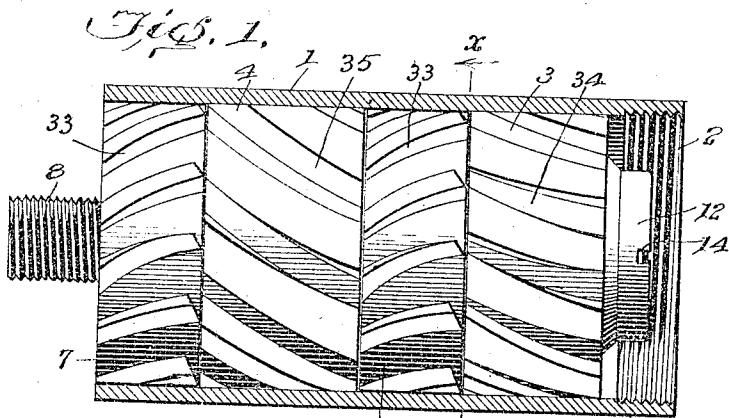
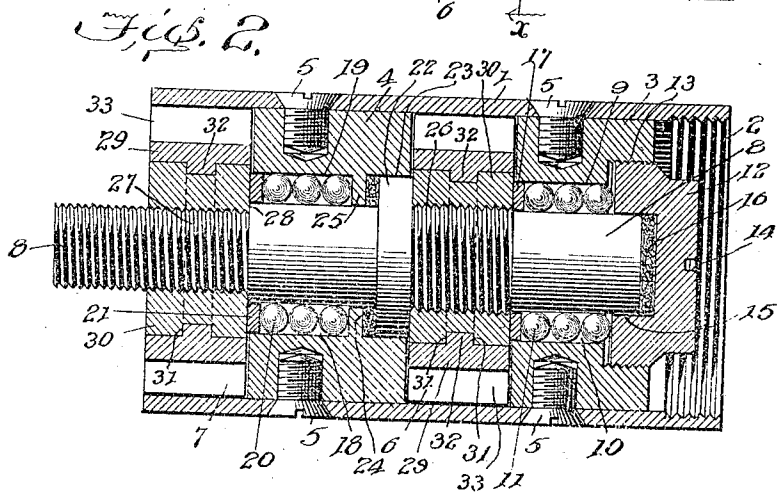
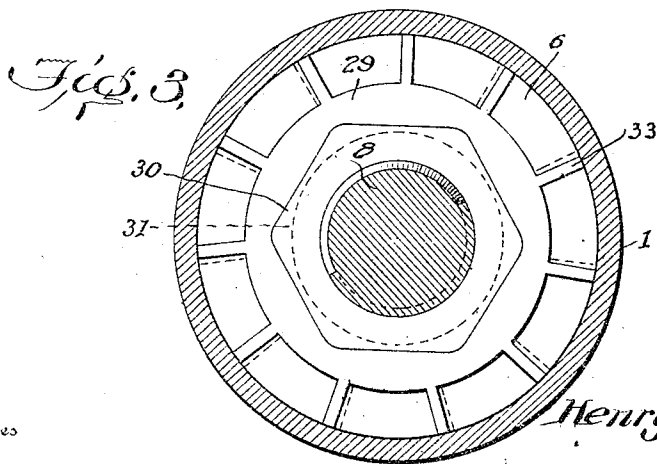


No. 825,094.

PATENTED JULY 3, 1906.

H. F. WEINLAND.
TURBINE MOTOR FOR BOILER TUBE CLEANERS, &c.
APPLICATION FILED JAN. 30, 1905.



Witnesses

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TURBINE-MOTOR FOR BOILER-TUBE CLEANERS, &c.

No. 825,094.

Specification of Letters Patent.

Patented July 3, 1906.

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To all whom it may concern:

Be it known that I, HENRY F. WEINLAND, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Turbine-Motors for Boiler-Tube Cleaners, &c., of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to turbine-motors for boiler-tube cleaners, &c., and more particularly to turbine-motors intended for use in connection with water under pressure as a motor fluid, the motor being connected with a rotary cleaning-head, preferably provided with centrifugally-acting cutter-bearing arms and traveling with said head through the tube to be cleaned. A structure of this type is set forth in Letters Patent No. 730,994, granted June 16, 1903, to my assignee, The Lagonda Manufacturing Company. One of the requisites of a cleaner of this type is a speed of rotation sufficiently high to cause the centrifugally-acting cutter-arms to accomplish their work, and one of the elements on which this speed is dependent is the diameter of the turbine-wheel. These cleaners are made in different sizes to correspond to the different sizes of boiler-tubes to be cleaned, and while the larger sizes of boiler-tubes are of a diameter such as to accommodate a motor comprising a wheel of a diameter sufficient to give the necessary power and speed it has been found in practice that the smaller tubes will not admit a motor having a wheel of a diameter sufficiently great to develop the necessary power and speed of rotation.

It is the object of my present invention to provide a turbine-motor for use in connection with boiler-tube cleaners of the class just referred to which will develop greater power and speed in proportion to its diameter than the motors heretofore used for this purpose, so that when my improved motor is made of a diameter sufficiently small to enable it to pass through the smaller size of boiler-tubes it will nevertheless develop power and speed sufficient to cause the cutter-arms to do their work properly.

A further object of my present invention

is to provide a construction such that the parts may be readily assembled and taken apart, ample provision being made to reduce friction and wear, and to provide a structure which is at the same time efficient and inexpensive.

To these ends my invention consists in certain novel features which I will now proceed to describe, and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a view of a turbine-motor embodying my invention in one form, the casing being shown in longitudinal section and the internal structure in elevation. Fig. 2 is a view similar to Fig. 1, but with the internal structure also in section; and Fig. 3 is a transverse sectional view taken on the line *xx* of Fig. 1 and looking in the direction of the arrows.

In the accompanying drawings I have shown a preferred embodiment of my invention in which the structure comprises an outer casing 1, preferably in the form of a cylindric tube, which may be threaded at one end, as indicated at 2, to provide for the attachment thereto of the hose connection by means of which water under pressure is supplied to the motor. Within this casing are located two heads 3 and 4, separated by a distance sufficient to admit between them a turbine-wheel. These heads are preferably in the form of blocks fitting within the casing and secured in position by screws 5 or in any other suitable manner. Said blocks constitute at one and the same time bearings for the rotatory parts and guides for the water-jets to direct the same properly against the water-wheels. These latter (two in number) are indicated, respectively, by the numerals 6 and 7 and are mounted on a shaft 8, the blocks 3 and 4 being centrally apertured for the passage of said shaft.

The block 3 has a central aperture or bore 9 of considerably greater diameter than the portion of the shaft 8 which passes through said block, so as to form a space or chamber 10, annular in form and adapted to receive antifricition balls or rollers placed between said block and the shaft to receive the radial thrust of the shaft-bearing. In the present instance I have shown a plurality of annular

rows of balls 11 filling the chamber 10. The block 3 also has an end-thrust bearing to receive any end thrust transmitted to the shaft 8 from the work in a rearward direction or toward the end of the motor farthest from the cleaning-tool. This end-thrust bearing is preferably in the form of a plug or block 12, threaded externally to fit a correspondingly-threaded recess 13 in the rear end of the block 3, the plug 12 being provided with a slot 14 to receive a screw-driver or similar device by means of which it may be screwed into position or removed or being otherwise so constructed as to permit the attainment of these results. The plug 12 has an internal recess 15 in its forward face, into which the rear end of the shaft 8 extends loosely, and a washer 16, seated at the bottom of the recess 15, serves to form a bearing for the end of the shaft 8, the thrust of which it receives. This washer is preferably of indurated fiber or the like. A washer 17, fitting within the chamber 10 at the other end thereof adjacent to the water-wheel 6, is interposed between said water-wheel and the antifriction balls or rollers within said chamber, so as to prevent them from coming into contact with and causing wear of the water-wheel 6. The shaft 8 passes loosely through this washer without contacting with the same. The bearing-block 4 is provided with a central aperture 18 for the passage of the shaft 8, said aperture being of a diameter sufficient to form around the shaft an annular chamber 19, similar to the chamber 10, and receiving antifriction elements 20, similar to those in the chamber 10. A washer 21, similar to the washer 17, is disposed between the antifriction-balls 20 and the water-wheel 7 to prevent wear of the latter by the former. The shaft 8 is provided about midway of its length with a collar or enlargement 22, and the block 4 is recessed, as indicated at 23, to receive said collar, which fits loosely therein and which bears against a washer 24, seated in the bottom of the recess 23. This washer receives the forward thrust on the shaft 8, due to the pressure of the water on the water-wheels, and is preferably also of indurated fiber, like its companion washer 16. The block 4 has an inwardly-extending annular flange 25, which forms one end of the chamber 19 and also the bottom of the recess 23. This flange is also so constructed that it does not contact with the shaft 8, and it will be observed that the peripheral or cylindrical surfaces of the shaft 8 have no contact with any fixed part, their only contact being with the antifriction balls or rollers, while the end thrust is taken entirely by the washers 16 and 24 and is not transmitted to the antifriction-balls.

The securing of the water-wheels to the shaft is effected by a screw-threaded connection, thereby permitting them to be readily removed and replaced while holding them

firmly in position on the shaft. In the case of the water-wheel 6 the shaft is provided with a screw-threaded portion 26, extending rearward from the collar 22, and the water-wheel 6 has an internally-threaded aperture which fits the screw-threaded portion and permits the water-wheel to be screwed thereon firmly against the collar 22 as an abutment. The water-wheel 7 is secured in position by providing the forward end of the shaft 8 with a screw-threaded portion 27, this portion being reduced in diameter to form a shoulder 28, and the water-wheel 7 has a correspondingly-threaded central aperture by which it may be screwed onto the threaded end of the shaft and against the shoulder 28 to hold it firmly in position. The threaded portion of the shaft 8 extends forward beyond the water-wheel 7 and casing 1 to provide a means for the attachment of the cutter-head.

In structures of this class it has always been difficult to attach the water-wheel to the shaft, particularly where a screw-threaded attachment is attempted, by reason of the fact that it is desirable that the water-wheels shall be cast or formed of brass or like material to facilitate the correct formation of the vanes or buckets; but a satisfactory threaded connection between the brass wheel and steel shaft has not been effected, the shaft 8 being preferably constructed of steel. I overcome these objections by constructing the water-wheel in two parts, the outer part 29 being formed of brass or the like, while the inner part 30 is of steel or iron. This inner part is polygonal in form, being shown as hexagonal, and is provided with a peripheral groove 31. The outer brass portion is then cast around the inner steel portion, and the brass will enter the groove 31, forming a tongue 32, which interlocks with the central portion to prevent any separation of the two parts in the direction of the length of the shaft on which they are to be mounted. The polygonal form of the steel center interlocks the two parts, so as to prevent the one from turning upon the other, causing them to rotate in unison. The steel center is centrally apertured and threaded, so as to fit upon the correspondingly-threaded part of the steel shaft, and the wheel and shaft are thus united in a satisfactory manner.

The two water-wheels are each provided with peripheral vanes or buckets 33, inclined as shown and forming between the casing and body of the wheel the usual inclined water-passages, which may be of any approved form. The water-wheel 6 is located between the blocks 3 and 4, and the block 3 is provided with passages 34, which are of the type usually employed in structures of this character, decreasing in cross-sectional area from rear to front, so as to act as jet-nozzles, and inclined in such a way as to deliver the water

to the wheel 6 so as to strike the vanes or buckets thereof at the desired angle. The passages 34 are preferably in the form of grooves formed in the exterior of the block 3 and completed by the casing 1, which forms their outer walls when the structure is assembled. The block 4 lies between the wheels 6 and 7, and it is also provided with water-guiding passages 35, which receive the water from the water-wheel 6 and deliver it to the water-wheel 7. These passages are preferably formed in the same way as the passages 34 by grooving or slotting the external surface of the block.

One of the distinguishing features of my present invention is that the water-passages 35 of the second or forward block are of considerably greater cross-sectional area than the water-passages of the first or rear block. By practical experience and extensive tests I have found that when the two sets of water-passages are thus proportioned a very material gain in power and speed is made, whereas a motor otherwise similarly constructed, but having the water-passages 35 of substantially the same size as the water-passages 34, is inefficient and unsatisfactory. I also prefer to so construct the water-passages 35 as to give them the same cross-sectional area throughout their length. They are, however, curved or inclined in the same direction and manner as the first water-passages.

By extended practical use of a motor constructed in the manner just described, in connection with a cleaner-head, the apparatus being so proportioned as to operate within boiler-tubes of smaller diameter, two-inch tube being the size actually cleaned, I have found that the apparatus with such a motor developed sufficient power and speed to clean the tubes in a perfectly satisfactory manner—a result which, so far as I am aware, has never been accomplished under similar conditions by a cleaner driven by a motor of the turbine type.

In addition to fulfilling the essential requirement of sufficient power and speed with a small diameter the motor also has manifest advantages in that the parts may be readily assembled or taken apart when required, that ample provision against excessive friction is made, and that the end thrust in each direction is properly supported. Any looseness arising from wear can be readily taken up by means of the screw-plug 12. It will also be observed that the construction, while efficient, is relatively simple and inexpensive.

It is obvious that various modifications in the details of construction may be made without departing from the principle of my invention. For instance, either one of the bearing-blocks may be integral with the casing, bearing-rollers may be substituted for the bearing-balls, and the type of water-wheel and jet-guide employed may be of any

approved character. I therefore do not wish to be understood as limiting myself strictly to the precise details of construction hereinbefore described, and shown in the accompanying drawings.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A turbine-motor for boiler-tube cleaners and the like, comprising a hollow cylindrical casing, heads secured at separated points therein and provided with guiding-passages for the water and with central bearing-chambers, a rotatory shaft mounted in said heads and provided with water-wheels located in front of the respective heads, rolling antifriction elements located in the bearing-chambers between the shaft and heads and arranged to receive the radial thrust only, the rear head being provided with a thrust-bearing for the rear end of the shaft, the shaft being provided with a collar in the rear of the front head, and the front head being provided with an abutment for said collar to receive the forward thrust of the shaft, substantially as described.

2. A turbine-motor for boiler-tube cleaners and the like, comprising a hollow cylindrical casing, heads secured at separated points therein and provided with guiding-passages for the water and with central bearing-chambers, a rotatory shaft mounted in said heads and provided with water-wheels located in front of the respective heads, rolling antifriction elements located in the bearing-chambers between the shaft and heads and arranged to receive the radial thrust only, the rear head being provided with a thrust-bearing for the rear end of the shaft, the shaft being provided with a collar in the rear of the front head, and the front head being provided with an abutment for said collar to receive the forward thrust of the shaft, said front and rear head thrust-bearings having washers interposed between them and the cooperating parts of the shaft, substantially as described.

3. A turbine-motor for boiler-tube cleaners and the like, comprising a hollow cylindrical casing, heads secured at separated points therein and provided with guiding-passages for the water and with central bearing-chambers, a rotatory shaft mounted in said heads and provided with water-wheels located in front of the respective heads, rolling antifriction elements located in the bearing-chambers between the shaft and heads and arranged to receive the radial thrust only, the rear head being provided with a thrust-bearing for the rear end of the shaft, the shaft being provided with a collar in the rear of the front head, and the front head being provided with an abutment for said collar to receive the forward thrust of the shaft, the rear-head thrust-bearing having a threaded connection with the body of the head, whereby

it may be adjusted in the direction of the axis of the shaft, substantially as described.

4. In a turbine-motor of the character described, a water-wheel comprising a body or
5 hub of hard metal, such as steel, polygonal in transverse section and provided with a circumferential groove, and an outer portion of relatively soft metal, such as brass, having water-passages formed therein and fitting

the polygonal hub or body and engaging the groove thereof, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY F. WEINLAND.

Witnesses:

A. W. DE FOREST,
C. D. AINGER.