4 Sheets—Sheet 1.

A. VACHEROT.

Rotary Engine and Pump.

No. 213,476. Patented Mar. 18, 1879.

FIG. 2.

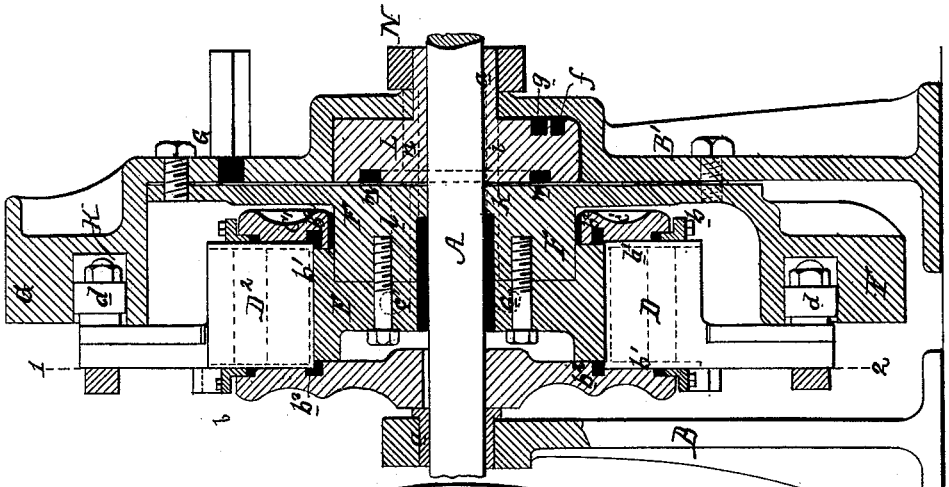
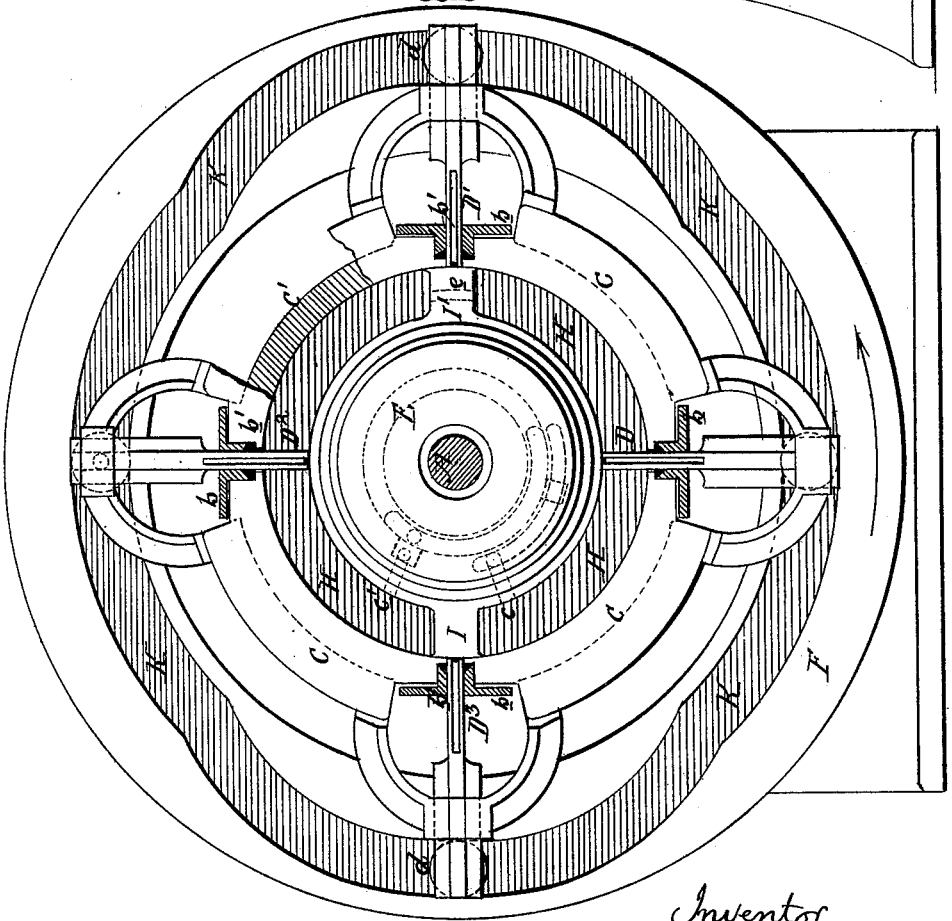


FIG. 1.



WITNESSES

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FIG. 5.

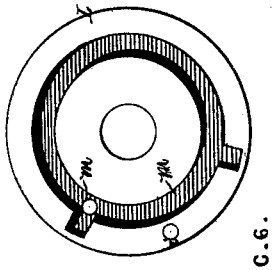

FIG. 6.

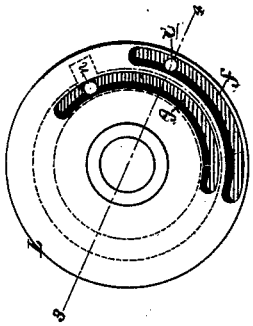

FIG. 7.

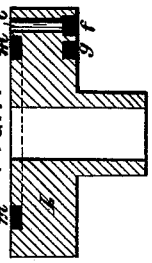

FIG. 4.

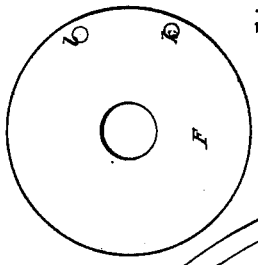

FIG. 3.

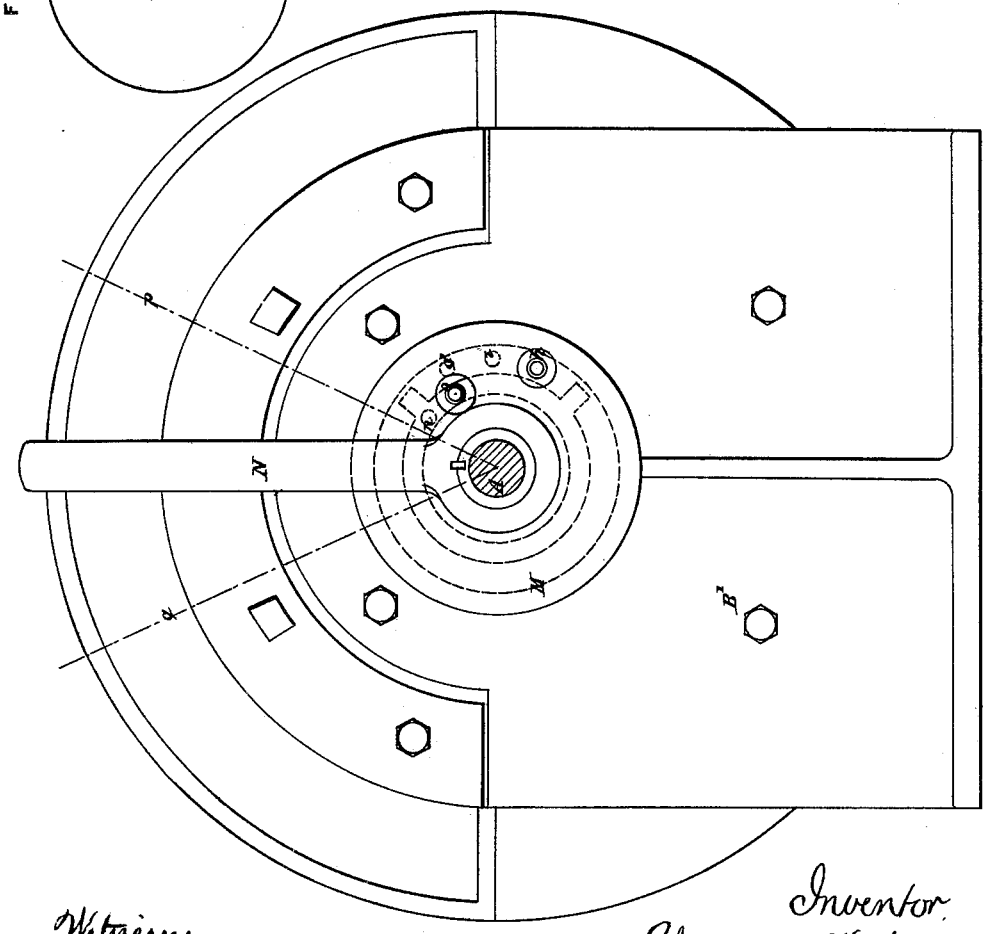

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FIG 9

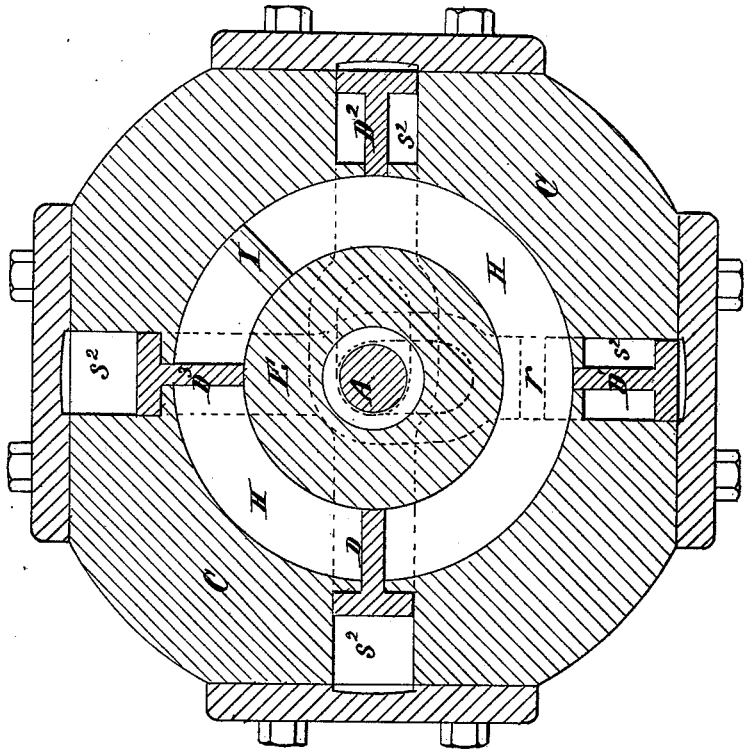
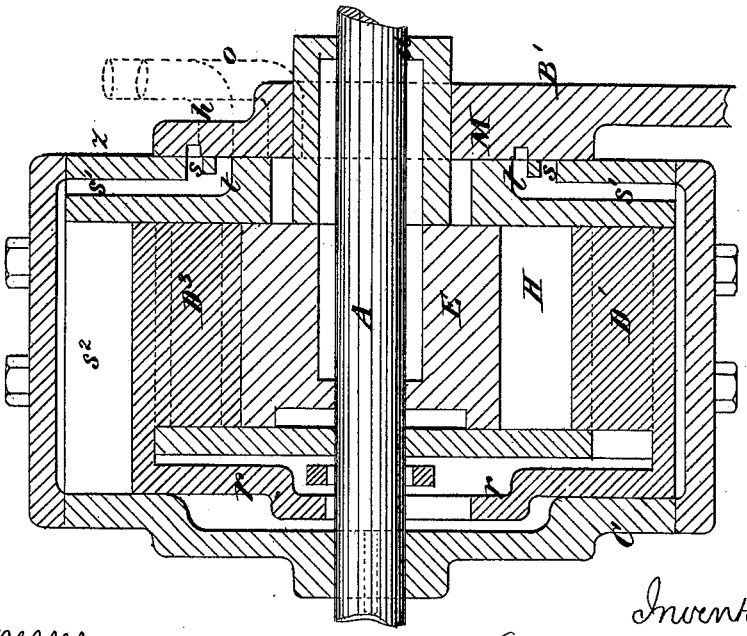


FIG 8



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4 Sheets—Sheet 4.

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Rotary Engine and Pump.

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Fig 11.

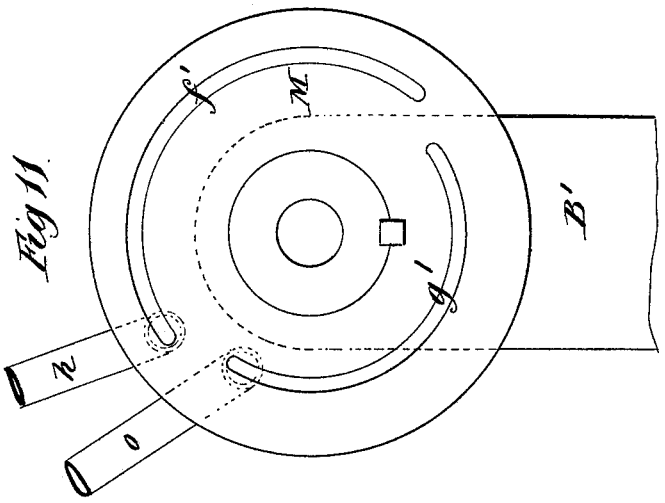
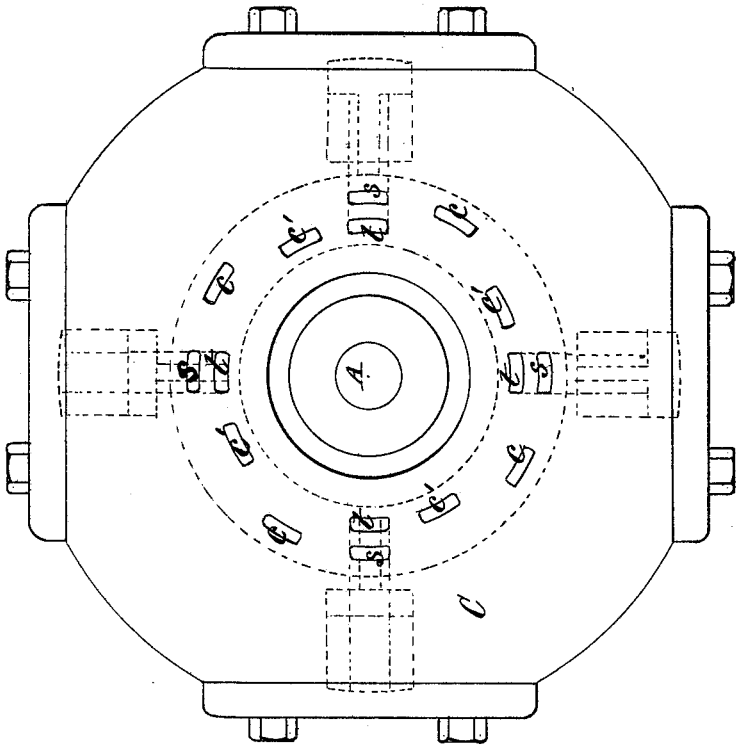


Fig 10



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UNITED STATES PATENT OFFICE.

ALEXANDRE VACHEROT, OF BRIDGE ROAD, BATTERSEA, SURREY COUNTY, ENGLAND.

IMPROVEMENT IN ROTARY ENGINES AND PUMPS.

Specification forming part of Letters Patent No. **213,476**, dated March 18, 1879; application filed July 22, 1878; patented in England, November 3, 1875, and June 7, 1878.

To all whom it may concern:

Be it known that I, ALEXANDRE VACHEROT, of Clyde House, Bridge Road, Battersea, in the county of Surrey, England, have invented certain Improvements in Rotary Engines, Rotary Pumps, and other like apparatus, of which the following is a specification:

My invention, for which I have obtained English Patents No. 3,828 of 1875 and No. 2,285 of 1878, relates more particularly to rotary engines to be driven by steam, water, gas, or other fluid, but is also applicable to pumps and similar rotary apparatus; and the object of the invention is to simplify the construction of the apparatus without impairing its efficiency, and thereby obtain an apparatus economical in its cost, compact, and not liable to get out of order.

In carrying out my invention as applied to rotary engines, I employ a hollow revolving cylinder and a stationary boss arranged within the same, in such a manner that a space or chamber is left between the external periphery of the boss and the internal periphery of the cylinder. The continuity of this space or chamber is interrupted by one or more permanent radial abutments formed on the boss, and separating the inlet-ports from the outlet-ports, one of which abutments (when more than one are employed) may be perforated, in order to allow the motive fluid to pass through the same. I also employ sliding valves or pistons, which are fitted so as to work through slotted guideways or stuffing-boxes in the sides of the cylinder and form the surface upon which the motive fluid acts. These valves or pistons are operated either by means of cams or by the motive fluid admitted behind them, so as to be successively moved away from the boss in order to admit of their passing the abutment as the cylinder rotates, and then again moved into contact with the external periphery of the boss, so as to receive the action of the motive fluid, by which the rotary motion is imparted to the cylinder; and in order that my said invention may be fully understood, I shall now proceed more particularly to describe the same, reference being had to the accompanying drawings, in which—

Figure 1, Sheet 1, represents a front sectional elevation of an engine constructed according to my invention, the section being taken along the line 1 2 in Fig. 2. Fig. 2 is a vertical section of the same in a plane taken at right angles to Fig. 1. Fig. 3, Sheet 2, is a rear elevation. Fig. 4 is a detail rear view of a portion of the internal framing, showing the passages for the motive fluid. Figs. 5, 6, and 7 are details of the distributing-valve, Figs. 5 and 6 being elevations of the front and rear sides, respectively, and Fig. 7 a horizontal section taken along the line 3 4, Fig. 6. Figs. 8 and 9, Sheet 3, and Figs. 10 and 11, Sheet 4, illustrate a modification, Figs. 8 and 9 being vertical sections taken at right angles the one to the other, Fig. 10 an elevation of the end *z* with the end plate removed, and Fig. 11 an elevation of the inner side of the said end plate.

Referring to the construction illustrated in Figs. 1 to 6, A is the shaft of the engine, which is supported in bearings at *a a* in the standard B and fixed frame B′, and may be fitted with driving-pulleys or other gear for transmitting motion or power. On this shaft I key the piece C, which, with the piece C′ attached thereto, forms what I designate the "cylinder," the same having formed therein slots or guideways for the reception of valves or pistons D D^1 D^2 D^3, which are capable of sliding toward and from the center of the engine. The said slots or guideways are fitted with stuffing-boxes at *b* in order to render the interior of the apparatus fluid-tight. In the interior of the cylinder C, I arrange the stationary boss E, which is attached to a piece, F, bolted to the frame B′, and also having attached to it another piece, G, the several parts E, F, G, and B′ and B forming together the framing of the engine.

The boss E and the cylinder C are so arranged in relation to each other that a space or chamber, H, is left between the external periphery of the boss and the internal periphery of the cylinder except at two points, at which the boss is fitted with radial abutments I I′.

The outer extremities of these abutments fit the bore of the cylinder C, against which they may be pressed by a spring or other means, if desired.

The pistons D D^1 D^2 D^3 are also normally in contact with the external periphery of the boss, and their sides form the piston-surface, against which the steam (for example) acts when admitted to the chamber H through the port *c*, as hereinafter explained.

Rotary motion is thus imparted to the cylinder C in the direction denoted by the arrow, the steam acting upon the piston D, which, for example, may be assumed to be then in closer proximity to the port *c* than is indicated in the drawings, while the stationary abutment I forms the necessary resistance. As the cylinder C rotates the pistons D^1 and D^3 will be brought into proximity to the abutments I I′, repectively, and it will be necessary to retract the said pistons in order to allow them to pass the abutments. This is effected by means of a cam-groove, K, formed in the ports F G of the framing, to which groove the rollers *d d*, attached to the pistons, are adapted.

The cam is made of such a shape as to cause the pistons to be withdrawn, so as to enable them to pass the abutments, and then moved into contact with the boss E at the proper time.

In the position shown in the drawings, the pistons D^1 D^3 are represented as having been withdrawn and in the act of passing the abutments I′ I, respectively. By the time the piston D arrives in proximity to the abutment I′ the piston D^3 will have passed the steam-port *c*, and the steam will act upon the said piston. Also, when the piston D is withdrawn, in order to enable it to pass the abutment I′, the steam which has been imprisoned between the two pistons D^3 and D will escape past the piston D and pass through an aperture, *e*, formed in the abutment I′. The steam is thus expanded and acts upon the piston D^1, the solid portion of the abutment providing a sufficient area to form an effective resistance. The piston D is then again moved into contact with the boss, and in its turn receives the steam, which has passed through the aperture *e* in the abutment I′ after escaping past the piston D^3. A similar action takes place with the whole of the pistons in succession, whereby the rotary motion of the cylinder C is maintained with a minimum expenditure of steam. The exhaust-steam finally escapes at *c′*.

The pistons are provided with grooves, as shown at b^1 by full lines in Fig. 1, and by dotted lines in Fig. 2, for the reception of packing of any suitable description to render the joints fluid-tight. The cylinder is also provided with grooves, as shown at b^2 in Fig. 2, for the reception of packing for a like purpose.

The packing may be so arranged as to be easily regulated by screws, if desired.

In order to enable the motion of the engine to be readily reversed, I employ a valve, L, (shown in detail in Figs. 5, 6, and 7,) adapted to the casing M, forming a portion of the frame B′, and fitted on the shaft A, so as to admit of the shaft turning freely therein. This valve is provided on its rear side with two semi-annular grooves, *f g*, to the former of which, *f*, steam is supplied through an opening at *h* in the cover M. The steam is then conducted through an aperture, *i*, (see Figs. 6 and 7,) and thence through a passage, *k*, in the piece F (shown most clearly in Fig. 4) to the steam-port *c*.

The exhaust-steam is conducted from the port *c′* along the passage *l* in the piece F into an annular groove, *m*, on the inner side of the valve L, thence through an aperture, *n*, into the semicircular groove *g*, from which it escapes through an opening, *o*, in the cover M into the atmosphere or elsewhere, as required.

When it is required to reverse the engine the valve is turned upon its axis, by means of its handle N, from the position indicated by the dotted line *p* to that denoted by the dotted line *g* in Fig. 3, whereby the passage *k* is brought into communication with the annular groove *m*, leading to the exhaust-outlet *o*, and the passage *l* is brought into communication with the aperture *i*, leading from the steam-inlet *h*, and the engine is accordingly reversed.

In Fig. 3 I have represented the handle in an intermediate position for the facility of showing the different passages and openings. By placing the handle in this position the engine will be stopped. By varying its position between the two extreme points, the ports may be more or less opened, as required.

In lieu of employing the reversing distributing-valve hereinbefore described, any equivalent valve or cock may be used, or each of the ports may be fitted with a three-way cock, so as to admit of the motion of the engine being reversed by changing the position of the cocks, and thus using the steam-port as the exhaust-port, and vice versa; or, when a capability of reversing is not required, a single distributing-valve may be employed—such, for example, as that shown applied to the modification of engine illustrated in Figs. 8 to 11, and hereinafter described.

The ports and distributing valve or valves or cocks may also be so arranged that the steam shall be only admitted during a portion of each fraction of a revolution, corresponding to the distance between two of the pistons of the cylinder, in order to utilize to the utmost the expansive action of the steam.

In the modification of engine illustrated by Figs. 8 to 11 the construction is generally similar to that of the engine shown in Figs. 1 to 7, the principal variations consisting in the use of a single radial abutment in lieu of two and in the pistons being forced into contact with the boss and retracted at the requisite periods under the action of the motive fluid—say steam, for example—instead of by cams, as in the preceding arrangement.

In the various Figs. 8 to 11, I have shown so much only of the engines as is sufficient to explain the variations from the arrangement shown in Figs. 1 to 7. It will be understood,

however, that the engine is to be fitted with stuffing-boxes, packing, and other accessories, as in the said former arrangement.

In the modification, Figs. 8 to 11, the perforated radial abutment I′ is dispensed with, the abutment I only being employed. The pistons D D^1 D^2 D^3 are also connected together in parts by a bar or rod, *r*, so that when one piston is forced inward into contact with the periphery of the boss the opposite piston will be forced outward; but the pistons may be arranged independently of each other, if desired, in which case two radial abutments are employed. *c c′* represent the ports, either set of which may be the steam-ports, the others being exhaust-ports. For the convenience of description, however, I shall assume that the ports *c* form steam-ports, while the ports *c′* are exhaust-ports. The steam is conducted by the inlet-pipe *h* into a semi-annular groove, *f′*, formed in the cover M, whence it passes through the ports *c c* into the interior of the cylinder, and acts in succession upon the several pistons.

These pistons are successively operated by steam, admitted through ports *s* s^2 and passages s^1 into the chambers behind the pistons simultaneously with the admission into the cylinder. The steam, after its action in the cylinder, passes through the ports *c′ c′* into another semi-annular groove, *g′*, formed in the cover M, whence it escapes by the outlet-pipe *o*, the steam, which has acted upon the pistons in order to force them inward and retract them, pressing through other ports, *t*, into the groove *g′*, and being discharged in a similar manner.

The apparatus may be used as a pump by driving the shaft by means of any suitable prime mover in lieu of the same being actuated by the agency of fluid admitted into the cylinder, as before mentioned, or two engines may be mounted on the same shaft, the one serving as the motor and the other as the pump.

In a similar manner the apparatus may be utilized as a blower, as will be well understood.

When the apparatus is used as a pump, if two abutments are employed, they may be imperforate, and an inlet and outlet may be provided at opposite sides of each of the stops, thus forming a double pump.

I am aware that it has been heretofore proposed to construct a rotary engine with valves operated by cams separate from the stationary abutments. This, therefore, I do not desire to claim, nor do I desire to claim, broadly, a stationary boss within a rotating cylinder of a rotary engine; but

I claim as my invention—

In a rotary engine or pump, the combination of the stationary boss E in the center of the engine, and having one or more radial abutments, I, with a hollow revolving cylinder, C, arranged around said boss, so as to leave a steam chamber or chambers, H, between the internal periphery of the cylinder and the external periphery of the boss, and with radial pistons or valves D D^1, &c., adapted to slide in guides in said outer cylinder, and devices, substantially as described, for moving said valves or pistons into and out of contact with the periphery of the stationary boss, as set forth.

In witness whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALEXANDRE VACHEROT.

Witnesses:

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