E. KIRK.

COMPENSATING THRUST BEARING FOR SHAFTS.

APPLICATION FILED NOV. 1, 1910.

986,635. Patented Mar. 14, 1911.

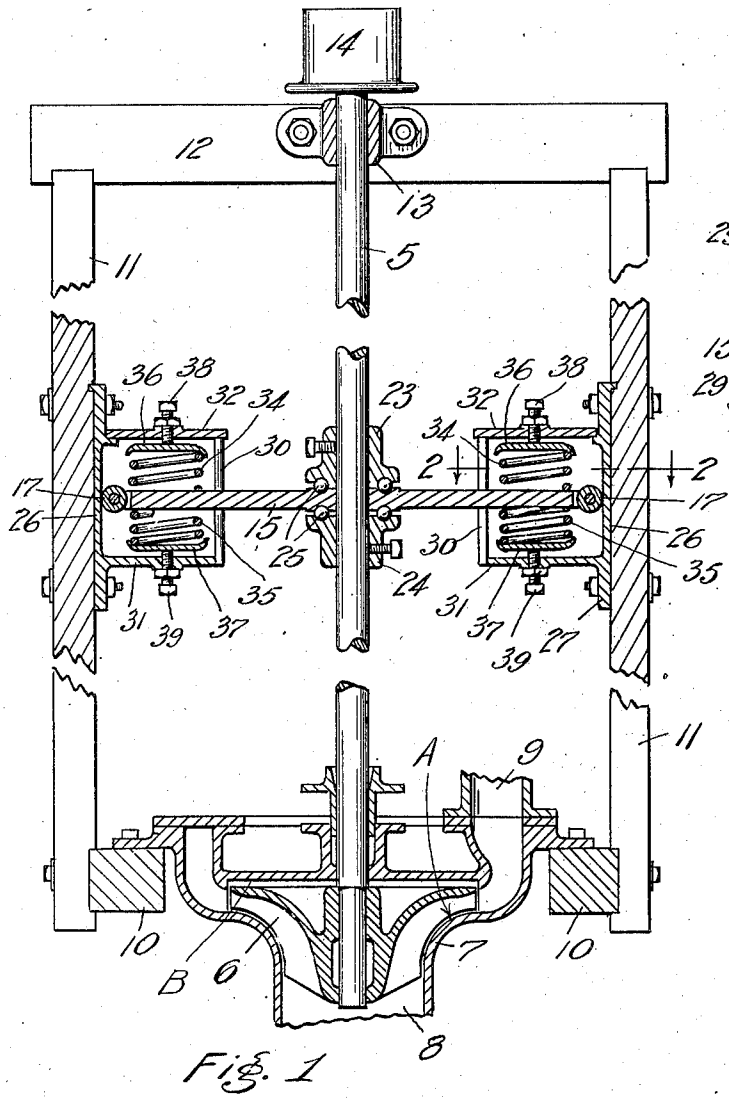

Fig. 1

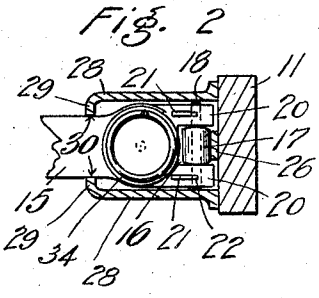

Fig. 2

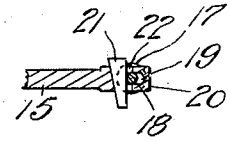

Fig. 3

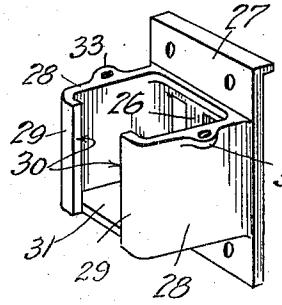

Fig. 4

WITNESSES:

H. Barnes

E. Peterson

INVENTOR:

Edward Kirk

BY

Pierre Barnes

ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD KIRK, OF SEATTLE, WASHINGTON.

COMPENSATING THRUST-BEARING FOR SHAFTS.

986,635. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed November 1, 1910. Serial No. 590,214.

To all whom it may concern:

Be it known that I, EDWARD KIRK, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Compensating Thrust-Bearings for Shafts, of which the following is a specification.

This invention relates to thrust-bearings for shafts. It is particularly adapted for the shafts of centrifugal pumps, and is shown in the accompanying drawings as applied to that purpose.

As usually constructed, the runner of a centrifugal pump whose shaft is arranged vertically in starting or when rotating at a relatively low speed will be supported by the casing, but when operating at its normal speed the runner will be raised by the force of the water passing through the casing to be thrust against the casing-head which is opposite to the pump intake-opening. The pressures thus created will render considerable friction to the affected parts with a consequent rapid wearing away of the same, and notably so when there is any gritting matter, like sand, conveyed with the water to aggravate the attrition of the juxtaposed rubbing surfaces of the pump parts.

The object of my invention is the provision of means whereby a pump runner is maintained out of contact with the casing thereof and to relieve the shaft and its supports from excessive strains and friction.

The invention consists in the novel construction and combination of devices, as will be hereinafter described and claimed.

Referring to the drawings, Figure 1 represents a vertical transverse section illustrating an embodiment of the invention and operatively connected with a pump. Fig. 2 is a horizontal section of the same on line 2—2. Fig. 3 is a fragmentary longitudinal vertical section of the spreader-member. Fig. 4 is a perspective view of one of the guide-boxes for said spreader-member.

The reference numeral 5 designates the upright shaft having mounted upon its lower end the runner 6 of a centrifugal pump whose casing is designated by 7. As customary, the inlet 8 of this class of pumps is arranged underneath in axial alinement with the pump and delivers the water about the periphery of the runner to be discharged, as in the illustrated example, through a delivery pipe 9. The pump casing is rigidly secured to frame timbers 10 whence extend upwardly tower-timbers 11 which support a transverse timber 12 which, in turn, has secured thereto a bracket box 13 serving as the upper bearing for said shaft. At the upper end of the shaft is shown a belt-pulley 14 for rotating the shaft to drive the runner through the medium of belt transmission from suitable power devices.

The aforementioned elements are, or may be, of usual construction and form no part of the present invention.

According to my invention there is fitted loosely upon the shaft, a spreader-member comprising a transversely disposed beam 15 extending into proximity to the tower-timbers 11. The ends of this member are forked to provide recesses 16 to accommodate rollers 17 which are rotatably mounted upon axles 18 whose ends are seated in elongated apertures (such as 19, Fig. 3) provided in the branches 20 of the respective ends. Said axles are adapted to be set outwardly to correspondingly move the rollers through the agency of wedge shaped keys 21 inserted in slots 22 of the several branches 20. Said spreader-member is preferably located at or in proximity to the midlength of the shaft 5 and is retained in such position by means of set-collars 23 and 24 which are rigidly secured to the shaft above and below the same. Interposed between the respective set-collars and the spreader member are series of anti-friction balls 25.

Rigidly secured to the tower-timbers 11 so as to receive the ends of the spreader are the guide-boxes therefor. Each of these boxes are constructed of a substantially rectangular casing provided with a back wall 27 from which extend side walls 28 terminating in inwardly directed flanges 29 having their opposing edges 30 parallel and spaced apart to a distance equal to or slightly greater than the width of the stretcher arms thereat. Within a box its back-wall is cut away to provide a centrally disposed upright bar 26 which serves as a track-rail for the adjacent roller 17. The box is also provided with a bottom 31 and has a removable cover 32 which may be secured to the box by bolts, not shown, engaging in screw-threaded apertured lugs 33 provided upon the side walls of the box.

Disposed above and below the stretcher and within each box are helical springs 34 and 35 which are respectively held in oper-

ative positions by dished plates 36 and 37. Adjustment screws 38 and 39 extend through threaded holes in the bottoms and covers, respectively, of the boxes for the purpose of adjusting the effective tension of the springs by causing the plates 36 and 37 to be moved more or less toward the stretcher in opposition to the power of the springs. The springs 35 are adjusted to normally support the runner so that it will be out of contact with the pump casing at A below and also clear of the casing B above. When the runner is driven at an effective speed, the resultant current of water which passes through the pump will influence the runner to raise the same, whereupon the springs 34 assert themselves to prevent the runner being forced against the casing surface B. When the runner is operating at a relatively slow speed the ensuing current in the pump is insufficient to sustain the runner and the parts supported thereby and would drop against the casing surface A but for the interference of the springs 35.

By the provision of the ball bearings for the shaft, the latter is rotatable without an appreciable amount of friction with respect to the spreader member. The spreader-member in conjunction with the rollers 17 tracking against the rail-bars 26 and restrained against any circular motion by the box-guides 30, serves to support the shaft against bending.

The invention is of simple construction, readily applied and adjusted and not easily deranged.

What I claim, is—

1. The combination of a shaft, a spreader loosely mounted thereon, means provided on the shaft for coupling the spreader therewith for longitudinal movements only, springs acting against the spreader to yieldingly resist the movements of the shaft in either longitudinal direction thereof, means for supporting said springs, and means for adjusting the springs.

2. The combination of a spreader, a shaft extending through the spreader and rotatable therein, means for securing the spreader and the shaft whereby they will be movable in unison in directions axially of the shaft, means for preventing the rotary movement of the spreader, and springs acting against the spreader to resist forces tending to effect the longitudinal movement of the shaft.

3. The combination of a shaft, collars secured thereto in spaced relation, a spreader upon the shaft intermediate said collars, bearing-balls interposed between the spreader and the respective collars, stationary guide-boxes for the ends of the spreader, springs located above and below the spreader in each of the boxes, and means for regulating the effective power of the several springs for selectively regulating the relative forces exerted thereby in resisting the longitudinal movements of the shaft.

4. The combination of a shaft, collars secured thereto in spaced relation, a spreader upon the shaft intermediate said collars, said spreader being provided at each of its ends with a roller, means for adjusting the relative positions of said rollers, stationary guide-boxes for the ends of the spreader and each provided with a track-rail for the respective rollers, springs located above and below the spreader in each of the boxes, and means regulating the effective power of the several springs for selectively regulating the relative forces exerted thereby in resisting the longitudinal movements of the shaft.

5. The combination of a shaft, collars secured thereto in spaced relation, a spreader upon the shaft intermediate said collars, bearing-balls interposed between the spreader and the respective collars, said spreader being provided at each of its ends with a roller, means for adjusting the relative positions of said rollers, stationary guide-boxes for the ends of the spreader and each provided with a track-rail for the respective rollers, springs located above and below the spreader in each of the boxes, and means for regulating the effective power of the several springs for selectively regulating the relative forces exerted thereby in resisting the longitudinal movements of the shaft.

EDWARD KIRK.

Witnesses:
PIERRE BARNES,
E. PETERSON.