No. 750,219. PATENTED JAN. 19, 1904.

W. VON PITTLER.

ROTARY ENGINE.

APPLICATION FILED APR. 23, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

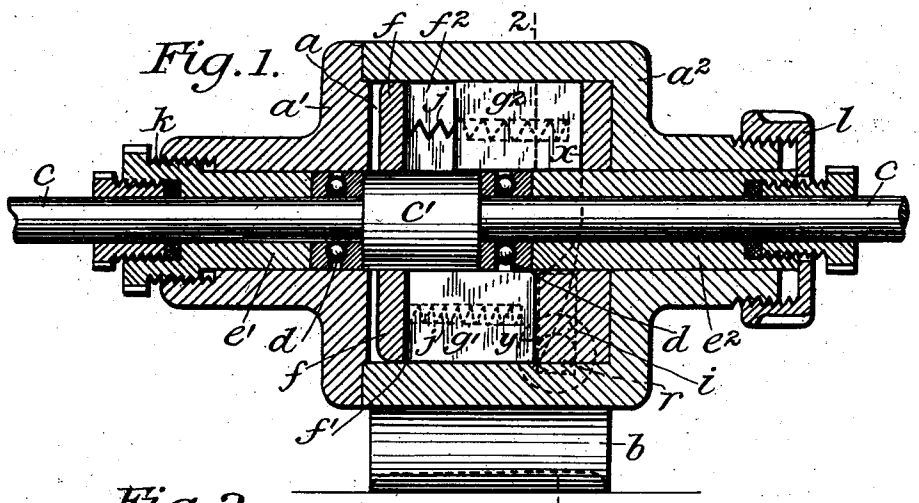
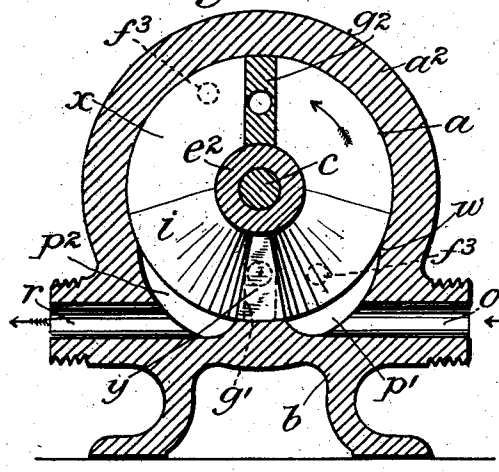


Fig. 2.



2.

Fig. 3.

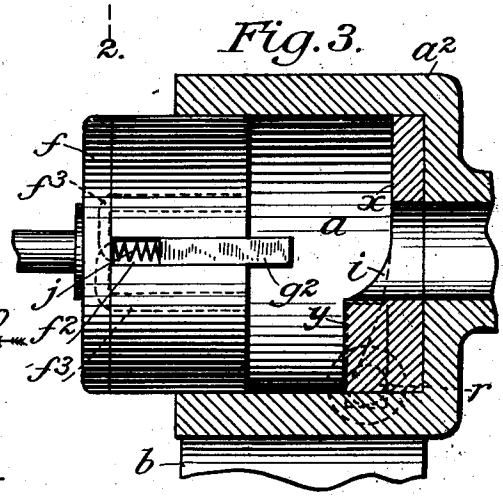


Fig. 5.

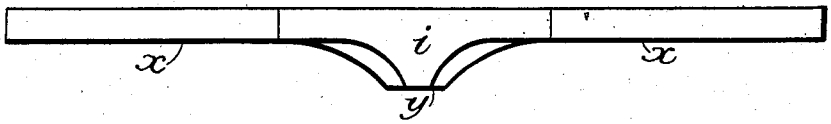
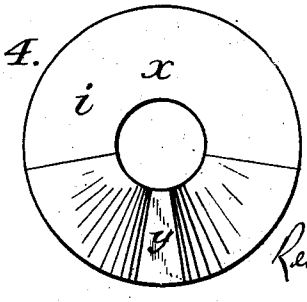


Fig. 4.



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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 6.

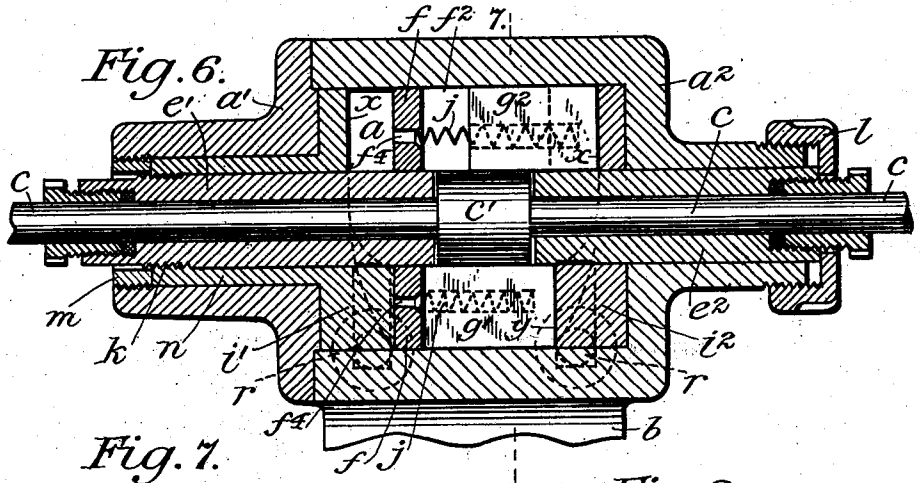
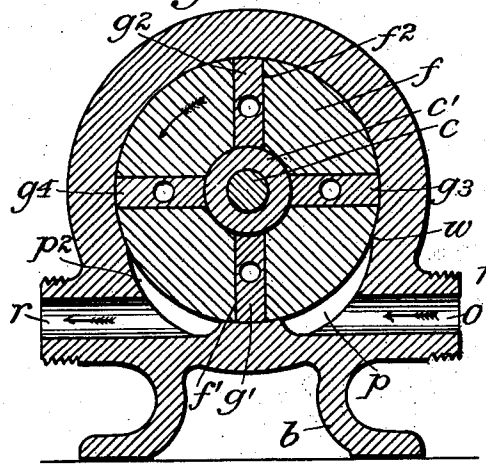


Fig. 7.



7.

Fig. 8.

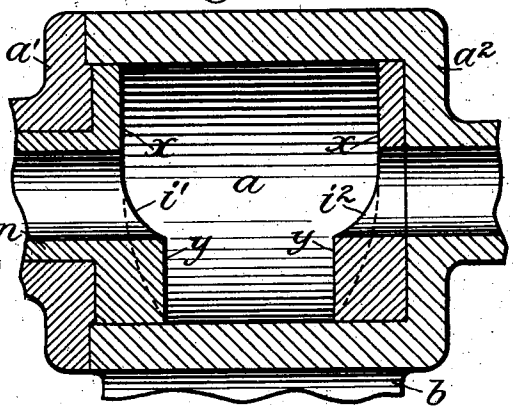
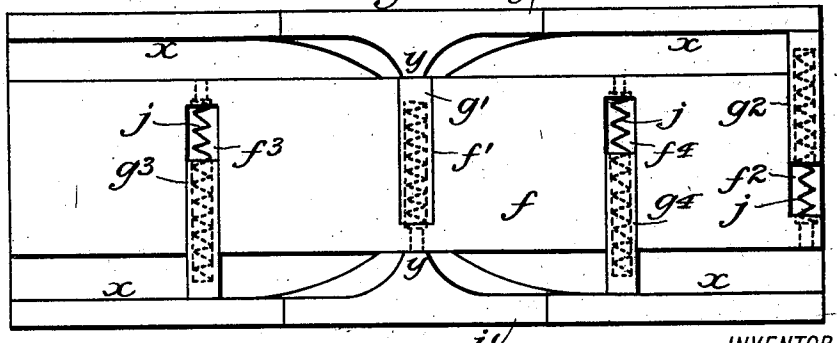


Fig. 9.



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APPLICATION FILED APR. 23, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 10.

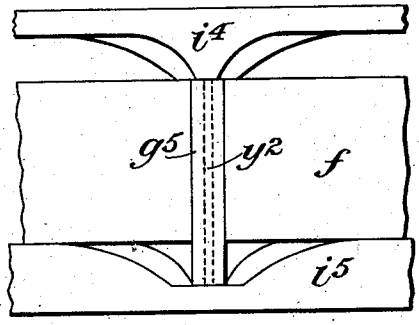
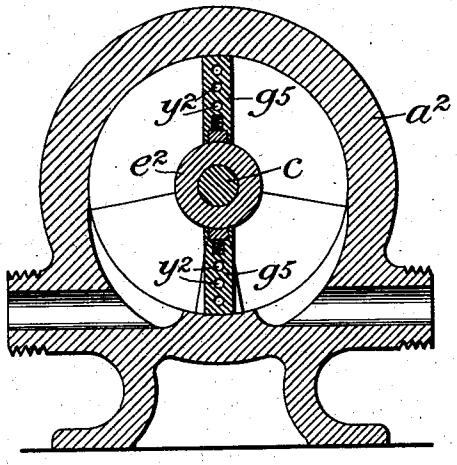


Fig. 11.



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No. 750,219. Patented January 19, 1904.

UNITED STATES PATENT OFFICE.

WILHELM VON PITTLER, OF LEIPZIG-GOHLIS, GERMANY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 750,219, dated January 19, 1904.

Application filed April 23, 1902. Serial No. 104,255. (No model.)

To all whom it may concern:

Be it known that I, WILHELM VON PITTLER, a subject of the German Emperor, residing at Leipzig-Gohlis, Germany, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention is concerned with improvements in rotary motors, pumps, and like machines wherein a rotating head is employed to carry one or more reciprocating pistons. These reciprocating pistons in machines of this character are generally in the nature of sliding plates, one end of the same being made to follow a guiding-surface, usually the surface of the shell or casing of the machine, said surface having a curvature more or less complex, and thereby causing the sliding plates or piston-slides to reciprocate back and forth in corresponding slots in the rotating head according to the variations of curvature of the guiding-surface against which they bear. Against these piston-slides when the apparatus is used as a motor the impelling fluid—as, for example, water, steam, compressed air, explosive gases, &c.—presses and causes the head to revolve.

In accordance with the present invention the piston-slides in the revolving head are made to reciprocate longitudinally with respect to the rotating head as distinguished from radially-reciprocating slides, which characterize other machines of this nature. Furthermore, the curved or cam surfaces against which the slides bear are located in the ends or heads of the power or operating chamber, and the curvature of these surfaces extends over a part only of the same, leaving the other part of the surfaces perfectly flat, thereby securing a uniform space between the rotating head and the flat portion of the curved surfaces and providing a free and unobstructed passage for the steam or other fluid which operates or is operated upon by the apparatus.

In the drawings, Figure 1 is a view, partly in longitudinal section, of a machine embodying the improvements and having a single curved or cam surface at one end or head of the power or operating chamber. Fig. 2 is a section on the plane indicated by the line 2 2 of the machine shown in Fig. 1. Fig. 3 is a detail view, partly in section, showing the rotating head partly removed from the power or operating chamber. Fig. 4 is a plan view of the annular cam removed from the chamber. Fig. 5 represents a development of the cam shown in Fig. 4. Fig. 6 is a view, partly in longitudinal section, of a machine having two curved surfaces or cams, one at each end or head of the power or operating chamber. Fig. 7 is a section on the plane indicated by the line 7 7 of the machine shown in Fig. 6. Fig. 8 is a detail sectional view of the power or operating chamber with the rotating head removed. Fig. 9 represents a development of both cams shown in Fig. 6 and shows graphically the positions of the slides at one point in the rotation of the head. Fig. 10 represents in a development a modified form of the cams. Fig. 11 represents a section view similar to Figs. 2 and 7 and shows the same modified form as Fig. 10.

The shell or casing, which for convenience in construction and in the assembling of parts may comprise two portions a' and a^2, adapted to be secured together in any well-known manner, is mounted on a suitable base b. A shaft c, having an enlarged part c', rotates in bearings d and sleeves e' and e^2. Rigidly secured to the enlarged part c' of this shaft is a rotating head f, and in Figs. 1 to 3, inclusive, this rotating head is provided with two slots f' and f^2 one hundred and eighty degrees apart, in which are fitted two slides g' and g^2, adapted to move back and forth in said slots longitudinally with respect to the rotating head and having a working fit between the sleeve e^2 and the wall of the chamber a. At one end of the power or operating chamber a is an annular cam i, which may be formed on or rigidly secured to the portion a^2 of the shell and of which the portion x is a flat surface, while the rise forms a curved surface which ascends gradually in the present case over about one quarter of the circular surface of the cam to a maximum y and then falls gradually over the next quarter of the surface, the rise and fall of the curvature being

symmetrical with respect to the maximum rise y, although the precise extent of the rise and fall portions of the surface may obviously be varied. The ends of the slides g' and g^2 are flat, and as the head f revolves the ends of these slides next the cam i are always in working contact with its surface, being held thereto by springs j.

Although it is essential in machines of this character that the piston-slides shall always remain close to their limiting or guiding surface, (here the surface of the cam i,) yet they should not be held against same so tightly as to cause undue friction. Accordingly the sleeves e' and e^2 are provided, the former being screw-threaded at k, and a nut l is provided on the end of the portion a^2 of the casing and bears against the sleeve e^2, whereby the position of the rotating head f may be readily adjusted from time to time to take up wear. Furthermore, a channel f^3 is provided in the rotating head at one side of each slide to transmit the pressure of the motive fluid to the rear or inner end of the slide, so that a light spring may be used to keep the slide always against its guiding-surface.

In Figs. 6 to 9, inclusive, is shown a machine having an annular cam i' i^2 at each end of the chamber a, the rotating head f being provided with four piston-slides g', g^2, g^3, and g^4, which are ninety degrees apart. The slides which are oppositely arranged, or one hundred and eighty degrees apart, are in working contact with the cam on one side, while the other two slides are in working contact with the second cam, so that as the head revolves the alternate slides are guided by the same cam. In order to equalize the pressure on both ends of the slides, openings f^4 are provided in the rotating head. The same means for adjusting the position of the rotating head are provided as are shown and described with respect to Figs. 1, 2, and 3. Additional means, however, are provided in a nut m, threaded in the end of the portion a' of the casing for adjusting the cam i', which may be formed integral with a sleeve n with respect to the cam i^2, the latter being rigidly secured to the portion a^2 of the casing, as is the case with the single cam illustrated in Figs. 1, 2, and 3.

In the modified form of the cams shown in Figs. 10 and 11 the springs working on the slides are omitted. In this case two piston-slides g^5 and g^6 are arranged one hundred and eighty degrees apart and positively guided between the cams i^4 and i^5, arranged at both ends of the chamber a. The curved part of the cam i^4 is opposite and equal to the curved part of the cam i^5; but the latter curved part is inwardly (the former is outwardly) directed. The distance between the two cams is in all small parts equal to the length of the piston-slides, which are adapted to advance at both front sides of the rotating head f. In order to avoid a too great pressure of the slides against the curved surfaces of the cams, longitudinal perforations y^2 are provided in the slides. When a slide enters in the curved part, the entrance to these channels y^2 becomes free and the fluid passes through the channels from one side of the slide to the other one. If the slide g^5 passes in the direction of the arrow into the position shown in Fig. 8, the fluid passes through the channels from the right hand above space x' to the left-hand space x^2 at the bottom and equalizes the pressure. During the working of the slides between the flat parts of the cams the channels g^2 are closed at both ends.

It is obvious that the apparatus may be used either as a motor to deliver power from the shaft c, the impelling fluid being steam, air under compression, water, explosive gases, &c., or that power may be applied to the shaft to induce the movement of any fluid, or, in other words, that the machine may be used as a pump. When used as a motor, the motive fluid enters the inlet-opening o. The slides being in the position shown in Figs. 1, 2, and 3, the motive fluid exerts its pressure against the slide g^2, the rise of the cam i constituting a reaction abutment. The head f is threfore rotated in the direction of the arrow, and slide g' is gradually exposed to the motive fluid by the decreasing curvature of the cam. A recess p' is provided in the shell or casing a^2, which permits the same pressure to exist on both sides of the slide g' until it has passed the point w. A similar recess p^2 is also provided in the casing a^2, and from this recess the fluid is discharged through the outlet r. When two cams are employed, as in Fig. 6, the same operation takes place on each side of the rotating head. The operation of the apparatus when used as a pump to cause the circulation of any fluid will be obvious from the foregoing without further description.

It will be noted that it is immaterial whether the head revolves and the cams remain stationary, or vice versa, as only the relative movement of these parts is necessary to the operation of the machine. It should also be noted that the sizes of the inlet and outlet openings should vary with the density of the motive fluid used. For example, they should be larger for water than for compresed air.

I claim as my invention—

1. In a motor the combination with a power or operating chamber of a cam in one end of said chamber having a curved rise portion and a flat portion, said curved rise portion ascending gradually over a portion of the circular surface of the cam to the maximum rise and then falling gradually over a like portion of the surface, the rise and fall each forming a concavity and being symmetrical with respect to the maximum rise, longitudinally-movable piston-slides guided by the cam and a head for holding said slides, said cam and head being adapted to have a relative rotary movement.

2. In a motor the combination with a power or operating chamber of a cam in one end of said chamber having a curved rise portion and a flat portion, said curved rise portion ascending gradually over substantially one quarter of the circular surface of the cam to the maximum rise and then falling gradually over substantially the next quarter of the surface, the rise and fall each forming a concavity and being symmetrical with respect to the maximum rise, two longitudinally-movable piston-slides one hundred and eighty degrees apart guided by the cam, and a head for holding said slides, said cam and head being adapted to have a relative rotary movement.

3. In a motor, the combination with a power or operating chamber, of a rotating head, means for longitudinally adjusting said head, a cam in one end of said chamber, and a longitudinally-reciprocating piston-slide in said rotating head and guided by the cam.

4. In a motor, the combination with a power or operating chamber, of a rotating head, a cam in one end of said chamber, a longitudinally-reciprocating piston-slide in said rotating head and guided by the cam, and a channel communicating with both ends of said slide.

This specification signed and witnessed this 5th day of April, A. D. 1902.

WILHELM VON PITTLER.

In presence of—
RUDOLPH FRICKE,
B. H. WARNER, Jr.