P. J. DARLINGTON.

ROTARY MOTOR.

APPLICATION FILED NOV. 24, 1914.

1,167,154.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.

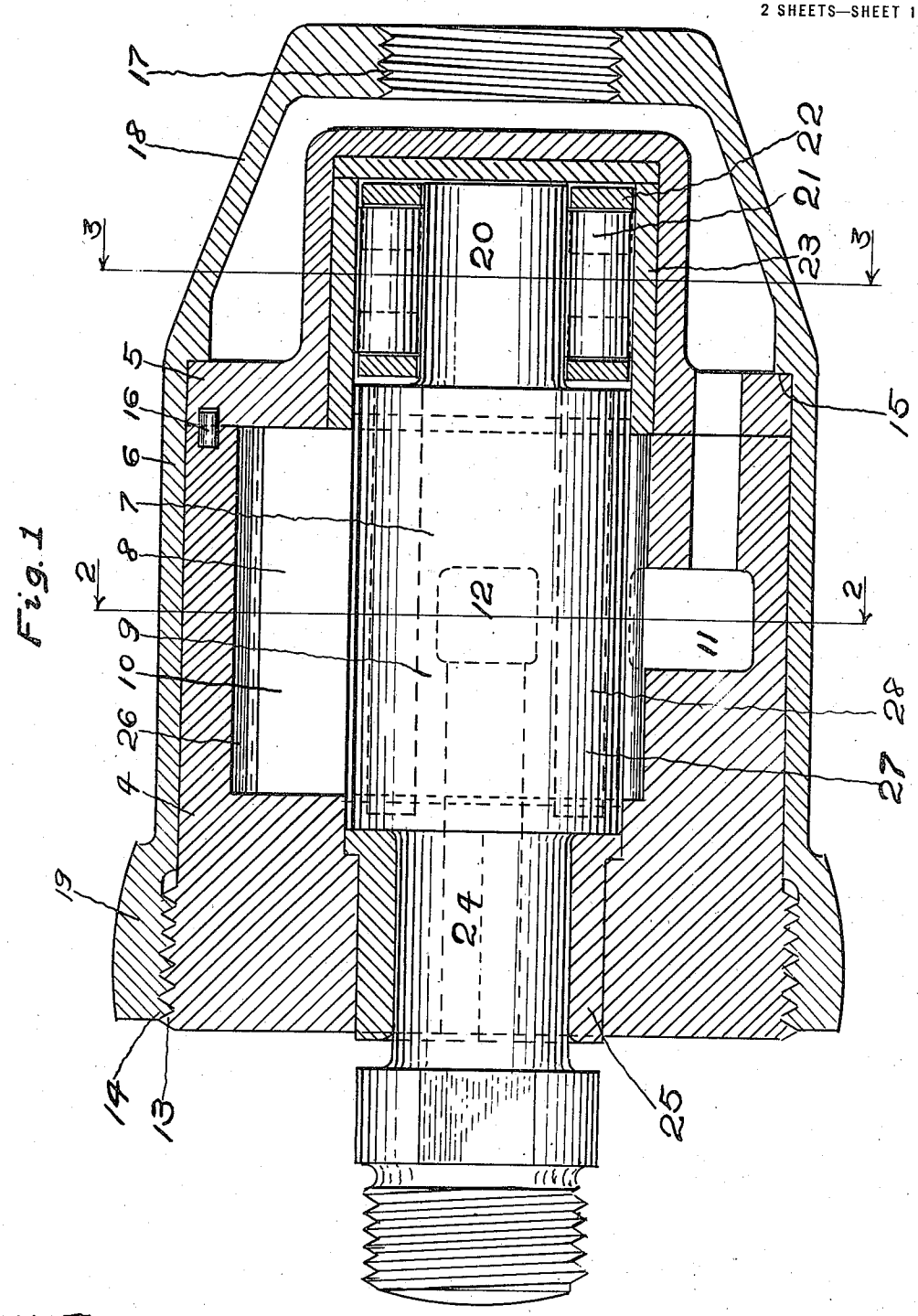


Fig. 1

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2

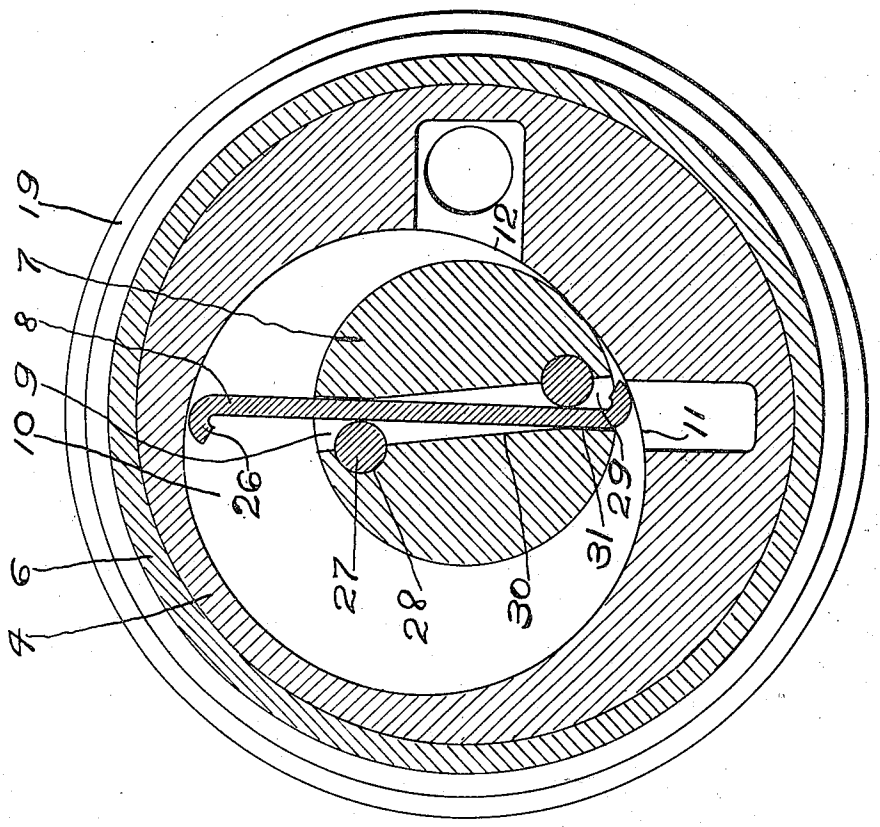
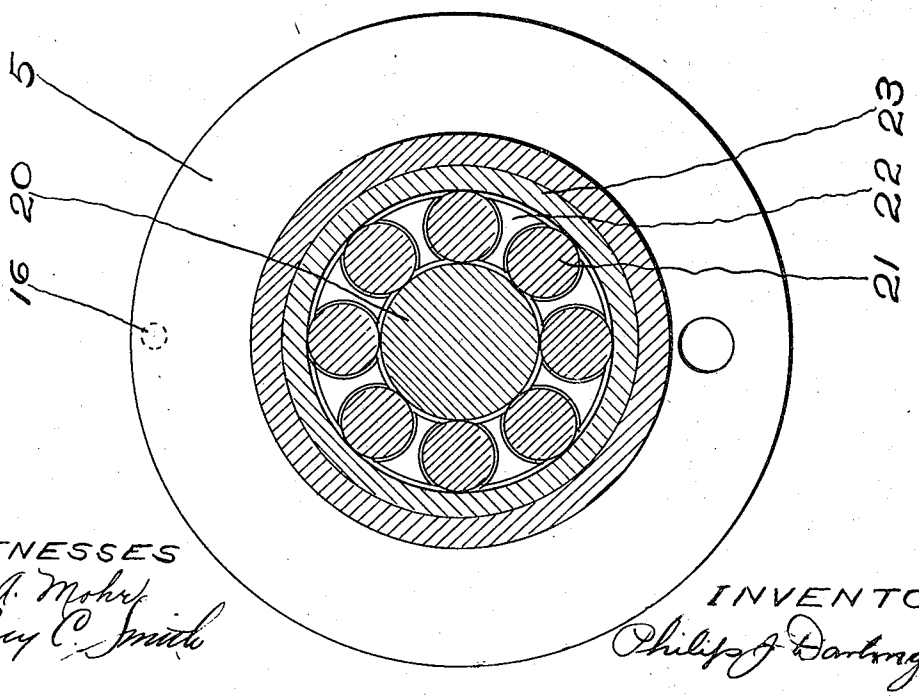



Fig. 3




WITNESSES

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# UNITED STATES PATENT OFFICE.

PHILIP J. DARLINGTON, OF HARTFORD, CONNECTICUT.

## ROTARY MOTOR.

1,167,154. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed November 24, 1914. Serial No. 873,737.

*To all whom it may concern:*

Be it known that I, PHILIP J. DARLINGTON, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented new and useful Improvements in Rotary Motors, of which the following is a specification.

This invention relates to rotary machines such as motors, pumps and blowers, either driving or driven across a pressure difference or head of water, air, steam or other fluid, although it is illustrated and described as embodied in an air driven motor of a type used for boiler tube cleaning.

The object of my invention is to simplify and cheapen the construction of machines of this class and at the same time increase their efficiency and render them longer lived and more cheaply and quickly repaired.

In the accompanying drawings Figure 1 shows a central longitudinal section, through the admission port, of a motor constructed according to this invention. Fig. 2 is a transverse section on line 2—2. Fig. 3 is a transverse section on line 3—3 with outer shell removed.

The motor shown has a cylinder 4 and a rear cylinder cover 5 mounted concentrically in an outer shell 6. A concentric rotary shaft 7, supported in the cylinder 4 and the cover 5, carries a sliding piston or blade 8 in a slot 9 and contacts with the cylindrical wall of an eccentric piston chamber 10 across which piston 8 fits loosely. The chamber 10 is not of circular form of cross section but may be of any form such that the piston 8 will fit loosely across it in all positions during revolution of shaft 7. An admission port 11 and an exhaust port 12, on opposite sides of the contact line or abutment between shaft 7 and chamber 10, admit and exhaust, respectively, the motive fluid to and from the chamber to cause rotation of the shaft in a well known manner.

The front end of the cylinder 4 has an externally screw threaded portion 13 screwing into an internally screw threaded portion 14 in the front end of the shell 6, forcing the cylinder cover 5 against an internal shoulder 15 in shell 6 and clamping cover 5 into place against the rear end face of cylinder 4. A dowel pin 16 secures cover 5 in its angular position on cylinder 4. Shell 6 has a screw threaded opening 17, at its rear end, to receive a fluid supply pipe. Shell 6 has a reduced and tapered rear end portion 18 and an enlarged front end portion 19 suitable for centering and guiding the motor around the curves of curved tubes. Shaft 7 has a reduced rear end portion 20 carried by bearing rollers 21 in a cage 22 forming a well known type of roller bearing. A bearing bush 23 is forced into cover 5 flush with the forward face thereof and forming a renewable bearing surface for the roller bearings. Bush 23 is held axially into place by a portion of its front end face overlying the rear end face of cylinder 4. A forward journal portion 24 of shaft 7 is supported by a split bush 25 in the front end of cylinder 4.

Features of my invention are the form of the blade and the slot and the means of supporting and detaining the blade in the slot. Centrifugal force, force of acceleration and pressure of the working fluid on the edge of the blade all produce harmful pressure of the blade against the cylindrical wall of the chamber and are all reduced by making the blade thin and light. To resist the wearing friction against the cylinder wall, it is desirable to have the blade edges thickened and a dragging or rearwardly extended edge, in the motor form, is very desirable to reduce edgewise forces on the blade and give a self closing or self packing contact line between the driven edge of the blade and the cylindrical wall of the chamber.

The mechanical limitation to cheap manufacture dictates that the blade shall be of such form that it can be readily bent from rolled sheet steel and that the slot in the shaft shall be of substantial width, much greater than the thickness of the central portion of the blade. All parts should be be very positively retained in place but easily removable and replaceable without the cutting out of rivets or other slow and difficult processes.

Blade 8 is formed of a thin central body having two opposite edge portions 26 oppositely turned over into letter S to form part cylindrical contact surfaces against the cylindrical wall of the chamber 10 and with edges trailing during rotation. The width of slot 9 exceeds the thickness of the edge portions 26 of the blade 8 so that the blade may be inserted through the slot. Round blade bars 27 in parallel longitudinal holes or seats 28 in the shaft body extend part way into the slot, holding the blade diagonally across the slot, closing the space between the blade and slot against leakage and prevent-

ing the blade falling out of the slot, when the shaft and blade are removed from the cylinder, until the bars are drawn rearwardly out of the seats to release the blade. The bars 27 are normally held in place by the bearing cage 22.

The blade bars 27 are located radially inward from the surface of shaft 7 a distance to form externally open pockets 29 in the slot of sufficient depth to allow each edge portion of the blade to bury itself below the shaft surface in passing the abutment or contact line between shaft and chamber wall.

The slot 9 in the shaft 7 is formed with two long parallel faces 30, separated by a distance greater than the edge portions of the blade, and, at an angle thereto, with two short faces 31, diametrically opposite each other in parallel planes separated a distance equal to the thin central body portion of the blade and on which the blade gets flat bearing surfaces as it lies in its normal position diagonally across the slot. The slot 9 is made slightly longer than the blade 8 to allow the shaft to float or move longitudinally as the bearings or shoulders wear.

To take apart the motor, the cylinder is unscrewed from and drawn out of the shell taking the cylinder cover with it. The cylinder cover is lifted off the cylinder. The shaft is forced out of the cylinder, taking the split bush and blade with it. The blade bars are drawn out of the shaft from the rear end and the blade drawn from the slot.

The invention claimed is:—

1. In a rotary machine, a cylinder, a slotted shaft, a blade free to slide in the slot of said shaft and a removable member carried by said shaft to prevent said blade falling out.

2. In a rotary machine, a cylinder, a cylinder cover, a slotted shaft, a blade free to slide in the slot of said shaft and normally held in place by said cylinder and cylinder cover, a removable member carried by said shaft and normally locked in place by said cylinder and cylinder cover, said removable member preventing said blade falling out of the slot of said shaft when said cylinder is removed.

3. In a rotary machine, a cylinder, a slotted shaft, a blade free to slide in the slot of said shaft and normally held in place by said cylinder and removable means for preventing said blade falling out of the slot of said shaft when said cylinder is removed.

4. In a rotary machine, a cylinder, a shaft, a slot in said shaft, a blade sliding in said slot and a removable member for partly closing the width of said slot, said removable member being normally held in place by the cylinder cover.

5. In a rotary machine, a cylinder, a shaft, a diametric slot through said shaft, said slot being formed with two sets of surfaces two of which are parallel with each other and the other two in parallel planes with each other, but at an angle to the first two surfaces.

6. In a rotary motor, a cylinder, a shaft, a slot in said shaft, a blade free to slide in said slot but thinner than the width thereof, said slot being formed with two sets of faces whereby said blade lies flat on one set of said faces while lying across the slot diagonally to the other two faces.

7. In a rotary machine, a cylinder, a cylinder cover, a shaft, a slot in said shaft, a blade lying through and diagonally across said slot and a removable member normally retaining said blade in said diagonal position.

8. In a rotary machine, a cylinder, a cylinder cover, a shaft, a slot in said shaft, a blade lying through and diagonally across said slot and a removable member normally retaining said blade in said diagonal position and said removable member being normally held in place by said cylinder cover.

9. In a rotary machine, a cylinder, a shaft having a diametric slot therethrough, a blade inserted radially through said slot and a removable retaining member inserted axially into said slot.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses this 23rd day of November, 1914.

PHILIP J. DARLINGTON.

Witnesses:—

BERTHA A. MOHR,

PERRY C. SMITH.