(No Model.)

J. S. MOODY.

SPINDLE AND BEARING.

No. 594,118. Patented Nov. 23, 1897.

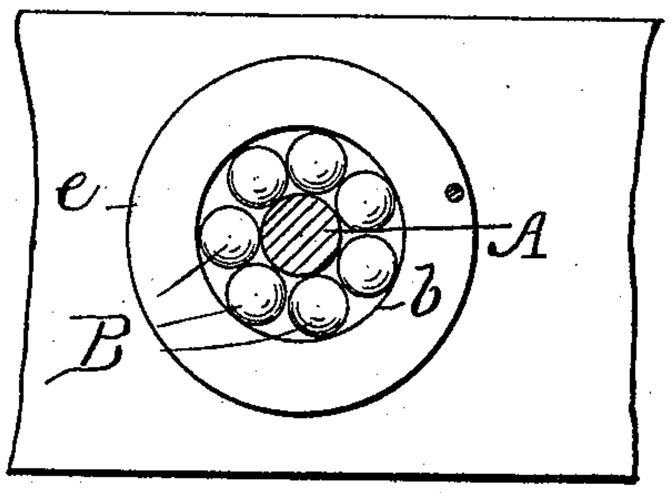

Fig. 2.

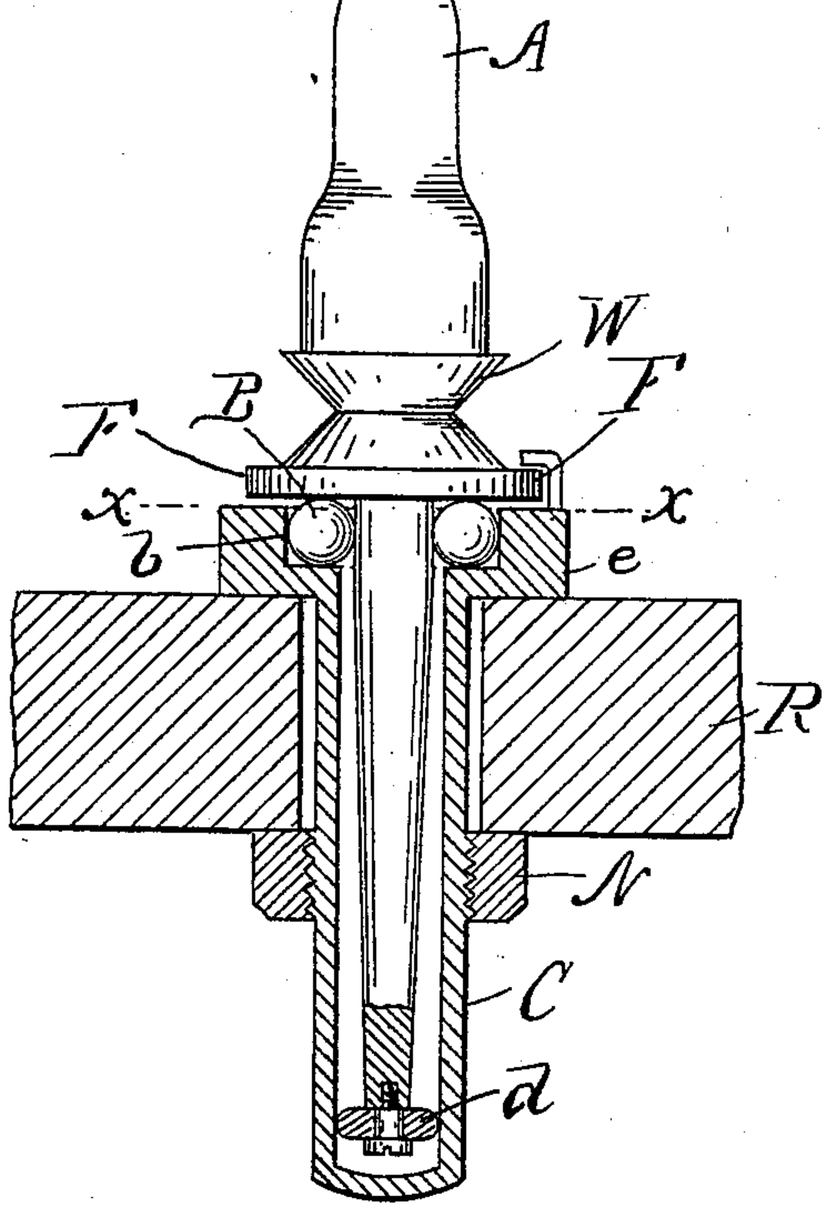

Fig. 1.

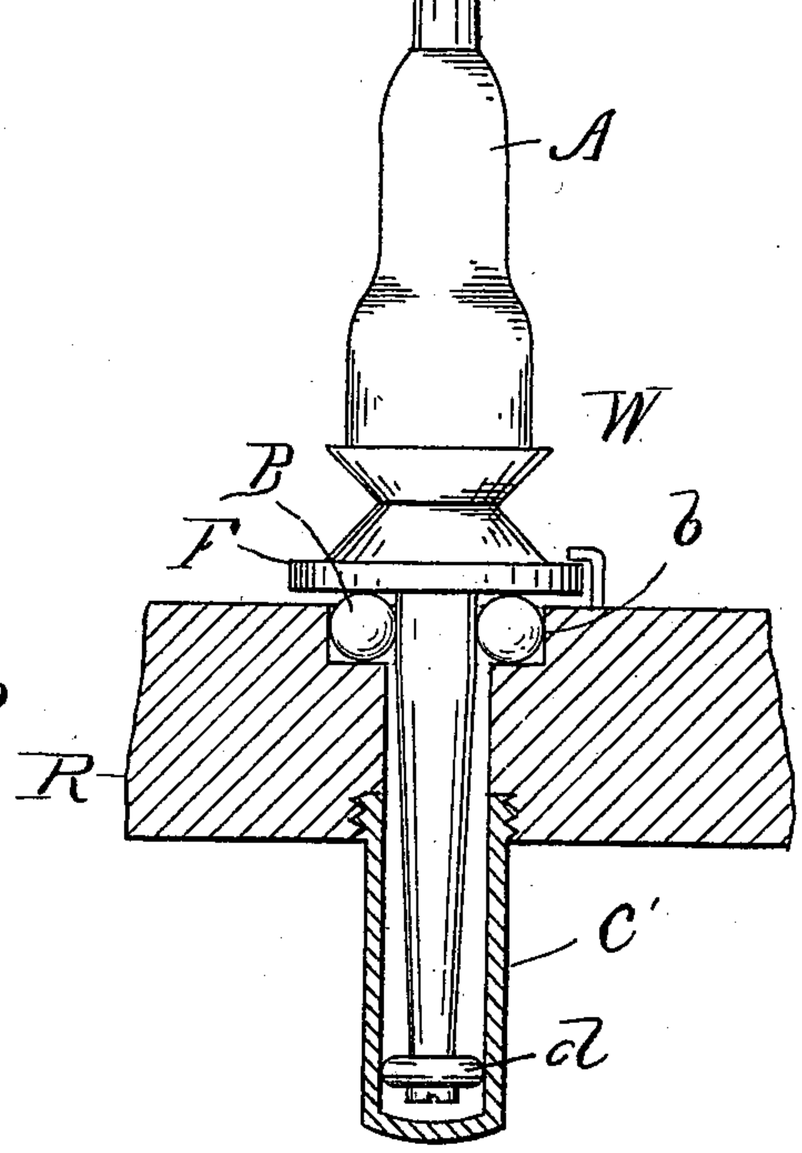

Fig. 3.

WITNESSES.

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SPINDLE AND BEARING.

SPECIFICATION forming part of Letters Patent No. 594,118, dated November 23, 1897.

Application filed October 21, 1896. Serial No. 609,607. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH S. MOODY, a citizen of the United States, residing at Saco, in the county of York and State of Maine, have invented a new and useful Improvement in Spindles and Bearings for the Same, of which the following is a specification, reference being had to the drawings accompanying and forming a part thereof.

My invention relates to live vertical shafts or spindles, being designed to preserve the normal vertical position of the spindle when in motion, to control the staggering movement resulting from an uneven load or high velocity, and to reduce to a minimum both the thrust and radial friction when the spindle is in rotation.

The object of my invention I attain by my construction of the spindle and bearings for the same in connection with spherical rollers or balls revolving freely in all directions, other parts shown and noted being common well-known devices.

A mode of construction as shown in the accompanying drawings is illustrative of my invention as applied to a live-spindle for spinning fibers.

Figure 1 is a front elevation, partly in section, of this construction. Fig. 2 is a horizontal sectional view through line *x x*, Fig. 1. Fig. 3 is a front elevation, partly in section, of an equivalent construction.

Similar letters indicate similar parts.

The spindle-case C, having its flange *e* counterbored, as at *b*, is secured on the spindle-rail R by the nut N. The counterbore in the case-flange is of such a diameter as to allow of the free rotary movement of the balls B when the spindle A is in position in the case. The counterbore is of such depth as shall allow of the free rotary movement of the flange of the spindle F when resting upon the balls and free from contact with the spindle-case flange.

The lower end of the spindle carries a spherical disk or ball *d* of less diameter than the inside diameter of the spindle-case and freely rotatable therein. The lower end of the spindle is tapered for the purpose hereinafter set forth.

In the process of spinning fibers on a bobbin carried on a live-spindle the spindle is rarely in a true vertical position when in motion, the load being unevenly distributed. This necessitates a certain amount of looseness of fit to enable the spindle to find its true center of gyration. This looseness of the spindle I secure by making the counterbore of a diameter which will allow a free but limited lateral movement of the balls and spindle when in motion, the inclination of the spindle from its true vertical position being controlled, jointly, by the caged balls and the ball or disk on the spindle. In assembling the parts, the case being secured in the rail as shown, the spindle carrying the disk or ball *d* is inserted therein to a depth which will allow of the balls being readily placed in the recess in the spindle-case flange, the taper of the spindle facilitating their insertion. The spindle is then dropped into its normal position, the flange resting upon the balls.

The spindle when in position in the spindle-case forms with the wall of the counterbore a cage or raceway in which the balls are carried and in which they have a free rotary movement in all directions, with sufficient looseness to run with an unbalanced load at high velocity, the number of these balls being such as shall fill the cage, with room for free rotation. Three balls, separately caged at equidistant points in the raceway, may be substituted for the larger number shown in the horizontal sectional view. The balls B are of such diameter as will assure but slight contact with the spindle or the wall of the counterbore when at rest and but slight frictional contact with the same when in motion. The disk or ball on the spindle is free from contact with the case when at rest or when the bobbin is evenly loaded. This ball acts as a cushion to the jar of high velocity or uneven load on the bobbin. This construction limits the irregular motion of the spindle when unevenly loaded and leaves the spindle free to assume its vertical position when its load is even. In this special mode of construction and application of my invention the end pressure or thrust of the spindle is upon the friction-balls B. The position of the spindle-flange F is such as shall secure the foot of the spindle from any vertical thrust or bearing. The radial bearing being controlled (limited) by the ball or disk *d*, attached to the

spindle, the friction is thus reduced to a minimum, the spindle is held normally vertical when in motion, and the radial tendency of the spindle consequent on an uneven load is controlled (limited) by the ball-bearings and spindle end bearing jointly, securing a uniform motion and a minimum of friction.

I do not limit my construction to the use of a case having a counterbored flange to carry the freely-rotating balls, as the essential office of the case is to afford a lateral support or bearing for the spindle-disk when in motion.

It is immaterial whether the balls be caged in the flange of the case or in a counterbore in the rail, either construction affording a like support for the balls and a like result in operation.

The case may be constructed without a flange and secured to the rail by any known method, a counterbore in the rail being an equivalent for the counterbore in the case-flange, the object being to provide a raceway for the freely-rotating balls supporting the spindle. This equivalent construction is shown in Fig. 3, the rail-perforation being counterbored and the case secured to the lower side of the rail, each performing the same functions and in the same manner as in Fig. 1.

Practically the element of friction is eliminated by my construction, as the shaft when in motion has only a rolling contact with its thrust-bearing or its radial bearing, all the rub or rubbing friction being that of the caged balls with each other, calling only for slight lubrication.

My invention provides a simple, cheap, and durable combined thrust and radial bearing for a live-spindle, requiring little or no lubrication. All rubbing friction of the spindle is eliminated, the spindle when in motion having only a rolling bearing on the balls, the rub being limited to the contact of the caged balls with each other.

By the improved construction herein set forth and shown the expensive and complicated bolster and step in common use are discarded, the cost of construction and adjustment greatly lessened, and a positive thrust and radial bearing for the spindle is assured.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In combination with a perforated spindle-rail, a live vertical spindle, carrying at its lower end a freely-rotating disk; a case to control the radial thrust of said disk; a flange fixed on said spindle above said disk, to support the entire vertical thrust of said spindle when in position in said rail; said flange resting and rotating upon a single series of caged spherical balls; said balls being freely rotatable in all directions, substantially as specified.

2. The herein-described spindle, and bearing for the same: comprising a spindle A, carrying at its lower end a freely-rotating disk *d;* a spindle-case C, to control the radial thrust of said disk; a flange F secured on said spindle above said disk; a whirl W secured on said spindle above said flange; a series of spherical rollers or balls B, caged in a counterbore *b;* the flange of the spindle resting upon said caged balls and freely rotating thereon, and supporting the vertical thrust of said spindle; the spindle when in position in the rail forming with the wall of the counterbore a cage for said balls, in combination substantially as specified.

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