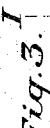


APPLICATION FILED SEPT. 24, 1907.

Patented Feb. 11, 1913.



INVENTORS

These attorney

C. E. Eggins

UNITED STATES PATENT OFFICE

EDWARD R. MILLS AND CHARLES A. CONN, OF PITTSBURGH, PENNSYLVANIA, ASSIGN-
ORS TO LIBERTY MANUFACTURING COMPANY, OF PITTSBURGH, PENNSYLVANIA.
A CORPORATION OF PENNSYLVANIA.

ROTARY MOTOR.

1,053,055.

Specification of Letters Patent. Patented Feb. 11, 1913.

Application filed September 24, 1907. Serial No. 394,299.

To all whom it may concern:

Be it known that we, EDWARD R. MILLS and CHARLES A. CONN, both of Pittsburgh, Allegheny county, 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 a motor embodying our invention, the plane of the section being indicated by the line I—I of Fig. 3; Fig. 2 is a similar section taken on the line II—II of Fig. 4; Fig. 3 is a cross-section on the line III—III of Fig. 1; Fig. 4 is a cross-section on the line IV—IV of Fig. 2; and Figs. 5 and 6 are cross-sections on the lines V—V and VI—VI respectively of Fig. 2.

Our invention has relation to the class of rotary motors, and is designed to provide a motor of this character, especially adapted for use with air as a motive power, although other motive fluids may be used, and which shall be simple in its construction and composed of but few parts which are easily assembled, and which can be readily taken apart for renewal and repairs.

The precise nature of our invention will be best understood by reference to the accompanying drawings, which will now be described, it being premised, however, that various changes may be made in the details of construction and arrangement by those skilled in the art without departing from the spirit and scope of our invention.

In these drawings, the numeral 2 designates the cylinder of the motor, whose otherwise open ends are respectively closed by the admission head 3 and the exhaust head 4. The cylinder has formed therein a piston chamber 5, which is eccentric with relation to the longitudinal axis of the cylinder. In the thicker portion of the walls of this cylinder are formed two longitudinally extending ports 6 and 7, the port 6 being preferably an admission port, and the port 7 being an exhaust port. Each of these ports communicates with the interior of the piston chamber 5 at a plurality of points throughout its length by means of the cross-ports 8. Each of the admission and exhaust heads is formed with a shoulder or rabbet 9 to receive the end of the cylinder, the parts be-

ing detachably secured together by means of the tension rods 10. These rods are seated in longitudinally extending grooves 11, which are formed in the exterior surface of the cylinder and heads, their downwardly bent ends which seat in the deepened grooves in the cylinder heads being secured by heads or nuts 12. These rods form a simple and secure means of holding the parts together.

13 designates a piston shaft, which extends eccentrically through the chamber 5, and which carries a single piston blade 14 which is arranged to slide freely through the diametrically extending slot in the shaft in which it is seated, the cross-sectional form of the cylinder 5 being such that both edges of the piston blade will maintain contact therewith during the entire revolution. The forward end of the piston shaft is provided with a bearing in the exhaust head 4, and extends through and beyond said head, terminating at its outer end in the threaded portion 15 adapted for connection with the tool which is to be driven by the motor. The rear end of the shaft 13 has a journal portion 16 which has its bearing in a split bushing 17, which is seated in the admission head 3. This bushing has formed therein a through-port 18, which communicates at its forward end with the admission port 6 of the cylinder, and which opens at its rear end into an air space or chamber 19 in the rear portion of the admission head 3. Said bushing is also cut away or slotted as shown at 20 in Fig. 2, to receive a thrust collar 21 on the rear end of the piston shaft. The slot or cut-away portion in the bushing is made of greater area than the thrust collar so as to provide an adjacent air space or chamber, which communicates with the atmosphere through a slot 22 in the head which communicates with the slot or opening 20. This bushing is secured against rotation by its engagement with the tension rods in the manner shown in Fig. 5.

23 designates a lubricant opening in the head 3, which communicates with the air chamber 19, and which is normally closed by a spring-seated valve 24. Oil introduced through this opening enters the chamber 19, and is carried by the air into the cylinder and finds its way to the bearings for the piston shaft, thereby keeping the parts properly lubricated. Any other suitable lu-

bricating arrangement may, however, be employed.

The admission head 3 is formed with a central threaded opening in its rear end to receive the threaded portion 25 of a hollow shank 26, which is adapted to be connected to a hose or other supply pipe for admitting air or other fluid to the motor. The inner end of this pipe 26 is extended into the chamber 19, and this extended end portion is formed with a plurality of perforations 27 which act as a strainer for the air to prevent foreign matter from being carried with the air into the motor.

The exhaust head 4 is formed with a longitudinally extending exhaust port 28, which opens to the atmosphere at its forward end and communicates with the exhaust port 7 of the cylinder at its rear end. We may also provide the wall of the exhaust port 7 with a plurality of exhaust passages 7* to provide an additional means of exhaust. In some cases, these passages may entirely take the place of the exhaust port 28 through the head 4. They are especially advantageous in small sizes of motors where there is not sufficient room in the cylinder wall to make exhaust passage 7 of large enough area to otherwise take care of the exhaust.

The operation of the motor will be readily understood. The air enters the piston chamber through the cross-ports 8 and exhausts therefrom into the exhaust port 7 through the other set of cross-ports. By the provision of a plurality of these cross-ports extending throughout the length of the cylinder, air is supplied to and exhausted from the piston chamber simultaneously throughout its length, thus obtaining a much quicker admission and exhaust. The operation may, however, be reversed, and the air or other fluid be brought into the motor through the port 7 and exhausted through the port 6.

The advantages of our invention result from the simplicity of construction, there being comparatively few parts, which are easily made and assembled, and which are held together in such a manner that they can be readily detached when necessary. While adapted for a variety of purposes, this motor has been found in practice to be especially adapted for use in driving boiler tube cleaners of that class in which the motor is carried through the tube to be cleaned with the cleaning tool which is attached to the projecting end of the piston shaft. The compact arrangement of the parts enables the motor to be readily constructed for this purpose, while the manner in which the air is discharged enables the latter to be utilized for blowing the material loosened by the tool out of the tube being cleaned. It will be noted that the piston shaft is not only pro-

vided with a thrust collar, or enlargement, at its rear end, but that it is also shouldered into the split bushing whereby all end thrusts are effectually taken care of. The provision of the air chamber and vent adjacent to the rear bearing of the piston shaft is also a feature of advantage, since the vent relieves any accumulation of air which might otherwise be caused by leakage past the shaft bearing. Another advantage of this air chamber and vent, is that the air which leaks by the bearing will carry with it sufficient lubricant to keep the rear bearing in proper condition. The front bearing will at all times be kept lubricated by the leakage of the air under pressure, carrying the lubricant with it.

What we claim is:—

1. In a rotary motor, a cylinder having a longitudinally extending admission port, a head at one end of the cylinder having an admission chamber therein, a bearing member seated within the admission chamber and having a port therethrough which connects the chamber with the admission port of the cylinder, said member also having a bearing for the motor shaft and a vent opening leading to said bearing; substantially as described.

2. In a motor, a cylinder having a longitudinally extending admission port, ported heads detachably secured to the ends of said cylinder, a piston shaft journaled at one end in one of said heads, and a split bushing seated within the other of said heads and forming a part thereof and having a bearing for the opposite end portion of said shaft; substantially as described.

3. In a motor, a cylinder having a longitudinally extending admission port, a head at one end of the cylinder having an admission chamber therein, a split bushing seated within the admission chamber, and a piston shaft having a shouldered engagement with said bushing, and also having a thrust collar engaging the same; substantially as described.

4. In a motor, a cylinder having longitudinally extending admission and exhaust ports, ported heads fitted to the ends of said cylinder, one of said heads having an admission chamber therein, a piston shaft journaled in said heads, and means for introducing a lubricant to said chamber; substantially as described.

5. In a motor, a cylinder having a longitudinally extending admission port, a head at one end of the cylinder having an admission chamber therein, and a supply pipe screwed into said head and extending into said chamber and terminating in a perforated discharge portion; substantially as described.

6. In a motor, a cylinder having a longitudinally extending admission port, heads

fitting and detachably secured to the ends of said cylinder, said heads having piston shaft bearings therein, and the rear head having an admission chamber and also a vent opening communicating with the rear shaft bearing, and means for introducing a lubricant into said admission chamber; substantially as described.

7. In a motor, a cylinder having longitudinally extending admission and exhaust ports communicating therewith at a plurality of points, the exhaust port having a plurality of discharge openings extending through its wall; substantially as described.

8. In a motor, a cylinder having longitudinally extending admission and exhaust ports, heads fitted to the ends of the cylinder, one of said heads having an admission port communicating with the admission port of the cylinder, and the other head having an exhaust port communicating with the exhaust port of the cylinder, the cylinder exhaust port also having a plurality of exhaust openings leading outwardly through its wall; substantially as described.

9. In a rotary motor, a cylinder, a motor element supported on bearings beyond the

ends of the cylinder, the rear bearing being inclosed, means for permitting the escape of pressure leaking from the motor chamber through the rear bearing, and means for introducing lubricant into the motor chamber with the motor fluid, and thereby causing it to be carried to the rear bearing by the pressure leakage; substantially as described.

10. In a rotary motor, a cylinder, a motor element supported on bearings beyond the ends of the cylinder, the rear bearing being inclosed, means for permitting the escape of pressure leaking from the motor chamber through the rear bearing, and means for introducing lubricant into the motor chamber and causing it to mix with the motor fluid, whereby some of the lubricant will be carried to the rear bearing by the pressure leakage; substantially as described.

In testimony whereof, we have hereunto set our hands.

EDWARD R. MILLS.
CHARLES A. CONN.

Witnesses:

G. M. VIERS,
H. M. CORWIN