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C. H. CHAPMAN.

SPINNING SPINDLE AND BEARINGS THEREFOR.

APPLICATION FILED JULY 22, 1904.

Fig. 1.

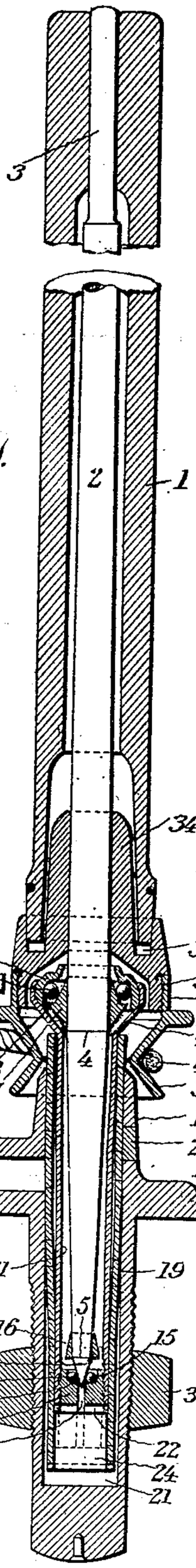


Fig. 6.

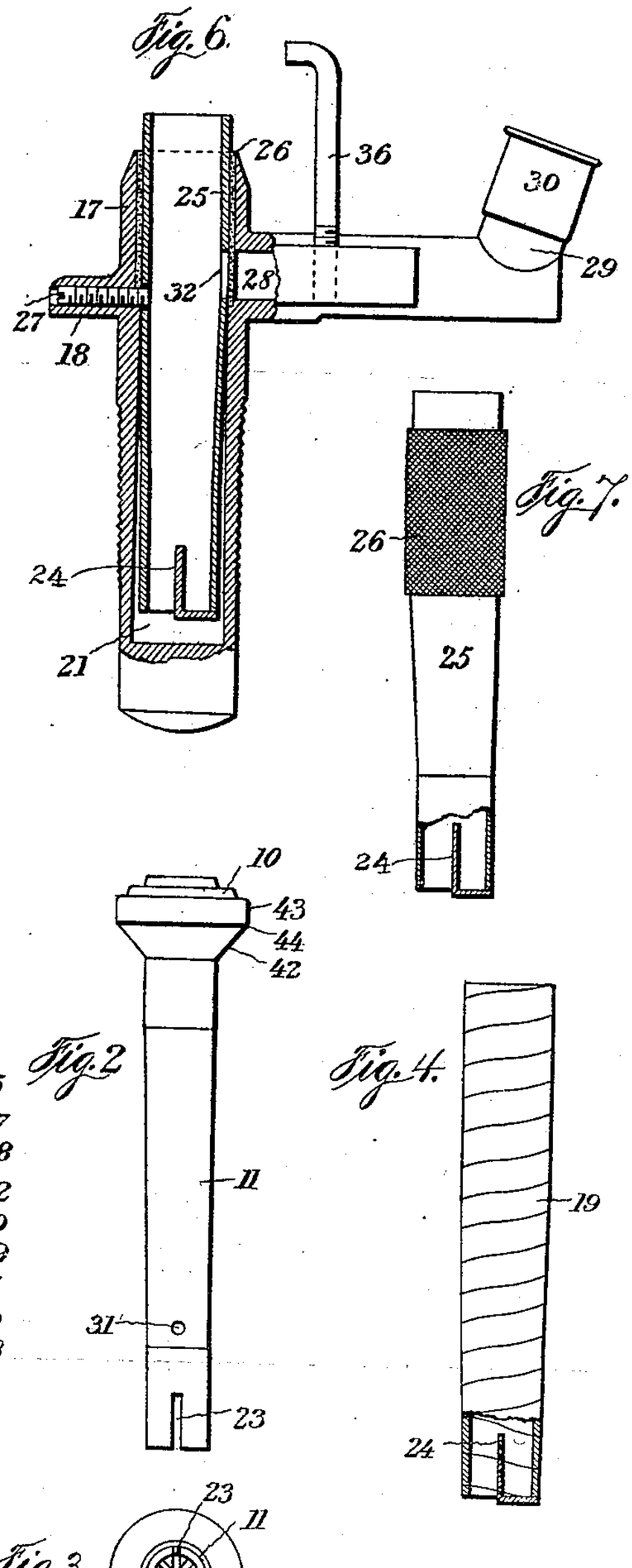


Fig. 7.

Fig. 2.

Fig. 4.

Fig. 3.

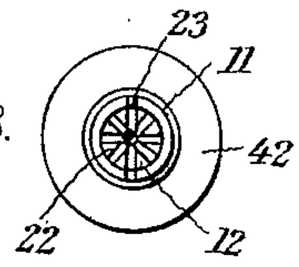
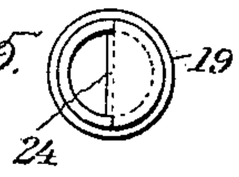


Fig. 5.



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UNITED STATES PATENT OFFICE.

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SPINNING-SPINDLE AND BEARINGS THEREFOR.

No. 841,485. Specification of Letters Patent. Patented Jan. 15, 1907.

Application filed July 22, 1904. Serial No. 217,686.

To all whom it may concern:

Be it known that I, CHARLES H. CHAPMAN, a citizen of the United States, residing at Winchester, in the county of Middlesex and State of Massachusetts, have invented a certain new and useful Improvement in Spinning-Spindles and Bearings Therefor, of which the following is a full, clear, and exact description.

The object of this invention is to provide a spinning-spindle with ball-bearings and with a capacity for longitudinal and lateral adjustments, whereby the spindle may accommodate itself to its load, thus permitting the running of the spindle at high speed, at greatly-reduced expenditure of power, and insuring a good quality of yarn.

The spindle has a cone fixed upon it to support bearing-balls, which are held in place thereon by the bolster ball-cup mounted in the upper end of the bolster. The bolster ball-cup is inclosed within the whirl. The lower end of the spindle is coned and stepped in a ball-bearing step in the bottom of the bolster. The bolster is supported within the bolster-case by means of a longitudinally and laterally movable sleeve, which accommodates itself to the movements of the spindle and bolster and also coöperates with the bolster to prevent it from turning. The bolster-case is provided with means for lubricating parts.

The foregoing and other novel features constitute the invention, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a longitudinal section, the spindle being in elevation. Fig. 2 is an elevation of the bolster. Fig. 3 is a bottom plan view of the bolster. Fig. 4 is an elevation of the supporting-sleeve, the lower end being broken out to show the locking device. Fig. 5 is a bottom plan view of the supporting-sleeve. Fig. 6 is an elevation, partly in longitudinal section, showing a modification of the supporting-sleeve and bolster-case. Fig. 7 is an elevation of the supporting-sleeve of Fig. 6 with its lower end broken out as in Fig. 4.

The bobbin 1 may be of any usual or approved form. The spindle 2 has a cylindrical portion 3 to engage the top of the bobbin, and below this portion the spindle is of gradually-increasing diameter to the full transverse line 4 and thence it is of a rapidly-decreasing diameter to the full line 5, below which it is made as a sharp inverted cone 6, which last is hardened. Fixed to the spindle above the line 4 is a cone 7, having a ledge 8 and receiving bearing-balls 9. The bolster-cup 10 surrounds the spindle and cone and is supported within the bolster 11. The cone, balls, cup, and the upper portion of the bolster constitute a bolster ball-bearing for the spindle. Below the cone 7 the bolster tapers and its lower end is supplied with a step 12, perforated vertically at 13 and provided with a ball-raceway 14, within which are balls 15. Above the line 5 the spindle is provided with a ball-retaining collar 16. The conical end 6 of the spindle is stepped in the perforation 13 and bears and rotates upon the balls. The lower end of the bolster 11 is screw-threaded internally and the step 12 screwed therein, and thus rendered adjustable within the bolster 11. The conical end 6, step 12, balls 15, collar 16, and the lower portion of the bolster 11 constitute a ball-bearing step for the spindle, and by virtue of the fact that the bolster has at its top the described ball-bearing it is herein referred to as a "ball-bearing bolster." That portion of the bolster 11 adjacent to the cone 7 is flared to conform to said cone, and throughout its length the bolster is larger than and consequently out of contact with the spindle. The bolster is supported within a tubular upright portion 17 of the base 18 by means of a sleeve 19, the upper portion of which is cylindrical and the lower portion tapering and fitting the bolster with an easy slip fit at top and bottom and loosely between. This sleeve may be soldered within the upright 17 through a hole therein, as at 20. As shown in Figs. 1 and 4, the sleeve is made of a coil of flat wire or other metal, or, as shown in Figs. 6 and 7, it may be made of sheet metal, as will presently appear more in detail. In either case the sleeve and bolster 11 are suspended within a well 21, depending from the base 18, and clear of the walls of said well below their cylindrical portions, so that the sleeve has sufficient longitudinal and lateral movement to accommodate the unbalanced load of the spindle incident to imperfect bobbins or spindles.

The upright 17, base 18, and well 21 constitute the bolster-case.

The step 12, as shown in detail in Fig. 3, has a number of notches or nicks 22 cut

transversely across its bottom, and the bolster 11 also has a transverse nick 23 cut in it, and the sleeve 19 has applied to it a vertically-arranged locking-clip 24, adapted to engage one of the notches in the step when alined with the nick in the bolster 11 to prevent the adjustment of the step from changing and also these parts from turning under the rotation of the spindle. By making a number of these nicks in the step a very nice adjustment of the bearings with relation to the spindle may be secured.

As shown in Figs. 6 and 7, the inherently inelastic sleeve 25 has applied to it externally a band 26 of yielding material, such as textile fabric—for example, a braided woolen tube—and said sleeve is held in place by a screw 27 in the base entering a hole in the sleeve, said hole being slightly larger than the screw, so that the sleeve, while prevented from turning or moving longitudinally to any considerable extent, still has sufficient freedom to accommodate any lateral movement required.

The base 18 is provided with an oil-reservoir 28, having a feed-tube 29, covered with a cap 30, and this oil-reservoir opens into the bolster-case 21 and supplies it and its contained parts with lubricant. The bolster 11 has an oil-hole 31 to admit lubricant to its interior, and the sleeve 25 has an oil-hole 32 adjacent the oil-reservoir 28. The sleeve 19 being spirally wound, the oil from the reservoir 28 can work through between and around the coils of the sleeve down and into the bolster-case 21.

The outside of the bolster-case is screw-threaded to receive a nut 33 for securing it to the bolster-rail. (Not shown.)

The whirl-base 34 is applied to the spindle in any usual way and is provided with the circular tapering groove 35 to receive the lower end of the bobbin, the latter having no connection with the spindle save at its upper end, as already described. The interior of this whirl-base is counterbored or otherwise recessed to receive the bolster ball-bearing. In practical use it has been found advisable to allow the spindle a little upward movement to enable the whirl to strike a slight blow against the stop-pin 36. This slight blow readily loosens the bobbin from the spindle without requiring it to be pulled off the spindle by force, and hence avoids the liability of the spindle being sprung out of true and also saves time when doffing and also in piecing up broken ends. The whirl-base is provided with an external screw-thread 37 to receive an internal screw-threaded flange 38 on the whirl 39. The screw-thread 37 is a left-hand thread, so that the tendency of the pull of the band is to screw the whirl onto the whirl-base. The whirl is smaller in diameter at the point of pull of the band 40 than the bolster ball-bearing, and hence the whirl must be screwed onto its base from below the bolster ball-bearing. By this construction a contracted cylindrical sleeve-whirl is produced, whereby it is possible to make a bolster ball-bearing of a large size and at the same time to retain a whirl of regular or standard diameter, and hence the spindles of the present invention may be applied to spinning-frames without alteration of the size or speed of the driving-drum.

The stop-pin 36 is screwed into the base and overhangs the horizontal flange 41 of the whirl.

The parts of the invention are preferably assembled as follows: The collar 16 is fastened in any suitable way on the end of the spindle above its cone 6, and the hardened-steel cone 7 is forced down upon the spindle into place. The bearing-balls 9 are arranged in the bolster-cup 10, which is of hardened steel, and the bolster 11 is applied to the spindle, cone, and bolster-cup, and its flared upper end 42 is set about the rim of the bolster-cup. In order to fix the relation of the flared upper end 42 of the bolster 11 and the inserted bolster-cup 10, the said flared upper end is made with a cylindrical flange 43, terminating in a shoulder 44. When the bolster-cup, balls, cone, and bolster are assembled, as previously described, this shoulder serves to aline these parts in order to form a proper ball-bearing. The ledge 8 prevents the balls from being displaced. While the step and its balls are being adjusted the collar 16 prevents the balls from dropping out of place. The step 12 is then screwed into place until it confines the balls against the collar. The spindle is then turned right side up and the step is unscrewed until the balls drop into the raceway 14, and then the step is adjusted until the spindle fits without lateral or vertical movement in its bearings. The interlocking of the clip 24 with the nicks in the step and bolster, as already indicated, enables me to obtain a very nice adjustment of the spindle in its bearings. The vertical perforation 13 in the step permits of the escape of any dirt or sediment. The whirl-base can next be forced upon the spindle, although it is perhaps better practice to force the base upon the spindle before adjusting its bearings; but since the bolster ball-bearing is of greater diameter than the smallest diameter of the whirl, of course the whirl must be placed in position after the spindle and its bearings are assembled and adjusted. The sleeve, Fig. 4 or Fig. 7, is then placed in position and its clip interlocked with the step.

When an unbalanced load is placed upon the spindle or when a spindle is slightly imperfect, the greater part of the load being above the center of the band-pull, the greater part of the load predominates over the lower and short end of the spindle and

the spring-sleeve takes on the gyration and the upper end of the spindle and bobbin runs quite steadily. Another important feature in carrying an unbalanced load is to keep a perfect adjustment of the lower end of the spindle in the step-bearing, and this my invention entirely effects, inasmuch as the tension caused by the band-pull acts to force the step-bearing into perfect adjustment on account of the contact with the balls 9 of the downward and outward taper of the bolster-cone 7. The tendency of the band-pull is to cause the cone to put a downward pressure sufficient to adjust the spindle in the step-bearing when the adjustment of the bolster-bearing and step-bearing are quite loose. Another important feature in my invention is that the lubrication is perfect. The reservoir is filled with oil, which fills the lower part of the base and bolster with oil, which is carried up on the spindle by the centrifugal force on account of its upwardly-increasing diameter and is spun out and thrown off at the extended ledge on the bolster-cone directly onto the bolster-balls 9, keeping them continually lubricated. This movement of the oil is facilitated by the upwardly-flaring construction of the cone below the ledge.

The spindle, whirl, cone, and collar are supported and revolve in the bolster-bearing and step-bearing, having no other support or contact.

I wish it to be distinctly understood that I do not limit my invention to the specific form of construction shown and described, since the details of construction may be modified without departing from the spirit of my invention, and, moreover, the invention is applicable to a bolster and step bearing of the ordinary journal type.

What I claim is—

1. A spindle, a bolster having a ball-bearing at its top and a ball-bearing step at its bottom to receive said spindle, and a sleeve in which said bolster is supported, and mounted to move laterally and vertically with the spindle.

2. A spindle, a bolster having a ball-bearing at its top and a ball-bearing step at its bottom to receive the spindle, and a sleeve in which said bolster is supported, and mounted to move laterally and vertically with the spindle, said sleeve engaging the bolster so as to prevent it from rotating with the spindle.

3. A spindle, having a ball-bearing bolster and a ball-bearing step therein, a contracted cylindrical sleeve-whirl extending below the bolster ball-bearing and encircling the bolster, the spindle, bearings, bolster and the sleeve-whirl all constructed to move together laterally and vertically, and means to limit their vertical movement.

4. A spindle, having a ball-bearing bolster and a ball-bearing step in said bolster, and a supporting-sleeve therefor, mounted to have a limited movement both laterally and vertically with the spindle, and means for adjusting the bolster and step bearings.

5. A spindle, having a ball-bearing bolster, a ball-bearing step in said bolster, a supporting-sleeve therefor, having a limited movement both laterally and vertically with the spindle, and means for adjusting the bolster and step bearings and positively locking the adjustment.

6. A spindle, having a contracted cylindrical sleeve-whirl, a bolster in which said spindle is stepped, and having a ball-bearing inclosed by said sleeve-whirl, and including a cone on the spindle having a laterally-extending ledge adapted both to retain and lubricate the balls and to limit the upward flow of oil due to the centrifugal force of the spindle.

7. A spindle, a bolster, a ball-bearing step adjustably arranged in said bolster and supporting the lower end of the spindle, and a collar on the lower end of the spindle to facilitate the assembling of the step-bearing.

8. A bolster, a bolster-case, a spindle, a spindle-step in said bolster, and a spirally-wound sleeve suspended within said bolster-case and having its lower end combined with and adapted to receive and yieldingly hold the bolster and its contained spindle.

9. A bolster, a bolster-case, a spindle, a spindle-step in said bolster, and a spirally-wound spring-sleeve suspended within said bolster-case and capable of both vertical and lateral yielding movements, combined with and adapted to receive and yieldingly sustain the bolster and its contained spindle.

10. A spindle, a bolster, a bolster-case, ball-bearings adjustably arranged within said bolster, a surrounding sleeve in which the bolster is supported and adapted to move vertically up and down, said sleeve yieldingly held in the bolster-case, all combined substantially as described.

11. A spindle, having a contracted cylindrical sleeve-whirl, a ball-bearing bolster and a ball-bearing step in said bolster, and a bolster-supporting sleeve having a limited movement laterally and vertically with the spindle.

12. A sleeve-whirl, and a spindle, a ball-bearing bolster and a ball-bearing step in said bolster, and a sleeve supporting said bolster and adapted to move vertically and laterally, and means to limit the upward movement of the spindle.

13. A spindle, a bolster in which the spindle is supported, a bolster-case, and a bolster-support secured to the bolster-case and also engaging the bolster at its upper end and free from contact with the bolster-case at its lower end.

14. A spindle, a bolster in which the spindle is supported, a bolster-case, and a bolster-support secured to the bolster-case and also

engaging the bolster at its upper end and at its lower end and free from contact with the bolster-case at its lower end.

15. A spindle, a bolster in which it is supported, a bolster-case, and a longitudinally-yielding sleeve surrounding the bolster and engaging the bolster-case at its upper end and clear of the walls of the bolster-case at its lower end.

16. A spindle, a bolster in which it is supported, a bolster-case, and a longitudinally-yielding sleeve surrounding the bolster and engaging the bolster-case at its upper end and clear of the walls of the bolster-case at its lower end and also engaging the bolster at its lower end.

17. A spindle, having a contracted cylindrical sleeve-whirl, a ball-bearing bolster whose upper end is inclosed by said sleeve-whirl, a sleeve supported at its upper end and free at its lower end and engaging the bolster at both ends, whereby the bolster is adapted to move laterally with its contained parts and is restrained from rotating with the spindle.

18. The bolster-base, provided with a flexible spring-sleeve, combined with a spindle, a ball-bearing bolster and a ball-bearing step therein.

19. The bolster-base, provided with a spirally wound spring-sleeve, a ball-bearing bolster supported in said sleeve, and a step-bearing in said bolster, combined with a spindle.

20. A spindle, a bolster-base, provided with a laterally and longitudinally movable flexible sleeve, a ball-bearing bolster, and a step-bearing in said bolster, said bolster mounted in and supported by said sleeve, and means for preventing the bolster from rotating.

21. A spindle, a bolster-base, provided with a laterally and longitudinally movable flexible suspended sleeve, a bolster in said sleeve, and means to positively restrain said bolster from rotating, said bolster having a limited vertical movement.

22. A spindle, a cone fixed thereon and having an upwardly-flaring oil-feeding ledge, a bolster surrounding said spindle and cone loosely, a bolster-cup fixed to said bolster, and bearing-balls supported upon the cone above the ledge and interposed between the cone and the bolster-cup.

23. A spindle, having a conical end, a collar fixed above such end, a bolster for the spindle, a step fixed in the end of said bolster and adapted to receive the conical end of the spindle, and bearing-balls arranged in said step and surrounding said conical end.

24. A spindle, a bolster-case, a sleeve suspended within said case, a bolster held within said sleeve against rotation and having a flaring upper end, a bolster-cup secured in said flaring upper end, a cone fixed on the spindle, bearing-balls interposed between the cone and the bolster-cup, a step in the lower end of said bolster, and bearing-balls in said step and surrounding the lower end of the spindle.

25. A spindle, a bolster-case, a sleeve suspended within said case, a bolster held within said sleeve and having a flaring upper end, a bolster-cup secured in said flaring upper end, a cone fixed on the spindle, bearing-balls interposed between the cone and the bolster-cup, a step in the lower end of said bolster, bearing-balls in said step and surrounding the lower end of the spindle, and means applied to said sleeve to positively restrain the step and bolster from rotating.

26. A spindle, a bolster therefor having a transverse nick in its bottom, a ball-bearing step in the bottom of said bolster provided with series of transverse nicks, a sleeve supporting said bolster, and a locking-clip fixed to said sleeve and adapted to engage any desired one of the nicks in the step and the nick in the bolster to prevent any change of the adjustment of the step or rotation of the bolster.

In testimony whereof I have hereunto set my hand this 19th day of July, A. D. 1904.

CHARLES H. CHAPMAN.

Witnesses:

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