E. H. BINGHAM.

ROTARY ENGINE.

APPLICATION FILED JUNE 17, 1918.

1,319,456.

Patented Oct. 21, 1919.

2 SHEETS—SHEET 1.

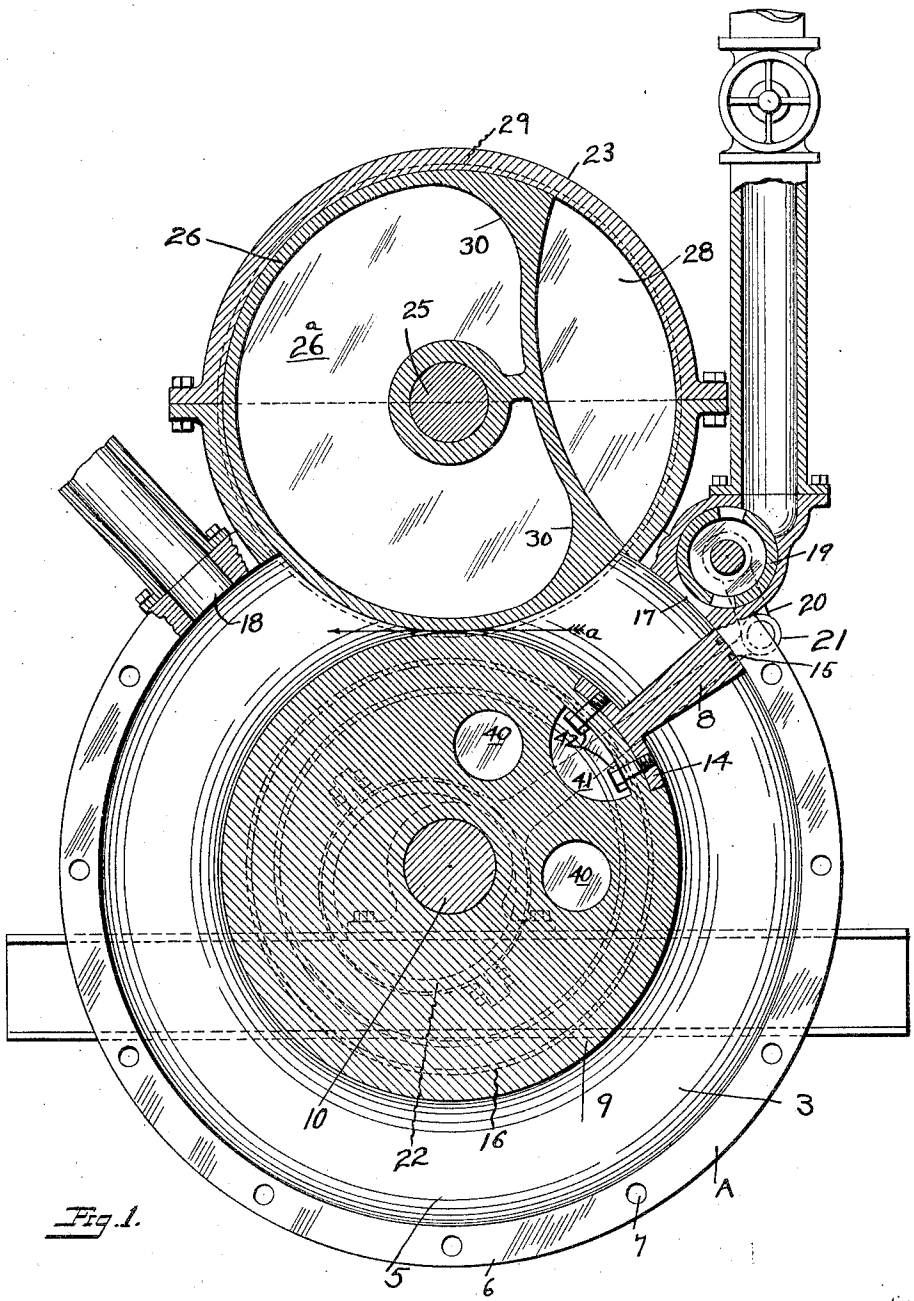

Fig. 1.

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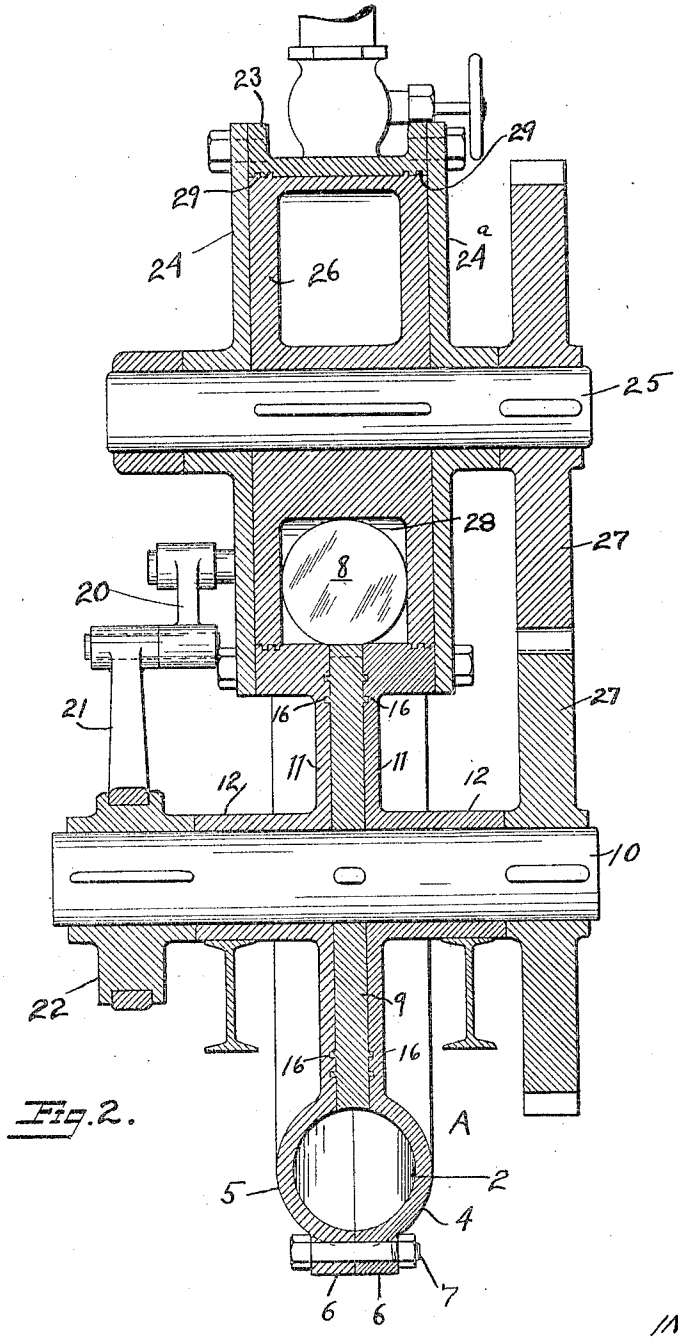

Fig. 2.

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UNITED STATES PATENT OFFICE.

EUGENE H. BINGHAM, OF SAN FRANCISCO, CALIFORNIA.

ROTARY ENGINE.

1,319,456. Specification of Letters Patent. Patented Oct. 21, 1919.

Application filed June 17, 1918. Serial No. 240,339.

To all whom it may concern:

Be it known that I, EUGENE H. BINGHAM, a citizen of the United States, residing at the city and county of San Francisco and State of California, have invented new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to a rotary engine, and particularly to an engine which is adapted to be driven by steam or a like motive fluid under pressure.

One of the objects of the present invention is to provide a simple, substantial and compact engine of the rotary type in which all reciprocating parts are eliminated, and which is particularly constructed to permit a long piston stroke and a substantially complete expansion of the motive fluid utilized.

Another object of the invention is to eliminate the use of packing rings, stuffing boxes and the like and in place thereof to provide labyrinth rings to prevent leakage of the motive fluid. Further objects will hereinafter appear.

The invention consists of the parts and the construction, combination and arrangement of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a side elevation in section showing the engine.

Fig. 2 is a central, vertical, cross section of Fig. 1.

Referring to the drawings in detail, A indicates the cylinder of the engine, said cylinder being cylindrical both in cross section, as shown at 2, in Fig. 2, and in side elevation, as shown at 3 in Fig. 1. The cylinder casting is, in this instance, made in two sections 4 and 5, said sections being secured together by annular projecting flanges 6 and bolts 7 passing therethrough.

The piston indicated at 8 is cylindrical in cross section to fit the bore of the cylinder, and it is, in this instance, secured to, and carried by, a central disk 9 which is secured on the main drive shaft 10, the disk 9 being inclosed between the side walls 11 of the main cylinder castings and the shaft 10 being journaled in bearings 12 which are formed integral with the side walls 11. For the purpose of permitting the piston 8 to be removed when the cylinder castings 4 and 5 are separated I have shown it as detachably secured to the disk or rotor 9, this feature of the structure being shown at 14 in Fig. 1. The piston may also be provided with expansion rings, as shown at 15, but I prefer to employ a ground piston which is just sufficiently small to permit a running fit between the piston and the cylinder walls.

For the purpose of preventing leakage from the high pressure side to the low pressure side of the cylinder I provide a series of labyrinth packing rings 16. These rings are formed integral with the rotor 9 at a point below the piston 8. These rings have a running fit with grooves formed in the side walls 11 of the cylinder castings, and to this extent not only serve as a packing to prevent the leakage of steam down the sides of the rotor and out through the shaft bearings 12, but also prevent leakage from the high pressure side of the cylinder to the low pressure or exhaust side, that is, steam cannot by-pass from one end of the cylinder to the other by passing by the sides of the rotor 9. Any leakage taking place would have to pass by the piston 8, but, as a snug running fit is maintained, the leakage at this point should be comparatively small, if any.

Formed on one side of the cylinder is an inlet port 17 and formed on the opposite side of the cylinder is an exhaust port 18. Connected with the port 17 is an oscillating valve 19 of suitable construction, which, in this instance, is driven by a rocker arm 20, a link 21 and an eccentric 22 which is secured on the main driving shaft 10. Each revolution of the driving shaft 10 transmits one complete oscillation to the valve 19, thereby opening and closing the inlet port at the proper time to permit admission of the motive fluid by which the engine is operated, the time of admission and the volume of motive fluid admitted being controlled entirely by the position of the eccentric and the stroke of the same.

Forming a part of one of the main cylinder castings at a point intermediate the ports 17 and 18 is an auxiliary cylinder 23. Journaled in bonnets or heads 24 and 24ª secured on each side of the auxiliary cylinder is a shaft 25, and secured on said shaft within the cylinder 23 is a rotating head member 26. This member has a diameter equal to the diameter of the rotor 9 and it is positively driven from the main shaft 10 by gears 27.

The speed ratio of the head 26 and the rotor is therefore equal and the peripheral speed will similarly be equal. This is of considerable importance as the head 26 is designed to contact with the periphery of the rotor 9 to maintain a packing or contact face therewith which will prevent high pressure steam from passing between the rotor and the head across the point indicated by arrow *a*. Passage of steam at this point would, of course, materially reduce the efficiency of the engine as it would escape directly to the exhaust port 18. The point of contact between the rotor and the head 26 is, in this instance, maintained and the leakage at this point should therefore be comparatively small.

By referring to Fig. 2 it will be seen that the head 26 is wider than the rotor 9, and also wider than the diameter of the piston 8. A segmental pocket 28, rectangular in cross section, is formed in the head to permit the piston to pass through and the greater width of the head 26 forms side walls for the pocket 28 which are surrounded by labyrinth rings 29. These rings continue clear around the head 26, and to this extent prevent steam from leaking down the sides of the head and out through the shaft bearings. The head may be cored out, as shown at 26^a, but fillets 30 are preferably provided to permit counterbalancing of the head, this being necessary in view of the fact that the segmental recess 28 is formed. The rotor 9 may also be counterbalanced to offset the weight of the piston 8 by forming one or more recesses therein, as shown at 40 and 41, the recess 41 being shown larger in the present instance, as it provides room for the heads 42 of the bolts by which the piston is secured.

A rotary engine constructed as here shown is very much lighter and compact for the amount of horse-power developed than most types of turbines or reciprocating engines. It is also more efficient in operation and economical as far as steam consumption is concerned as the piston stroke is unusually long, that is, the stroke of the piston in reality is equal to the distance around the cylinder from the port 17 to the port 18. The length of stroke thus provided permits an almost complete expansion of the steam; hence the economy produced. No reciprocating members are utilized and it is therefore possible to run the engine at a comparatively high speed without danger of excessive vibration, vibration being, in fact, almost entirely eliminated, as all revolving parts are counterbalanced, as previously described. Steam leakage is also taken care of in a novel manner as labyrinth packing rings are employed wherever leakage might take place. This is also an important feature of the present invention as it is well known that labyrinth rings are, practically speaking, frictionless and will therefore not consume the power generally lost where packing rings, stuffing boxes and like devices are employed.

While a single cylinder engine is here shown I wish it understood that any number of cylinders may be mounted on the drive shaft 10, the size and number of cylinders employed depending entirely upon the horsepower required.

The materials and finish of the several parts may be such as the experience and judgment of the manufacturer may dictate.

I also wish it understood that various changes in the form, proportions and minor details of construction may be resorted to without departing from the spirit of the invention as disclosed in the appended claim, and that I do not wish to limit myself to the specific design and construction here shown.

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

A rotary engine comprising a cylinder, said cylinder being cylindrical in side elevation and in cross section, a rotor mounted interior of said cylinder, an annular slot formation on the inner side of the cylinder, a piston secured to the rotor adapted to travel within the cylinder and the annular slot, an exhaust and an inlet port formed in the cylinder, means for regulating the volume of steam admitted, a head member on the cylinder forming a partition between the inlet and the exhaust port, said head member having a recess formed therein to permit passage of the piston, labyrinth rings carried by the head member to prevent leakage of steam down the sides of the head member, a driving connection between the rotor and head member, and means for counterbalancing the head member and the rotor.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

EUGENE H. BINGHAM.

Witnesses:
CHARLES EDELMAN,
J. PODESTA.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."