No. 646,024.

Patented Mar. 27, 1900.

H. B. GOODHART.

FLUID PRESSURE ENGINE.

(Application filed Dec. 11. 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

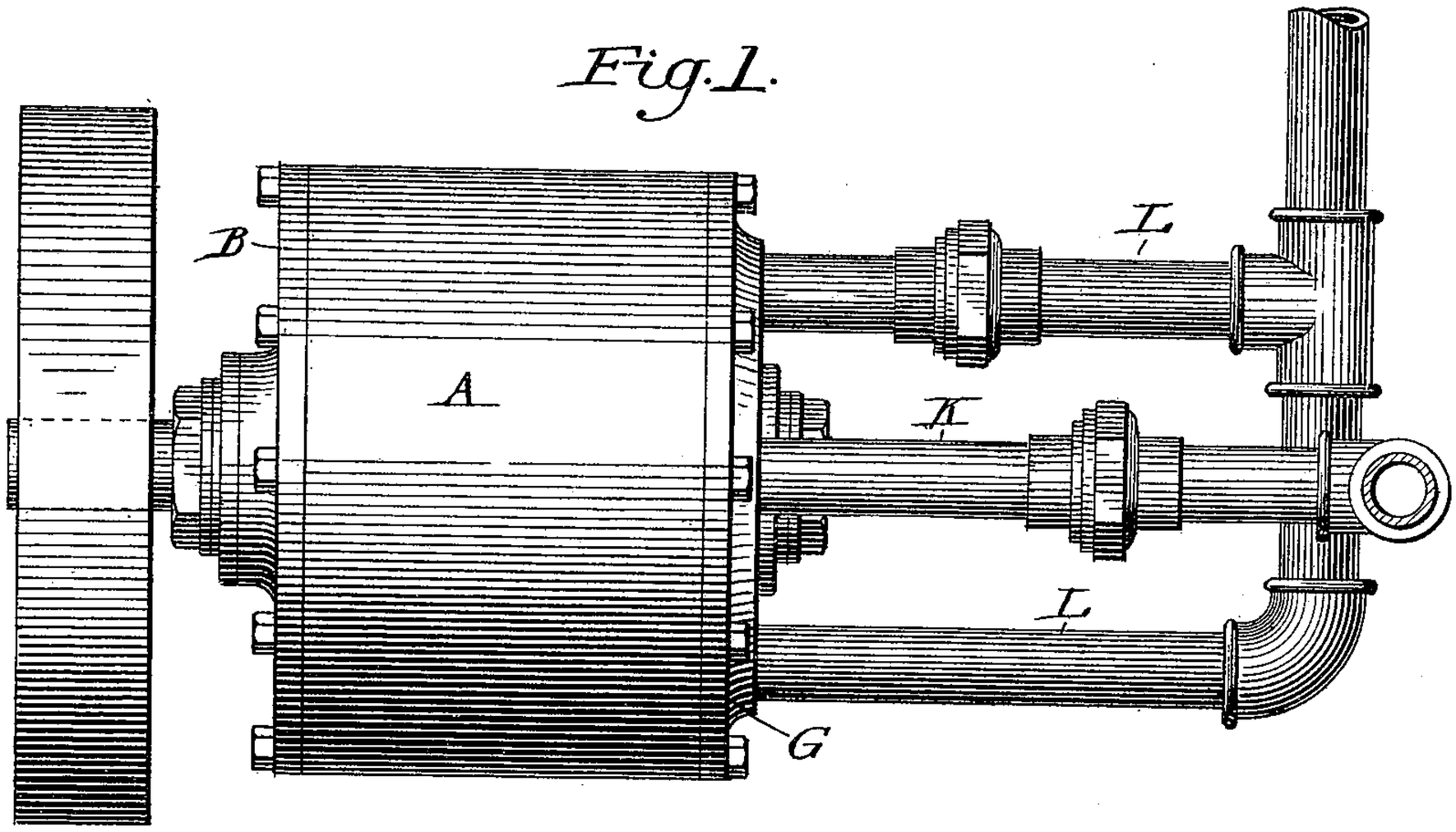
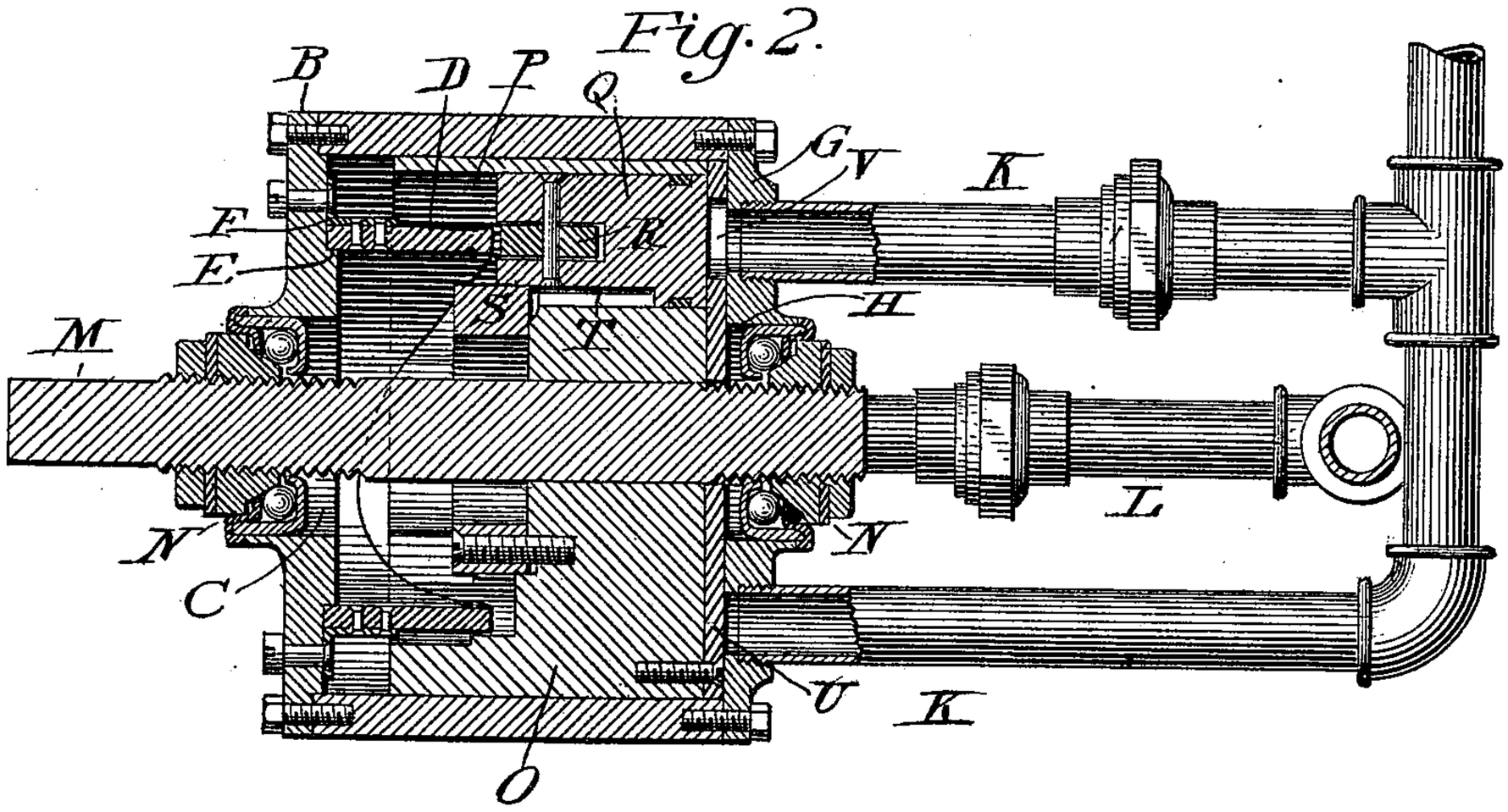


Fig. 2.



Witnesses:
O. W. Edelin.
R. A. Balderson

Inventor:
Howard B. Goodhart.
By F. E. Stebbins
Atty.

No. 646,024. Patented Mar. 27, 1900.

H. B. GOODHART.

FLUID PRESSURE ENGINE.

(Application filed Dec. 11, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

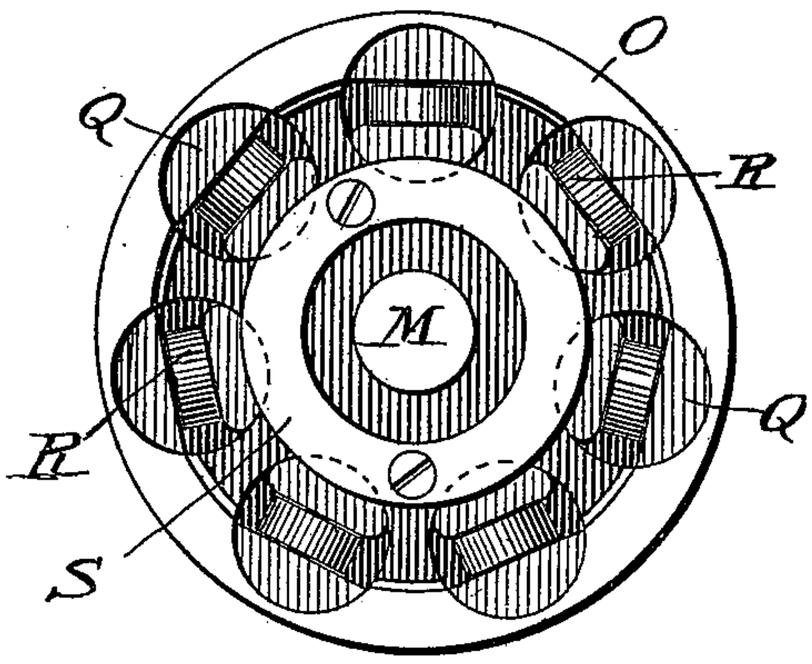


Fig. 4.

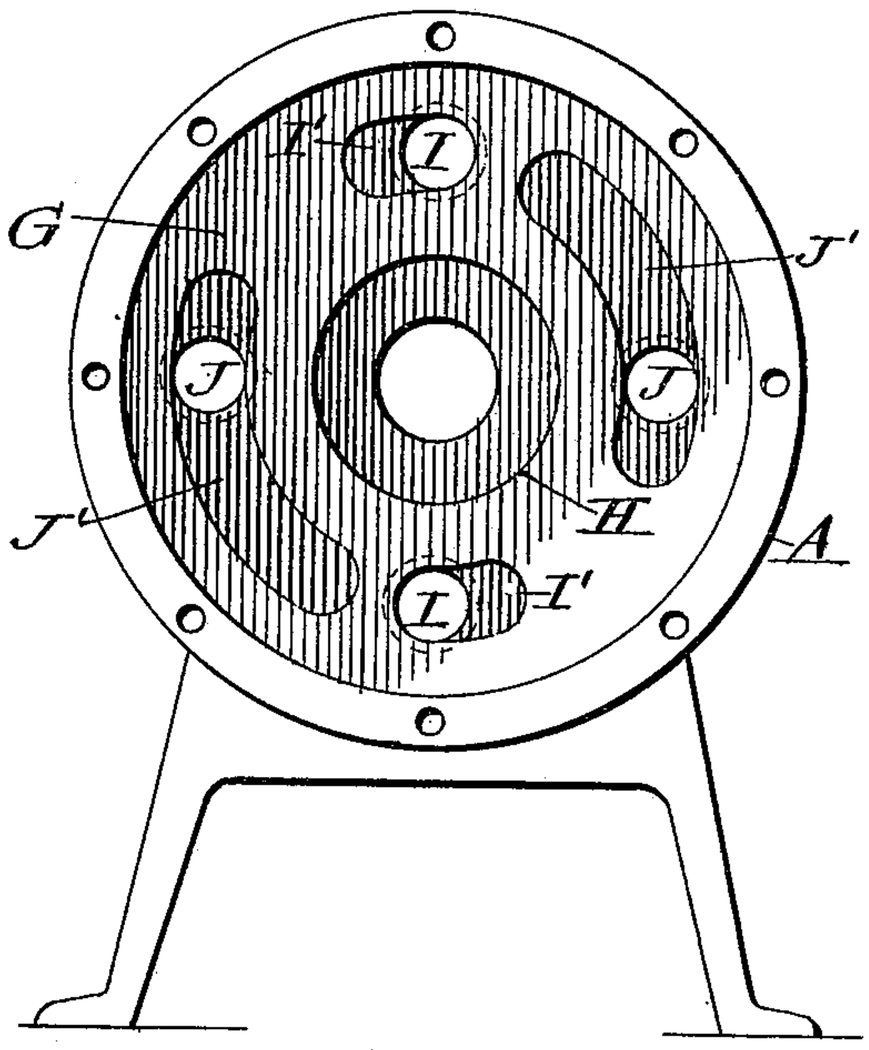


Fig. 5.

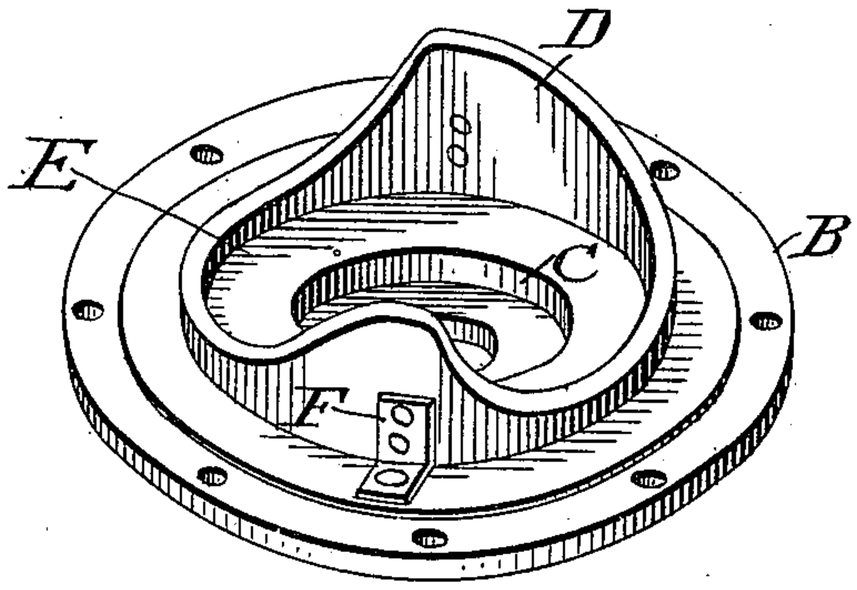


Fig. 6.

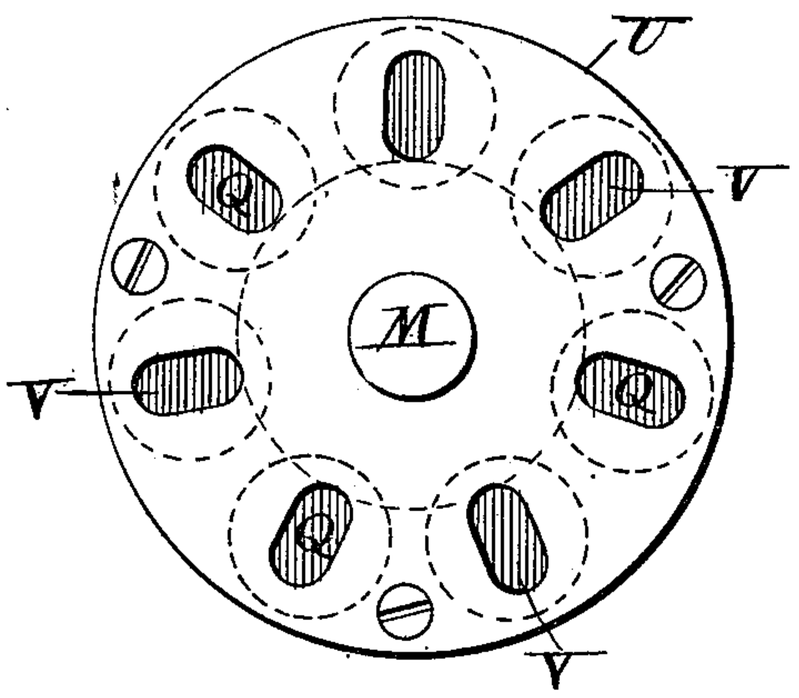
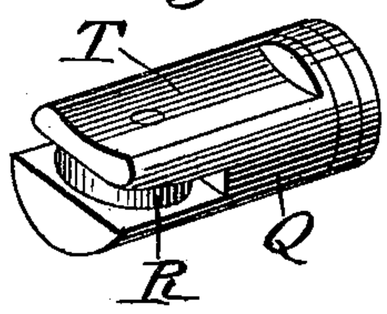


Fig. 7.



Witnesses:
D. W. Edelin.
R. A. Baldeson

Inventor.
Howard B. Goodhart.
By F. E. Stebbins.
Atty.

UNITED STATES PATENT OFFICE.

HOWARD B. GOODHART, OF READING, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO JOHN J. FULMER AND ALLEN JOHN BIEHL, OF SAME PLACE.

FLUID-PRESSURE ENGINE.

SPECIFICATION forming part of Letters Patent No. 646,024, dated March 27, 1900.

Application filed December 11, 1899. Serial No. 739,926. (No model.)

To all whom it may concern:

Be it known that I, HOWARD B. GOODHART, a citizen of the United States, residing at Reading, in the county of Berks and State of Pennsylvania, have invented certain new and useful Improvements in Fluid-Pressure Engines, of which the following is a specification.

The object of my invention is the production of a fluid-pressure engine adapted to be operated by steam or compressed air which shall be simple in construction, composed of few parts, light in weight, and so constructed that it will occupy a comparatively-small space or area, which shall use steam or compressed air efficiently and economically, which shall be durable in service, not liable to become deranged, and easily repaired when necessary, and which withal shall constitute a means for utilizing the energy of fluid motive power that is superior to any analogous type of engine heretofore produced.

With the above main end in view my invention consists, *imprimis*, in an engine having a rotary cylinder provided with piston-chambers and pistons, a cam-ring, and inlet and exhaust ports at one end of the rotary cylinder only and in the same perpendicular plane.

It further consists in an engine having a rotary cylinder provided with a plurality of piston-chambers and pistons, a double cam-ring, and inlet and exhaust ports at the end of the rotary cylinder.

Still further, it consists in an engine having a rotary cylinder provided with piston-chambers and pistons, a cam-rim, and a plurality of inlet and exhaust ports arranged alternately in the cylinder-head.

Still further, it consists in an engine comprising a rotary cylinder provided with piston-chambers and pistons having antifriction-rollers, a cam-ring, inlet and exhaust ports in the same plane, and means for preventing the rotation of the pistons in the chambers.

Finally, it consists in certain novelties of construction and combinations and arrangements of parts hereinafter described and specifically claimed.

The accompanying drawings illustrate an example of the physical embodiment of my invention constructed according to the best mode I have so far devised for the application of the principle.

Figure 1 is a top plan view of the example, showing the engine complete with steam supply and exhaust pipes attached to one of the cylinder-heads. Fig. 2 is a part-sectional view of Fig. 1, taken in a plane passing through the steam-supply pipes. Fig. 3 is a view in elevation of the outer end of the rotary cylinder. Fig. 4 illustrates one side of the inner cylinder-head having the inlet and exhaust ports. Fig. 5 is a view in perspective of the outer cylinder-head and cam-ring. Fig. 6 is a view in elevation of the inner end of the rotary cylinder. Fig. 7 is a perspective view of one of the pistons.

Referring to the several views, the letter A designates the cylinder-casing, made of any suitable dimensions and having a base cast integral therewith or attached thereto in any desirable way.

B is the outer cylinder-head; C, an opening in the head for the shaft and bearing; D, a double cam-ring of the shape shown in Fig. 5; E, a boss integral with the head B, over which the cam-ring fits, and F are clips which secure the cam-ring rigidly in place.

G is the inner cylinder-head, and H an opening in the head for the shaft and bearing.

I designates the inlet-ports, located one hundred and eighty degrees apart, and I′ grooves in the surface of the head, adjacent the inlet-ports.

J are the exhaust-ports, each in this instance located ninety degrees from an inlet-port.

J′ are curved grooves made in the surface of the head, adjacent to and extending each side of the exhaust-ports.

K are the two inlet steam-pipes, and L the two steam-exhaust pipes,

M designates the threaded shaft, and N ball-bearings of any desired type, located between the shaft and cylinder-heads and arranged as shown, so that the shaft can be longitudinally adjusted relative to the inner cylinder-head.

O is the rotary cylinder.

P are piston-chambers formed in the body of the rotary cylinder and in a circle about the longitudinal axis thereof.

Q are reciprocating pistons of the general

shape shown in Fig. 5, each being shorter than the length of a piston-chamber.

R are antifriction-rollers journaled in slots made in the ends of the pistons.

S is a ring secured to the rotary cylinder in such a position that its outer edge projects into the piston-chambers, as indicated in Fig. 2 and by dotted lines in Fig. 3.

T are concave recesses formed in the surfaces of the pistons for a part of their lengths, which bear against the outer surface or circumference of the ring S, secured to the rotary cylinder.

U is a disk of the same diameter as the rotary cylinder, to the inner end of which it is rigidly held by screws, and V are holes made in the disk and in line with the pistons and piston-chambers.

The *modus operandi* of the engine is as follows: Steam or other fluid motive power being admitted to the pipes K K and the rotary cylinder turned so that a piston-chamber is brought into alinement with one of the inlet-ports I, the piston in said chamber will be forced outwardly against the inclined surface of the cam-ring, which action will cause the rotary cylinder to revolve and move the piston-chamber out of alinement with the inlet-port and shut off the steam. The rotary motion thus imparted to the cylinder brings a piston-chamber into alinement with the inlet-port which is located directly opposite to the one which has previously been opened. The admission of steam then gives another rotary impulse to the cylinder, the piston traveling down the incline on the other half of the cam-ring. By the relative disposition of the parts steam is obviously admitted to piston-chambers alternately by ports on opposite sides of the shaft M through the pipes K K. As the cylinder revolves after steam is cut off, the piston-chamber is brought opposite a groove J′, and the exhaust commences and is finally consummated when the piston-chamber is brought into alinement with the port J or slightly beyond it. The same rotary motion simultaneously retracts the piston, which is forced up the inclined surface of the cam-ring. The number of rotary impulses given the cylinder will depend upon the number of pistons, there being seven shown in the engine illustrated.

From the foregoing description, taken in connection with the drawings, it becomes evident that I have produced an engine which fulfils all the conditions set forth as the purpose or end of my invention, besides possessing many other desirable and novel features and characteristics. Fluid motive power being admitted at two points distant from each other one hundred and eighty degrees, the rotary cylinder is balanced, which will insure a steady motion and materially retard the wear of the parts and also diminish friction. Moreover, there will be no dead-center, inasmuch as a second piston commences its stroke before its predecessor has reached the lowest part of the cam-ring. The rotary cylinder being adjustable through the medium of the bearings, it can always be held in direct frictional contact with the inner cylinder-head G, so that no steam or fluid motive power can pass to the inside of the cylinder-casing A from either the inlet or exhaust ports. The location of the inlet and exhaust ports in the same plane and at the end of the rotary cylinder insures the quick action of the steam on the pistons and its unimpeded and complete exhaust from the piston-chambers without any back pressure. The antifriction-rollers are held in line with the surface of the cam-ring by very simple means, which occasions the least possible friction. The lubrication of the movable parts is efficiently secured by the introduction of oil or other lubricant within the cylinder-casing, thus preventing wear of the pistons, the antifriction-rollers, and the cam-ring.

While I have specifically illustrated only one example of the physical embodiment of my invention, I do not thereby intend to limit the scope thereof to such example, inasmuch as the same can be embodied by other modes and under other forms. Numerous modifications may likewise be introduced at the will of the manufacturer. For example, the relative dimensions of the parts may be altered, the number of pistons be more or less than seven, the shape of the inlet and exhaust ports be changed, the grooves I′ and J′ be of any desired formation, such as of greater depth adjacent the ports than at points more remote, one of the cylinder-heads may be integral with the casing, the cam-ring may be integral with the outer cylinder-head, the ring S be integral with the rotary cylinder, the shape of the holes in the disk changed, if desired, and even the disk itself made as an integral part of the cylinder, the shape of the double cam-ring altered within limits, and means provided for regulating the steam-supply. All these and other analogous alterations, changes, and substitutions I shall regard as unsubstantial and as embraced within the scope of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination in an engine, of a shaft; a rotary cylinder secured to the shaft and having chambers parallel with the said shaft; reciprocating pistons in the chambers and each piston provided with an antifriction-roller; an outer cylinder-head; an inner cylinder-head having inlet and exhaust ports therein arranged alternately in a series; a double cam-ring located on the outer cylinder-head; and means for preventing the rotation of the pistons in the piston-chambers; in substance as set forth.

2. The combination in an engine, of a shaft; a rotary cylinder secured to the shaft and having chambers arranged parallel with the said shaft; reciprocating pistons movable in the chambers and each piston provided with

an antifriction-roller; an outer cylinder-head; an inner cylinder-head having inlet and exhaust ports therein arranged alternately in a series; and a double cam-ring located on the outer cylinder-head; in substance as set forth.

3. The combination in an engine, of a shaft; a rotary cylinder secured to the shaft and having chambers parallel with the said shaft; reciprocating pistons in the chambers and each piston provided with an antifriction-roller; an outer cylinder-head; an inner cylinder-head having inlet and exhaust ports therein arranged alternately in a series; and a double cam-ring, D, located on the outer cylinder-head and having its edge in a circle corresponding to a circle described by a radius which extends from the center of the shaft to the center of an antifriction-roller; in substance as set forth.

4. The combination in an engine, of a shaft; a rotary cylinder secured to the shaft and having chambers arranged parallel with the said shaft; reciprocating pistons in the chambers and each piston provided with an antifriction-roller; an outer cylinder-head; an inner cylinder-head having inlet and exhaust ports therein arranged alternately in a series; and a double cam-ring located on the cylinder-head; the inner surface of the said inner cylinder-head adjacent the inlet-ports being grooved or recessed, as at I′, whereby the motive fluid is gradually admitted to the piston-chambers; in substance as set forth.

5. The combination in an engine, of a shaft; a rotary cylinder secured to the shaft and having chambers parallel with the said shaft; reciprocating pistons in the chambers and each piston provided with an antifriction-roller; an outer cylinder-head; an inner cylinder-head having inlet and exhaust ports therein arranged alternately in a series; and a double cam-ring located on the cylinder-head; the inner surface of the said inner cylinder-head adjacent the exhaust-ports being grooved or recessed, as at J′, whereby the motive fluid is gradually exhausted from the piston-chambers; in substance as set forth.

6. The combination in an engine, of a shaft; a rotary cylinder secured to the shaft and having chambers parallel with the said shaft; reciprocating pistons in the chambers and each piston provided with an antifriction-roller; an outer cylinder-head; an inner cylinder-head having inlet and exhaust ports therein arranged alternately in a series; and a double cam-ring located on the outer cylinder-head; said rotary cylinder having at one end a disk, as U, provided with openings, V; in substance as set forth.

7. The combination in an engine, of a shaft; a rotary cylinder secured to the shaft and having chambers parallel with the said shaft; reciprocating pistons in the chambers and each piston provided with an antifriction-roller; an outer cylinder-head; an inner cylinder-head having inlet and exhaust ports therein arranged alternately in a series; and a double cam-ring located on the outer cylinder-head; said shaft being supported in adjustable bearings, whereby the rotary cylinder can be shifted by means of the threaded nuts upon the shaft and thereby held in frictional contact with the inner cylinder-head; in substance as set forth.

8. The combination in an engine, constructed substantially as set forth, of a cylinder having piston-chambers, a ring, S, and pistons provided with recesses, T, adapted to fit the outer circumference of the ring.

In testimony whereof I affix my signature in presence of two witnesses.

HOWARD B. GOODHART.

Witnesses:
GEO. M. MILLER,
ALLEN J. BIEHL.