W. S. ELLIOTT.

ROTARY MOTOR.

APPLICATION FILED JAN. 20, 1908.

1,045,134.

Patented Nov. 26, 1912.

2 SHEETS—SHEET 1.

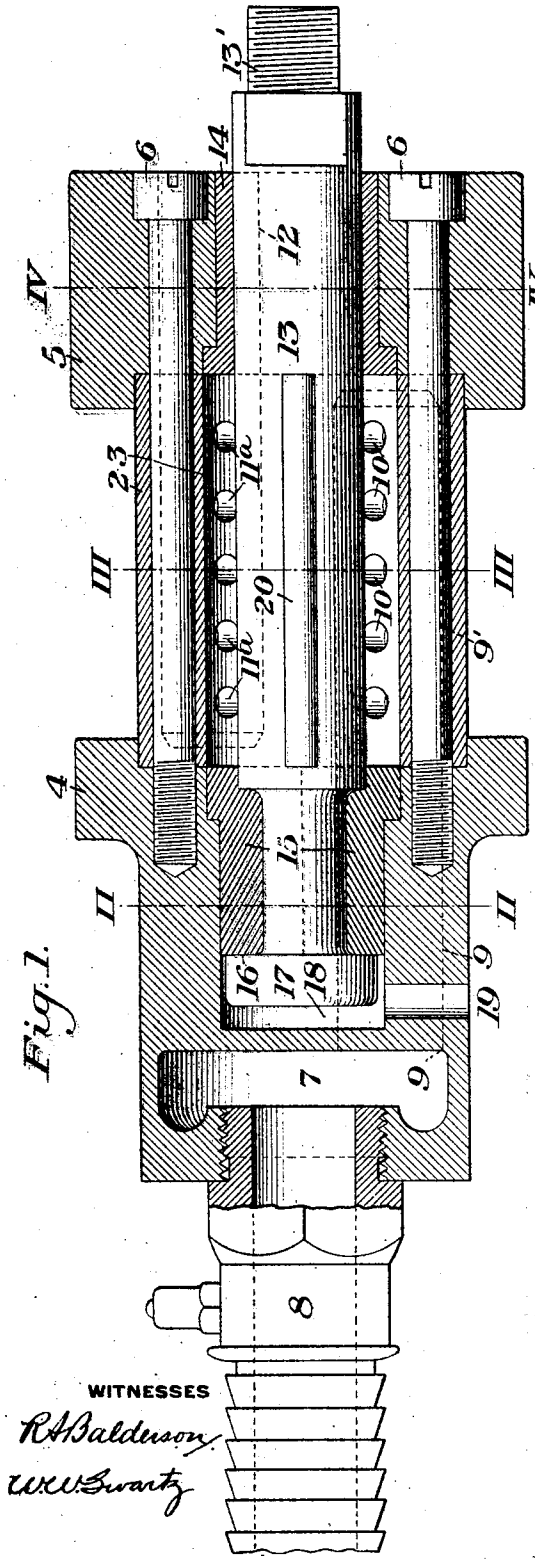

Fig. 1.

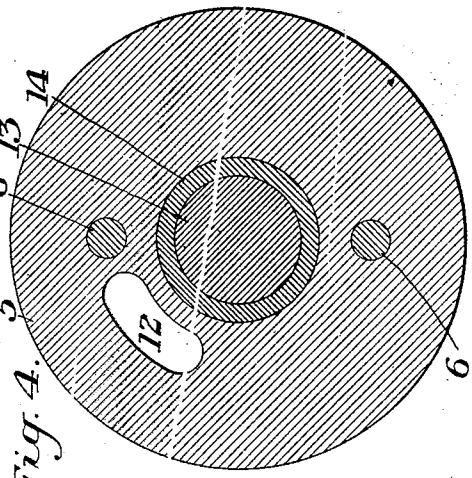

Fig. 4.

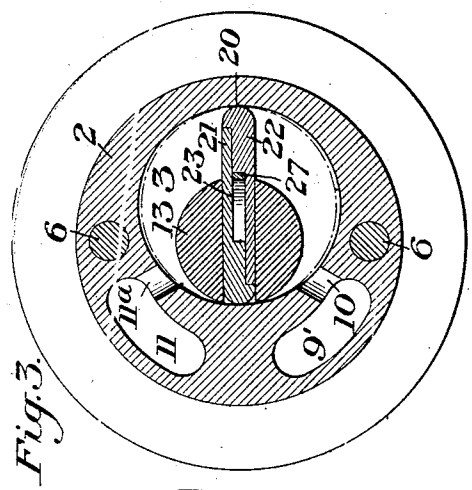

Fig. 3.

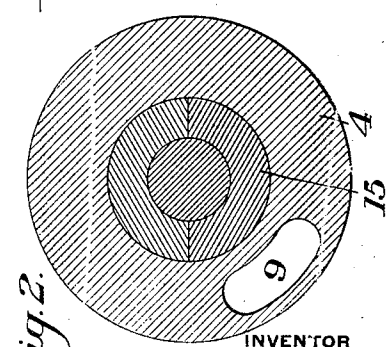

Fig. 2.

WITNESSES

R. A. Baldeson

W. W. Swartz

INVENTOR

Wm S. Elliott

by Bakewell, Byrnes & Parmelee,

his Attys.

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2 SHEETS—SHEET 2.

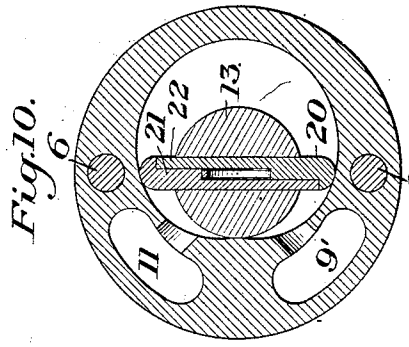

Fig.10.

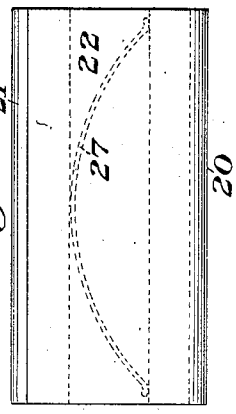

Fig.9.

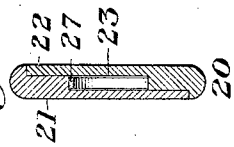

Fig.8.

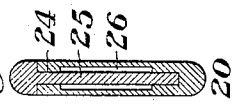

Fig.7.

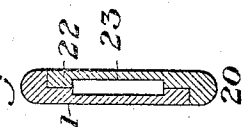

Fig.6.

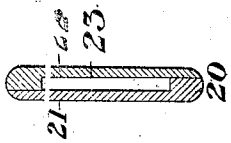

Fig.5.

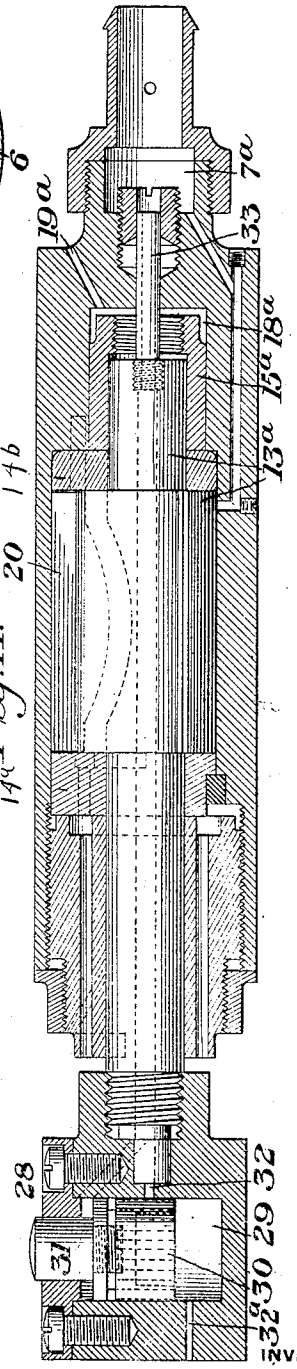

Fig.11.

WITNESSES

R. A. Balderson

C. W. Swartz

INVENTOR

Wm. S. Elliott.

by Bakewell, Byrnes & Parmelee,

his Attys.

UNITED STATES PATENT OFFICE.

WILLIAM S. ELLIOTT, OF PITTSBURGH, PENNSYLVANIA.

ROTARY MOTOR.

1,045,134. Specification of Letters Patent. Patented Nov. 26, 1912.

Application filed January 20, 1908. Serial No 411,588.

To all whom it may concern:

Be it known that I, WILLIAM S. ELLIOTT, of Pittsburgh, Allegheny county, State of Pennsylvania, have invented a new and useful Rotary Motor, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal section of one form of motor embodying my invention; Figs. 2, 3 and 4 are cross-sections taken, respectively, on the lines II—II, III—III, and IV—IV of Fig. 1; Figs. 5, 6, 7, and 8, are sectional detail views, showing different forms of the expansible piston-blades; Fig. 9 is an elevation of one form of piston blade; Fig. 10 is a cross-section of a modified form of motor; and Fig. 11 is a longitudinal section, showing another modification.

My invention has relation to the class of rotary motors, and is designed to provide a simple and compact motor which is especially adapted for use with air as a motive power, although other motive fluid may be used.

The more particular objects of my invention are to provide means for relieving the motor from the effect of an accumulation of air or other motive fluid at the inner end of the piston shaft; and to provide an improved construction of piston which will at all times maintain a close contact between its outer edges and the inner walls of the cylinder.

The precise nature of my invention will be best understood by reference to the accompanying drawings, which will now be described, and in which I have shown several different embodiments of my invention, it being premised, however, that the invention is susceptible to various other changes and modifications.

Referring first to the construction shown in Figs. 1 to 4, inclusive, the numeral 2 designates the cylinder of the motor, having therein an eccentrically located piston-chamber 3. This cylinder is secured between the end-heads 4 and 5 by means of the long tension screws 6, or by any other suitable means which will permit the parts to be readily detached. The head 4 preferably constitutes the admission head of the motor, and is provided with an admission chamber 7, which is supplied with air or other motive fluid, by means of a pipe or nozzle 8 adapted for connection with a supply-pipe or hose. Leading from the admission chamber 7 through the head 4 is an admission port 9, and the thickened wall of the cylinder 2 is formed with a registering, longitudinally extending port 9′ which communicates with the interior of the cylinder by the plurality of cross-ports 10.

11 is a longitudinally extending exhaust port in the wall of the cylinder 2 with which it communicates by the cross ports 11^a, and which communicates at its forward end with an exhaust port 12 which extends outwardly through the head 5.

13 designates the piston shaft, which is journaled in bushings 14 and 15, seated within the heads 4 and 5, and which is extended through the head 5 and is formed with a threaded shank 13′, or other suitable means for the attachment thereto of the tool or other device to be operated by the motor. The piston shaft is of reduced diameter within the rear bushing 15, forming a thrust shoulder 16 within said bushing, and its inner end has a head or collar 17 which turns in a space or chamber 18 within the head 4. This space or chamber is formed with a vent opening 19 which leads outwardly from said chamber to the atmosphere. The purpose of this vent opening is to relieve the piston shaft from the effect of any accumulation of air which might otherwise occur in the space or chamber 18 by reason of leakage from the cylinder through the rear bushing 15. Another advantage of this air-chamber and vent is that by lubricating the interior of the cylinder in any suitable manner, the air which leaks through the bearing will carry with it sufficient lubricant to keep the bearing in proper condition.

Secured in the piston shaft is a diametrically extending piston blade 20 which is composed of two interfitting members 21 and 22. This blade is free to slide bodily in

the slot in the piston shaft, and the two members thereof are also free to slide upon each other for the purpose of insuring close contact between their outer longitudinal edges and the interior wall of the cylinder, by the centrifugal action of rotation. For the purpose of increasing this centrifugal action upon the members of the blades, their inner portions are cut away in the manner indicated at 23 in Figs. 3 and 5 and whereby their centers of mass are brought toward their outer ends where the centrifugal action thereof will have its greatest effect. While at the same time, the cutting away of the members reduces the centrifugal force of the members as a whole and thereby reduces their friction against the cylinder. This result may be obtained in several different ways. Thus in Figs. 3, 5, 6 and 8, I have shown the cutting away of the inner faces of the blade-members to different extents for this purpose, while in Fig 7 I have shown one of the members as having a slot 24 therein to receive loosely therein the thin web-portion 25 of the other member, the inner walls of the slot being cut away as indicated at 26 for the purpose of reducing the mass toward the center of the blade and bringing the centers of mass nearer the outer edges of the blades. A spring 27 may be interposed between the two members of the blades for the purpose of assisting the centrifugal action in forcing them outwardly into contact with the cylinder walls, but this will not be necessary ordinarily, except with motors which are designed to run at a comparatively low speed. For motors of relatively high speeds, centrifugal action alone, due to the concentrating of the centers of mass toward the outer edges of the blades, as above described, will be sufficient to at all times maintain the proper contact of the blade-edges.

In the form of motor above described, the interior of the cylinder has a somewhat oval cross-section. The form of the cylinder in section may, however, be of any approved form, such as the curve shown in Fig. 10.

In the modification shown in Fig. 11, the end of the piston shaft is provided with a knocker attachment 28, which is provided with a piston chamber 29, fitted with a piston 30, to which is attached a knocking tool 31. The chamber 29 is supplied with air through a port 32, which communicates with a pipe or tube 33 extending longitudinally through the piston shaft 13^a, and into the admission chamber 7^a in the rear end portion of the cylinder-head. In this construction the cylinder itself is shown as having end-extensions which form the heads and in which the bushings or bearings 15^a for the shaft, corresponding to the space or chamber 18 in the construction first described, and which is provided with the vent or escape-opening 19^a. The shaft 13^a may be provided with any of the forms of piston blades before described.

The operation will be readily understood. The air enters the piston chamber through the longitudinally extending admission port and cross-ports 9 and 10 and exhausts therefrom through the cross-ports 11^a, and exhaust-ports 11 and 12. In the form of motor shown in Fig. 11, the attachment 28 is not only rotated by the rotation of the piston shaft, but the piston 30 is also reciprocated, thereby actuating the knocking tool 31, the piston 30 acting as its own valve to control the admission of air from the pipe 33 through the port 32 and its exhaust at the port 32^a.

I do not herein wish to limit myself to any particular construction of the motor as a whole, since my invention is adapted to various forms of rotary motors of the general types shown and described.

The advantages of my invention result from the provision of the chamber or space at the inner end of the piston shaft, with the vent therefor, for the purpose of preventing accumulation or leakage of air or other motive fluid, in the manner above described; and from the construction of the piston blades whereby their centers of mass are brought toward their outer edges for the purpose of increasing the centrifugal action of rotation of their outer portions, while reducing the centrifugal action and friction as a whole, thereby maintaining proper contact with the cylinder walls without undue wear. This construction of the blade also automatically compensates for all wear which may take place, either on the edges of the blade, or on the cylinder wall. It will be noted that in the form first described, the bushings 14 and 15 have enlarged inner ends or flanges which close the open ends of the cylinder and define the ends of the piston chamber. These bushings, which are removable, not only form renewable wearing surfaces for the shaft journals, but they also form wearing surfaces for the ends of the piston blades. After wear has occurred, these members may be readily removed and renewed, thus preventing the wear from causing leakage around the ends of the piston blades to an extent which will interfere with the operation of the motor. This can be done without the necessity for either a new cylinder or new end portions. The same result is accomplished in the construction shown in Fig. 11 by the provision of the removable wear plates 14^a and 14^b, which define the ends of the piston chamber. It will be apparent that so long as these fea-

struction and arrangement of the motor as a whole may be of widely varying character.

It will be obvious that my invention is adapted to pumps and compressors, as well as to motors.

I claim:—

1. In a rotary motor, a piston shaft, a rear bearing for said shaft, an air space adjacent to said bearing, and means for venting said space; substantially as described.

2. A rotary motor having an air space at the rear end of the piston shaft, and means for venting said space; substantially as described.

3. In a motor, a piston shaft and an air-chamber adjacent to one of the bearings of said shaft, and having a vent opening leading therefrom; substantially as described.

4. In a motor, a cylinder having a longitudinally extending admission port, ported heads fitted to the ends of the cylinder and detachably secured thereto, said heads having bearings for the motor shaft, and the rear head having an admission chamber therein, the rear head having a vent opening therein communicating with the rear shaft bearing; substantially as described.

5. A rotary motor having a chamber containing a motor element, a shaft on which said element is mounted, said shaft having front and rear bearings, the front end of the shaft extending beyond the front bearing for attachment to a tool, and the rear bearing terminating and being inclosed within the rear end of the motor, means for admitting working fluid to the cylinder through its rear end, and means for relieving the accumulation of fluid at the rear end of the shaft; substantially as described.

6. A rotary motor having a fluid supply pipe connected at its rear head, and having a longitudinally extending port leading to the cylinder, a motor shaft having its axis parallel to the axis of the supply pipe, the rear bearing for said shaft being located in front of the supply pipe connection, and there being an air space adjacent to the end of said shaft; substantially as described.

7. A rotary motor having a connection for a fluid supply at one end, and a shaft terminating in front of the fluid supply connection, and there being an air space adjacent to the end of the shaft; substantially as described.

8. A rotary motor having a connection for fluid supply at one end, a shaft for the motor having a bearing terminating in front of the supply connection, an air space located between the supply connection and the rear end of the shaft, and means for venting said space; substantially as described.

9. A rotary motor having a piston shaft and a socket bearing for the rear end of said shaft, together with means for venting said bearing to prevent an accumulation of pressure therein; substantially as described.

10. A rotary motor having a shaft extending rearwardly within a bearing, and means for venting pressure which accumulates at the rear end of the shaft; substantially as described.

11. A rotary motor having front and rear bearings, a motor chamber between the bearings, a supply connection at the rear of the rear bearings, a passageway leading from the supply connection to the motor chamber, and an opening to the atmosphere at the rear end of the shaft; substantially as described.

12. A rotary motor having a chamber containing a motor element and having end portions at the ends of said chamber, a shaft on which said element is mounted, one of said end portions having a through bearing, and the other of the end portions containing a socket bearing for said shaft, and a wear member seated in a counter-bore or recess of each end portion, said wear members having openings therethrough for the shaft, and being of a diameter equal at least to the diameter of the motor chamber, the ends of which chamber they define; substantially as described.

13. A rotary motor having a chamber containing a motor element and shaft on which said element is mounted, said shaft having front and rear bearings, the front end of the shaft extending through the front bearing for attachment to a tool and the rear bearing terminating and being inclosed within the rear end of the motor, means for admitting working fluid to said chamber through the rear end of the motor, and wear members defining the ends of said chamber, said members having openings therethrough for the shaft and being of the full diameter of the chamber; substantially as described.

14. A rotary motor having a chamber containing a motor element and having end portions at the ends of said chamber, a shaft on which said element is mounted, one of said end portions having a through bearing, and the other of said portions containing a socket bearing for said shaft, and a wear member seated in a counter-bore or recess of an end portion, said wear member defining an end of the motor chamber and having an opening therethrough for said shaft, the wear member being of a diameter equal at least to the diameter of the motor chamber; substantially as described.

15. A rotary motor comprising end members having elongated bush bearings for the rotary element of the motor, and an intermediate cylinder member, the bearing in the

rear end member terminating within said member, and means for preventing accumulation of pressure at the rear end of the bearing due to leakage from the cylinder through said bearing; substantially as described.

16. A rotary motor having a rear ported closure containing a shaft bearing, said bearing having a vent opening leading to the atmosphere; substantially as described.

In testimony whereof, I have hereunto set my hand.

WILLIAM S. ELLIOTT.

Witnesses:
JOHN MILLER,
H. M. CORWIN.