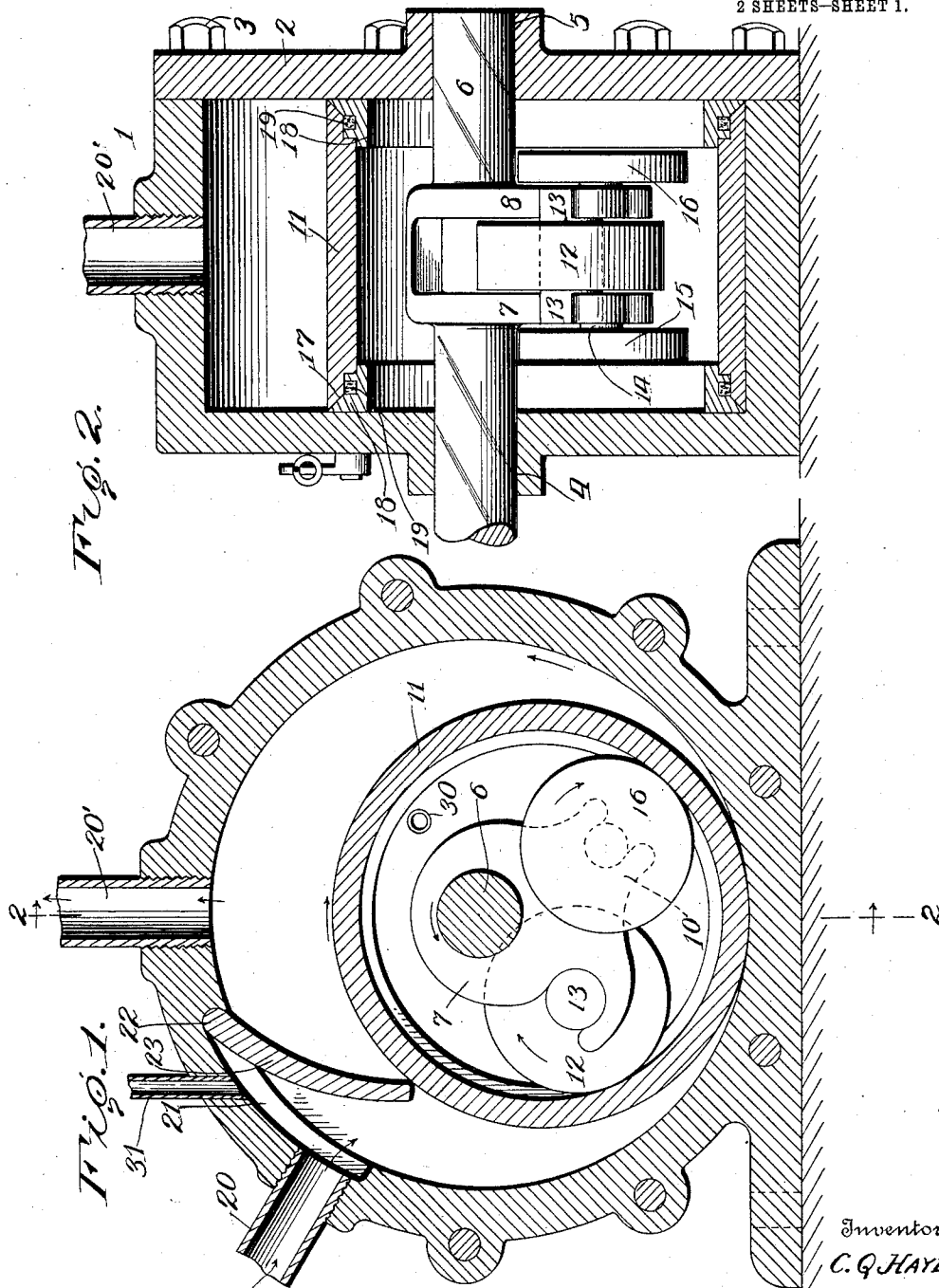


C. Q. HAYES.
 ROTARY ENGINE.
 APPLICATION FILED MAY 9, 1911.

1,043,697.

Patented Nov. 5, 1912.

2 SHEETS—SHEET 1.



Witnesses
 C. P. Wright for
 H. A. Patterson.

By

A. S. Patterson

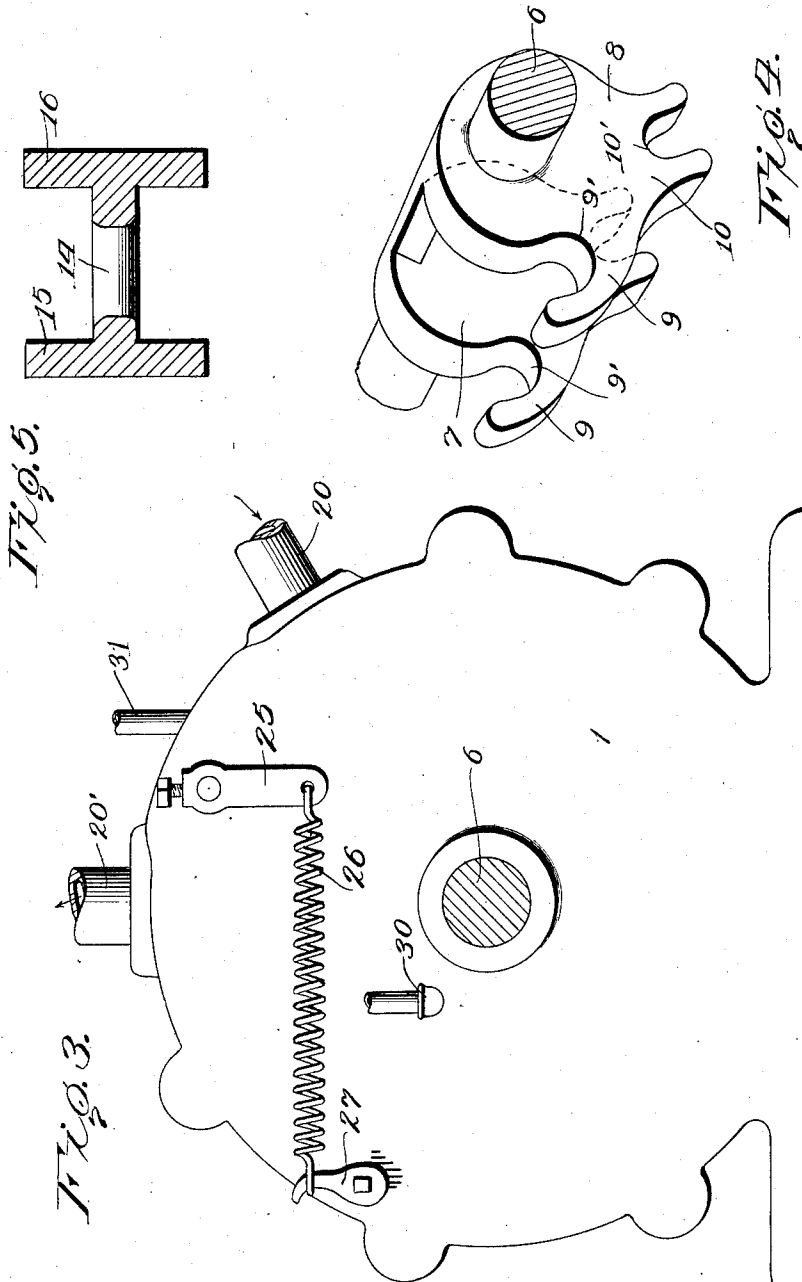
Inventor
 C. Q. HAYES

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334

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UNITED STATES PATENT OFFICE.

CALVIN Q. HAYES, OF ST. PAUL, MINNESOTA.

ROTARY ENGINE.

1,043,697.

Specification of Letters Patent.

Patented Nov. 5, 1912.

Application filed May 9, 1911. Serial No. 626,022.

To all whom it may concern:

Be it known that I, CALVIN Q. HAYES, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in rotary engines.

The object of my invention is to provide a rotary engine in which it is not necessary to pack the engine shaft, thus producing an engine in which there is less friction.

Another object of my invention is to provide a more simple, cheap and effective engine of this character having certain details of structure hereinafter more fully set forth.

In the accompanying drawing—Figure 1 is a vertical transverse sectional view of my improved engine. Fig. 2 is a longitudinal vertical sectional view taken on the line 2—2 of Fig. 1. Fig. 3 is a side elevation of my improved engine. Fig. 4 is a perspective view of a central portion of the engine shaft, showing the crank arms carried thereby. Fig. 5 is a side view partly in section of a double roller member carried by the crank arm for engaging the interior of the piston.

Referring now to the drawings, 1 represents my improved engine cylinder, which is provided with a removable head 2, held upon the cylinder by means of bolts 3. While I have shown this specific form of cylinder, it will be readily understood that other forms of cylinders could be used.

In the ordinary type of engines, it is necessary to pack the cylinder head or heads around the engine shaft to prevent the leakage of steam, while in my improved engine I dispense with such packing and thereby greatly reduce the friction of the engine.

The cylinder 1 and the cylinder head 2, are provided with openings 4 and 5, through which passes the engine shaft 6. The engine shaft intermediate the ends of the cylinder is provided with two laterally extending crank arms 7 and 8. These arms are made exactly alike and, therefore, I will describe but one of the arms. The arms as shown are cast integral with the engine shaft and each arm is provided with two bifurcated portions 9 and 10 forming bearings 9' and

10' for the anti-friction rollers hereinafter more fully described.

Within the cylinder and surrounding the shaft 6 is a piston 11, which is made of cylindrical form and of a length to fit within the cylinder between the cylinder heads and yet not engage the same, allowing for the free rotation of the piston. This piston, as heretofore stated, is of a cylindrical form and of such a thickness that cannot be collapsed by the steam pressure applied to the outer periphery. The piston, as shown, is of a diameter of about two-thirds of that of the interior bore of the cylinder and being loosely mounted within the cylinder will roll upon the interior thereof and thus cause minimum friction between it and the inner periphery of the cylinder. The piston, as shown, surrounds the engine shaft and is of a diameter considerably greater than that of the crank arms 9 and 10. The engine shaft 6, as shown, is cut away between the cranks 7 and 8 forming a space in which revolves the roller 12, said roller having trunnions 13 mounted in the bearings 9', and said roller being adapted to bear and roll upon the inner periphery of the piston 11. Mounted in the bearings 10' is a shaft 14, having rollers 15 and 16 at its ends, which are adapted to bear against the inner periphery of the piston 11. By this structure it will be seen that the piston 11 is eccentric to the shaft 6 and held in this relation by means of the rollers 12, 15, and 16.

In order to prevent the steam or explosive mixture in the cylinder around the piston from passing into the piston, I provide the ends of the cylinder with beveled, notched faces 17, in which are located the metal packing rings 18, and between the packing rings in the ends of the piston are elastic gaskets 19, whereby the rings are held tight against the cylinder heads and at the same time the steam or gas is prevented from passing between the ends of the piston and the packing ring.

The cylinder 1 is provided with an inlet 20, and adjacent said inlet the inner face of the cylinder is provided with a cut-away portion 21, in which is pivoted at 22 the swinging abutments 23. The said abutment is normally held inwardly against the piston 11. The cylinder is also provided with an exhaust 20' beyond the inlet 20.

When using my improved engine as a

steam engine the impact of the steam forces the abutment 23 against the piston 11 and forms a tight joint to prevent the escape of the steam. The steam then expands within the space between the abutment and the inlet and forces the piston 11 in the direction indicated by the arrow in Fig. 1. The piston 11 while traveling in the direction to the right, as shown by the arrow, is rotating in a direction indicated by the arrow at the top of the cylinder and thus the cylinder has a rolling movement upon the interior of the cylinder. The piston 11 is held in its position in respect to the shaft 6 by means of the rollers 12, 15 and 16. The rotation of the piston 11 carries with it the arms 9 and 10 and thus the shaft is rotated.

In order to supply the engine with the necessary lubricant, I provide a pipe 30 connected to the cylinder head adjacent the engine shaft, whereby oil is fed within the piston 11 and the bearings of the rollers 12, 15 and 16 are kept well lubricated. In order to properly lubricate the inner periphery of the cylinder 1, I provide a pipe 31 through which oil is forced. While I have shown this specific manner of providing a loose rotating piston for operating the engine shaft, it will be understood that the same could be varied without departing from my invention.

The cylinder 1, at the upper end, is provided with an exhaust port 20'. This exhaust port as shown in Fig. 1 of the drawings, is in rear of the pivotal connection 22 of the swinging abutment 23.

In operation the steam or gas enters the cylinder through the port 20 and travels downwardly against the piston forcing the same around in the direction of the arrow at the right of Fig. 1. The piston while traveling in the direction of the arrow and is revolving in the direction of the arrow at the top of the cylinder Fig. 1, or in other words, is rolling around the inner periphery

of the cylinder. The steam pressure or explosion continues to operate upon the piston until the same has made about three-fourths of a revolution when it passes the exhaust port 20' and the engine exhausts.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A rotary engine, comprising a cylinder, a shaft extending therethrough, a hollow cylindrical piston surrounding the shaft and having beveled notched outer ends, metal packing rings in said notched ends of the piston, elastic gaskets between the ends of the piston and the packing rings, crank arms carried by the shaft within the piston, rollers carried by said arms in engagement with the inner periphery of the piston at different points therearound, an abutment engaging the outer periphery of the piston and said cylinder having an inlet, and an exhaust on opposite sides of the abutment.

2. A rotary engine comprising a cylinder, a shaft extending therethrough, a hollow cylindrical piston surrounding the shaft and having beveled notched outer ends, metal packing rings in the notched ends of the piston, elastic gaskets between the ends of the piston and the packing rings, crank arms carried by the shaft within the cylinder, said arms having tangentially arranged slots therein on both sides of the arms, a roller between the arms and having pintles mounted in one set of said slots, and a shaft straddling the arms and mounted in the other set of slots in the opposite ends of the arms and having rollers on its outer ends on the outside of the arms, substantially as shown and described.

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

CALVIN Q. HAYES.

Witnesses:

D. J. KEEFE,
S. E. REDLUND.