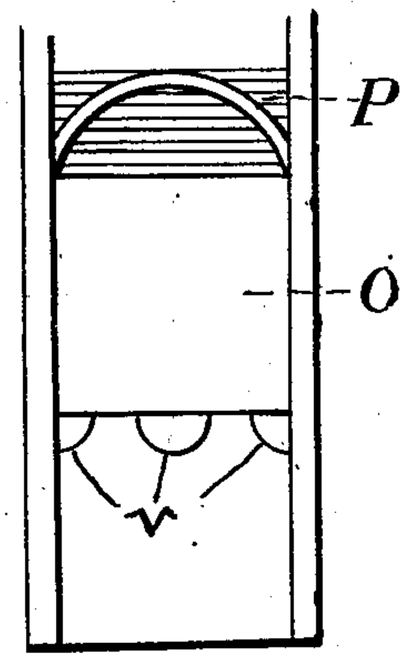

Fig 6

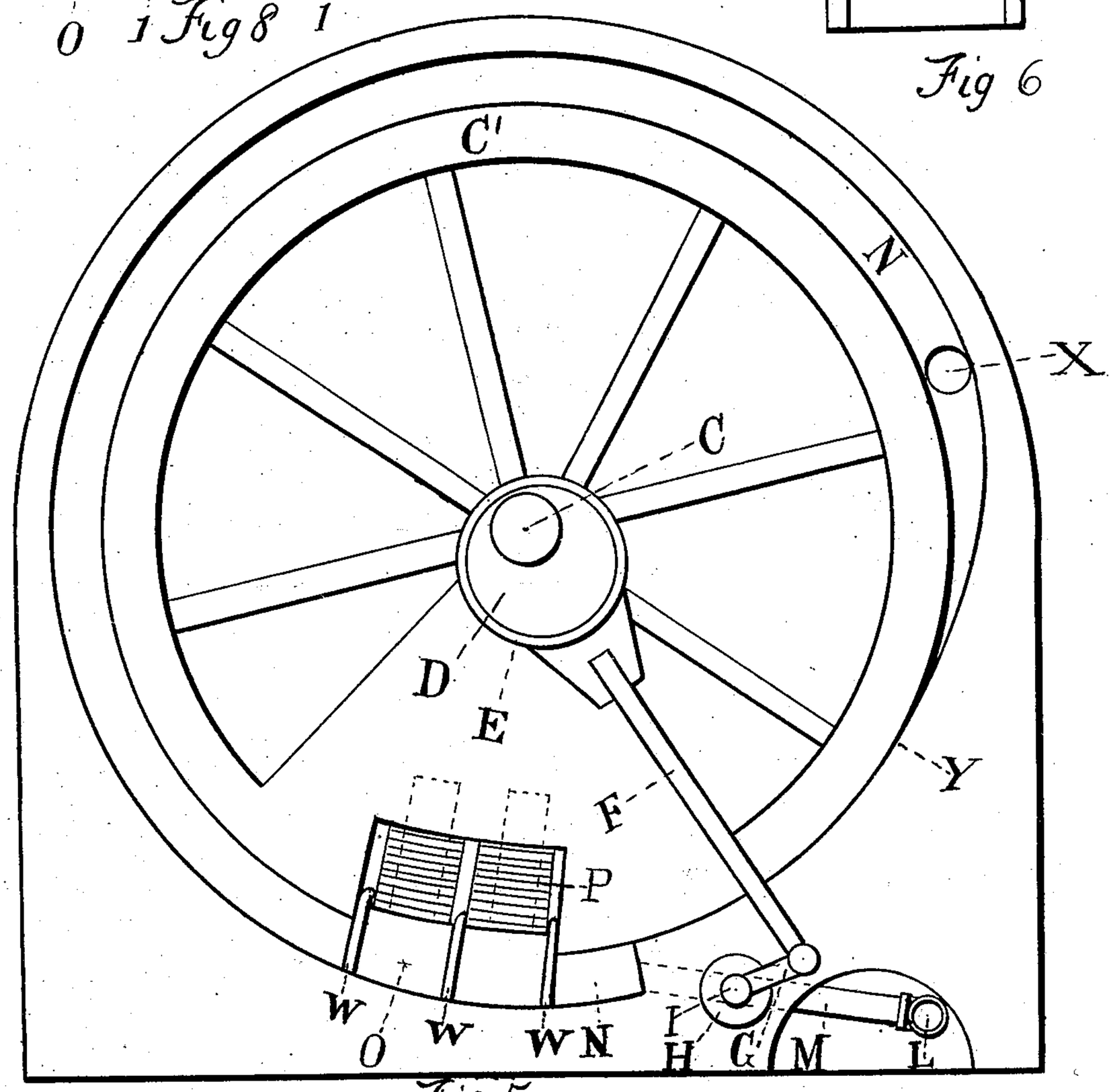

Fig 5

WITNESSES:
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No. 754,672. Patented March 15, 1904.

UNITED STATES PATENT OFFICE.

HENRY C. MITCHELL, OF ANDOVER, MASSACHUSETTS.

ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 754,672, dated March 15, 1904.

Application filed June 23, 1903. Serial No. 162,758. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. MITCHELL, of Andover, Massachusetts, have invented a new and useful Improvement in Rotary Steam-Engines, of which the following is a specification.

My invention relates particularly to non-reversing rotary steam-engines in which the expansion of the steam is availed of, rather than what is called its "kinetic" energy, and in which the steam is applied to one piston instead of to a succession of pistons or paddle-wheels—as, for instance, in what are called "turbine-engines"—and is intended to avail of all the power of steam expansion instead of a part of it.

My invention consists in mechanical devices and combinations for securing and utilizing the entire expansion of steam in rotary engines, including in these means a proper valve and a revolving piston and appurtenances, as hereinafter described.

My invention will be plain by reference to the drawings, in which—

Figure 1 is a perspective of my invention, showing the high-pressure part of the engine A and the low-pressure part of the engine B. Fig. 2 is a detail plan of valve G. Fig. 3 is a section of exhaust-valve T. Fig. 4 is a section of the rotary receiver-valve. Fig. 5 is a front view of A of Fig. 1 with the casing removed. Fig. 6 is a detail sectional view showing the subsidiary exhaust-channels in the cylinders. Fig. 7 is a detail drawing of the cylinder-packing ring. Fig. 8 is a plan of the piston with two stems, although a piston with one stem may be used.

In the drawings, as already remarked, A is the high-pressure, and B the low-pressure, parts of the engine, and *a* a part of the casing, which is removed in the lower part of Fig. 1.

B is the pillow-block; *b*, the covering of the bearing; C, the power-shaft; C′, the fly-wheel to which the shaft C is keyed, and C^2 the fly-wheel of B.

D is the eccentric of A, housed behind *b;* D′, the eccentric of B.

E E′ are straps about the eccentrics D and D′.

F is the eccentric-rod for A; F′, the eccentric-rod for B.

G is the adjustable valve-lever; H, the valve; J, the valve-shaft, and K the valve-opening.

L is the steam-supply pipe; M, the throttle-pipe. (Shown only in dotted lines, Figs. 1 and 5.)

N is the steam-space between the casing and the outer periphery of the wheel C′, which space forms the high-pressure cylinder of A and is provided at the steam-entrance with the abrupt shoulder *n* and extends to the exhaust X, from which it gradually tapers to a steam-tight joint at Y.

N′ is the space between the casing and the wheel C^2, which forms the low-pressure cylinder of B, extending to the exhaust X′ and tapering to Y′.

O is the piston; *o o*, the piston-stems for A; O′, the piston for B, (its guides not shown.)

P P are springs normally pressing the piston outwardly.

R is the exhaust from A to B and is so enlarged as to constitute a receiver.

S is the emergency-valve; T, the exhaust-valve. (Shown in Fig. 3.) U is the rotary receiver-valve. These valves are only modifications of well-known forms.

V V V are the subsidiary exhaust-grooves to allow the escape of the steam after the pistons pass X X′.

W is the packing. It will be seen that the half-rotary valve is worked by an eccentric and by a lever which automatically adjust themselves to a non-reversible engine.

The operation of my invention will be plain from these drawings. The steam being admitted from the supply-pipe L through the pipe M and the valve G, acts upon the piston O in the cylinder N, thereby causing revolution of said cylinder and the fly-wheel, which revolution by reason of the eccentric D acting upon the rod F closes the adjustable valve G and permits the continuous expansion of the steam until the piston O passes the point X in the cylinder, whereupon the steam is admitted to the receiver R of B. the low-pressure engine. The adjustability of valve G to the boiler-pressure permits both of using any normal boiler-pressure required and of cutting off the steam coming through the valve G at any desired extent of movement

of piston O, and the same is true of piston O′. Also it will be understood that from about X to Y piston O constantly recedes into the fly-wheel C′, and from Y to cylinder N, Fig. 5, said piston is wholly within the fly-wheel, and the same is true of piston O′ and its cylinder C^2. Upon the piston O reaching the position again, as shown in Fig. 1, the effect of the eccentric will have been to again open the valve G and steam will again be admitted to operate the piston O, as before, and continuously until shut off. The exhaust-steam which passes to the receiver R entering the cylinder N′ of B expands against the piston O′, causing a similar operation to that in the part A—that is to say, the rotation of wheel C^2 and the continuous advance of the piston O′ until the same passes the exhaust X′, at which point the ordinary open-air exhaust may be used or the steam may be condensed in the usual way or another, and if required a succession of the parts B may be used.

In Fig. 6 I have shown the subsidiary channels whereby the steam when it reaches X in the part A may pass under the piston back to the exhaust, and so on to R. The advantage of these subsidiary channels or grooves is to avoid the impact which otherwise would occur in the exhaust.

As a packing for the piston O, I prefer the construction shown in Fig. 7, in which W shows a metallic spring clasping the piston in grooves 1 1 1, Fig. 8, for by reason of this any wear from the movement of the cylinder, and consequent variation in the tightness of the piston, will be compensated by the spring action of the packing. The only use of energizing-valve S will be in case of the engine stopping with valve G closed.

Having described my invention, what I claim is—

1. In a non-reversing rotary engine operated by steam expansion, the combination of a supply-pipe, a half-rotary valve, an eccentric and rod, and a single lever for operating the valve, a double-stem piston and cylinder in which said piston moves having an abrupt steam-entrance shoulder and tapering beyond the exhaust to a steam-tight joint, subsidiary exhaust-grooves and a fly-wheel carrying said rotatable cylinder and piston.

2. In a non-reversing rotary engine, a supply-pipe, a valve therefor operated by an eccentric and a lever, a double-stem piston, a cylinder having a plurality of packing-rings distributed along the piston in grooves, a fly-wheel carrying said rotatable cylinder and piston, an eccentric carried by said fly-wheel and connected with a lever for operating said valve, an exhaust X, a receiver R, and a second similar piston, cylinder, fly-wheel carrying same, and eccentric; substantially as described and shown.

3. In a rotary fluid-engine, the combination of a casing provided through part of its periphery with an annular steam-space, a rotating disk forming the inner wall of said steam-space, an outwardly-pressed piston carried by said disk and adapted to close said steam-space when outwardly pressed, a supply-pipe entering said steam-space, an adjustable valve therein driven by an eccentric from said disk to operate said valve, an exhaust-port opening into said steam-space, and subsidiary exhaust-grooves in said casing across the exhaust-port, as and for the purpose described, all substantially as described.

4. In a non-reversing rotary steam-engine, the combination of the double-stem piston O having the grooves I with the steam-packing W composed of resilient metal substantially circumferential to the form of the piston, and closely fitting the same, and broken at its lower part to admit of a spring action as required.

5. In a rotary engine operated by steam expansion, a double-stemmed piston O having packing-grooves 1 and the stems *o*, *o;* substantially as and for the purpose described.

In witness whereof I hereunto subscribe my name this 22d day of June, 1903.

HENRY C. MITCHELL.

Witnesses:
GERTRUDE A. ROBINSON,
MICHAEL LUCEY.