

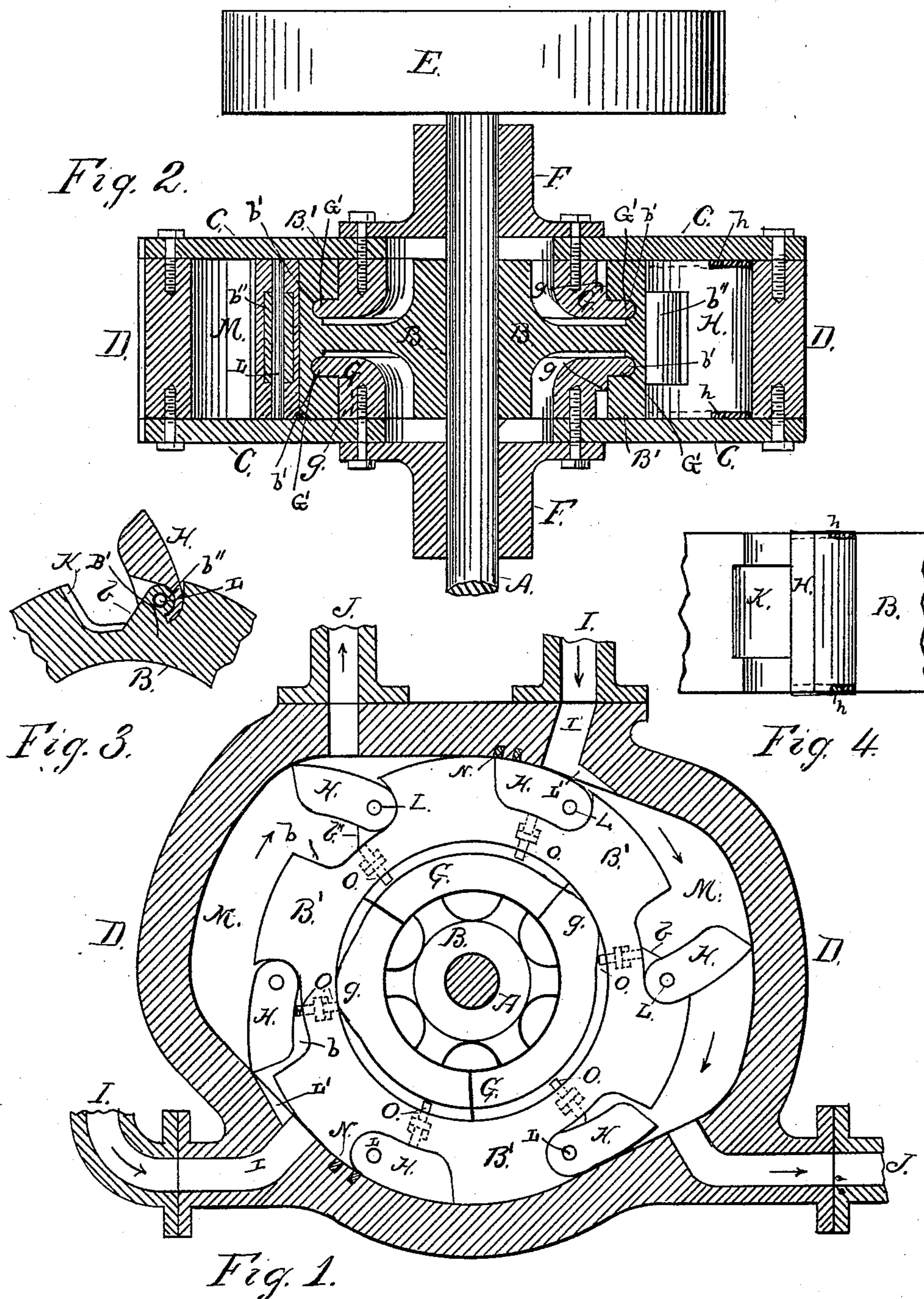
(No Model.)

F. L. VOORHIES.

ROTARY ENGINE.

No. 390,044.

Patented Sept. 25, 1888.



Witnesses:

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UNITED STATES PATENT OFFICE.

FRANK, L. VOORHIES, OF SAN JOSÉ, CALIFORNIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 390,044, dated September 25, 1888.

Application filed May 11, 1888. Serial No. 273,580. (No model.)

To all whom it may concern:

Be it known that I, FRANK. L. VOORHIES, of San José, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 is a vertical longitudinal transverse section through my improved rotary engine. Fig. 2 is a horizontal section of the same in the plane of the main shaft. Figs. 3 and 4 are details.

This invention is an improvement in rotary concentric piston-engines, and its objects are to simplify the construction and increase the durability, economy of steam, and efficiency of the same; and to these ends the invention consists in the hereinafter-described novel arrangement and construction of parts of the engine.

In the drawings, D represents the annular portion of the engine-case; and C C are side plates bolted thereon, so as to form steam-tight joints therewith.

A is a shaft passing transversely through plates C C and journaled in boxes F F, bolted exteriorly to said plates, as shown.

B is a wheel mounted upon shaft A within the casing. The rim B' of this wheel is of such width as to fit nicely between the plates C C, as shown. The inner face of rim B' is provided on each side of the spoke-web with annular shoulders b', and G G are annular sectional blocks bolted to the opposite plates, C C, as shown, and provided with shoulders G', which are properly dressed or packed to bear against and form steam-tight joints with shoulders b' of the wheel-rim.

The annulus D is enlarged or extended on opposite sides of the wheel B, forming chambers M M, that are separated by wheel B, which fits closely against the inner face of the annulus between said chambers. In the periphery of wheel B are formed transverse chambers b b, as shown, and in these chambers are seated valves H H, which are pivoted by rods L upon eye-lugs b'', projecting from rim B' in said chambers at one end thereof, so that the valves

can swing open, as shown. The chambers b b have narrow channels or recesses K formed in them at the ends opposite lugs b'', which channels permit the entrance of steam beneath the valves when the latter are down. The lugs b'' are rounded and enter similarly-rounded recesses in the base of the valves H, and the ends of the valves are rounded and enter rounded sockets in the rim of wheel B, as shown in Fig. 3, so that properly-tight joints will be maintained between the valves and the rim of wheel B at all times.

h h are packing-bushes set in grooves in the edges of valves H, to make tight joints between the same and the wall of chambers M.

I is an inlet-port leading through annulus D into the upper end of one chamber M, and I is a similar port leading into the lower end of the opposite chamber M.

L' L' are short channels or grooves formed in the inner face of an annulus, D, communicating with ports I and extending in the direction of rotation of the wheels, for a purpose hereinafter shown.

J J are the exhaust-ports from said chambers, leading through the annulus at the ends of the chambers opposite the inlet-ports.

N N are packing-bushes set into grooves in the inner face of the annulus, near the inlet-ports thereof, as shown.

O O are plungers playing through radial openings in the rim B' in the chambers b thereof and bearing against the under surfaces of the valves H. These plungers are keyed in their openings or otherwise secured, so that they cannot escape from their position, but have free play therein. When the valves are down or closed, the inner ends of plungers O are projected within the inner periphery of rim B' of wheel B, and may rest upon the outer periphery of the annular blocks G.

g g are cams formed on the blocks G in such position as to engage the plungers O and force them outwardly, opening the valves H at the moment they reach the steam-inlet ports.

E is a fly-wheel or pulley on one end of shaft A.

The operation of the machine is as follows: Steam is admitted through ports I, and, impinging against valves H, force the latter open in chambers M. The valves then stop the passage of steam to the exhaust-ports, and the

steam acting against the valves (which then serve as pistons) revolve wheel B and its shaft until the valves are forced down to the exhaust-ports. The number of valves and the arrangement of the chambers M and ports are such that before the first valves that receives the impact of steam has reached the exhaust-port another valve has been brought into position beneath the inlet-port. The steam then enters channel K beneath this valve and partly opens the same. The further rotation of the wheel causes the plunger O of such valve to impinge against the corresponding cam, *g*, which causes the plunger to move outward and to positively and forcibly open the valve still farther and force it to cut off steam from the preceding valve, and the first-named valve thus becomes the main impact-valve. The offset *L'* of the inlet-ports is so arranged that steam will be delivered to one valve until the succeeding valve has been partly opened, and by this arrangement the steam is gradually applied to and cut off from each valve. The ends of chambers M M are contracted, so that the opening of the valves will be gradual and the valves be automatically closed after they pass the exhaust-ports. The packings N N prevent any backward escape of steam from one chamber to the other. I have illustrated two chambers, M M, in the drawings; but the engine would operate with one chamber, and, if desired, more than one may be used. The number of valves H can also be varied, according to the power and size of the engine. Both packing-blocks G and wheel B can be made in sections in large machines. The engine may be used with steam, air, or gas as the motive power.

Having described my invention, I claim—
1. The combination of the casing having a

chamber, M, and inlet-port I therefor, having offsets *L'* and the exhaust-ports therefor, with the wheel mounted in said chamber, having a series of pockets in its periphery and the lugs rising in said pockets, the plungers playing through openings in said pockets, the hinged valves pivoted to the lugs in said pockets, and the cam engaging the plungers and positively opening the valves, substantially as and for the purpose described.

2. The combination of the casing, wheel B therein, having annular shoulders *b'* on the inner face of its rim, and hinged valves H on said wheel, and the plungers engaging the valves, with the annulus-blocks G G, engaging the shoulders of the wheel, all constructed and arranged substantially in the manner and for the purpose described.

3. The combination of the casing, with the pocketed wheel B, valves H, pivoted on lugs rising in the pockets of said wheel, the plungers O, and blocks G G, having cams *g g*, all constructed and arranged substantially in the manner as and for the purpose described.

4. In a rotary engine, the combination of the casing composed of annulus D, having ports I and J and the side plates, C C, with the shaft A, journal-boxes F, wheel B, valves H, hinged in pockets of said wheel, the plungers O O, blocks G G, and cams *g g*, all constructed and arranged to operate substantially in the manner as and for the purpose described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

FRANK. L. VOORHIES.

Witnesses:

L. M. RUCKER,

M. A. BOULWARE.