Oct. 26, 1926. 1,604,929

C. F. MERRILL

SPINNING RING AND TRAVELER

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Fig.1.

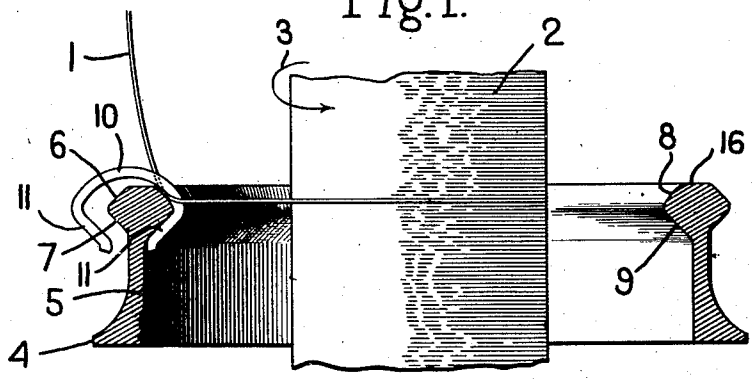


Fig.2.

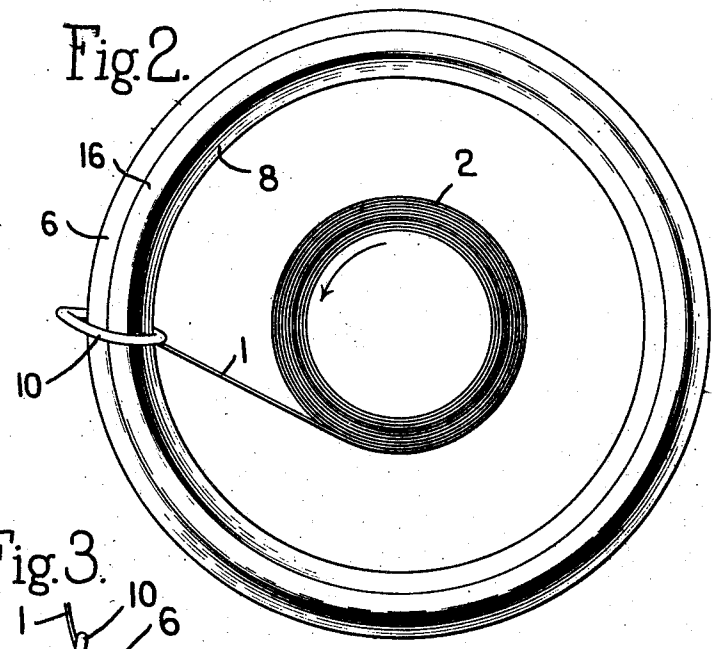


Fig.3.

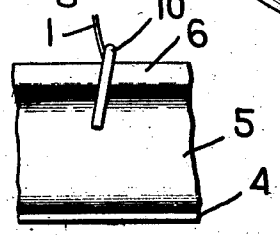


Fig.4. Fig.5.

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Fig. 6.

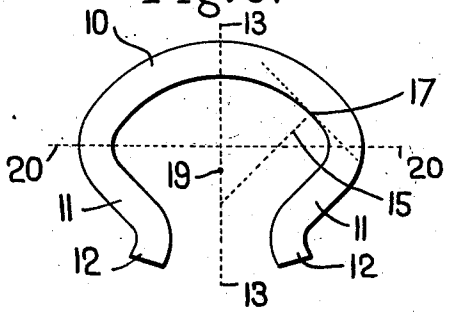


Fig. 7.

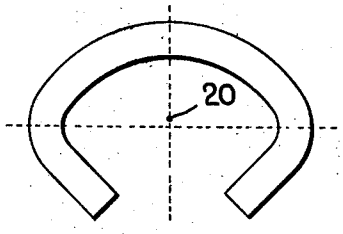


Fig. 8.

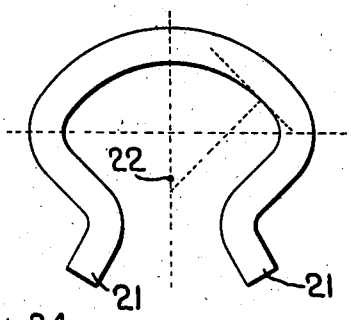
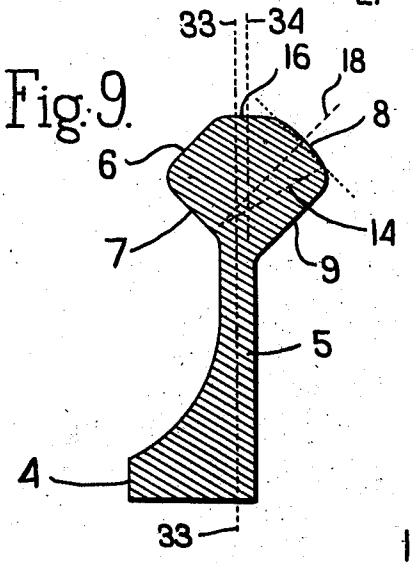


Fig. 9.



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Fig. 10.

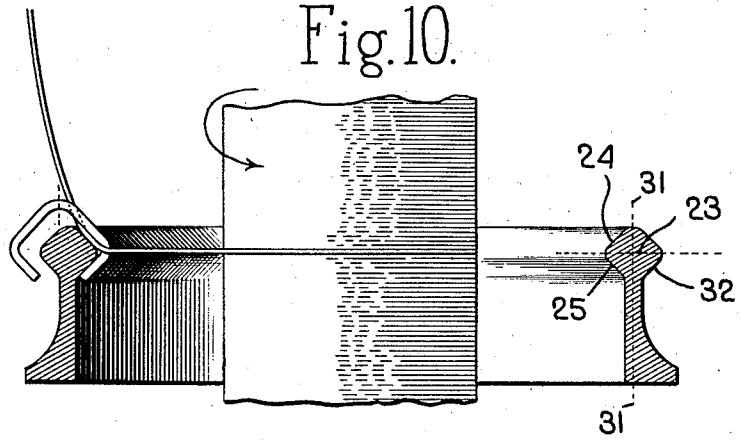


Fig. 11.

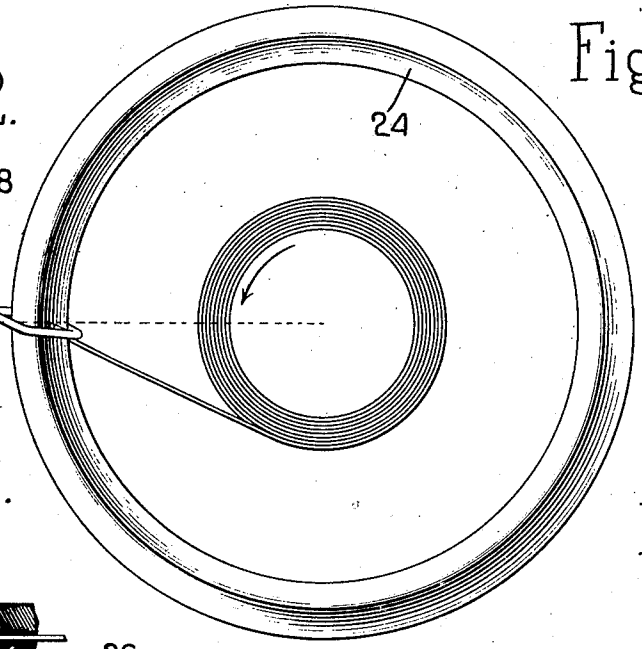


Fig. 12.

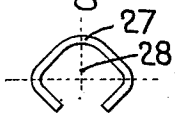


Fig. 13.

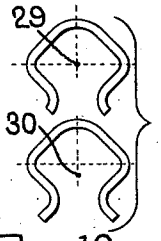


Fig. 14.

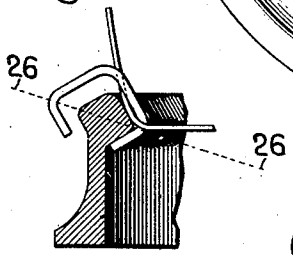


Fig. 15.

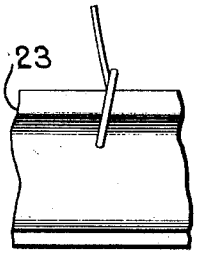
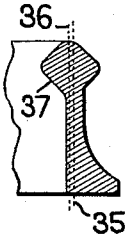


Fig. 16.



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UNITED STATES PATENT OFFICE.

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SPINNING RING AND TRAVELER.

Application filed February 10, 1926 Serial No. 87,382.

This invention relates to the cooperating ring and traveler elements of ring spinning mechanism long and extensively employed in the spinning and twisting of yarns. To this type of spinning mechanism a vast amount of engineering ability and inventive talent has been devoted, but it is still imperfect in operation, subject to uneven, and often rapidly destructive, wear of the contact surfaces of the cooperating elements, and hence limited as to the uniformity, continuity and fineness of the product. Excessive wear necessitates frequent replacement of the travelers, and less frequent replacement of worn-out rings, which creates expense in maintaining the spinning mechanism in proper operating order. Furthermore, in the more advanced stages of wear of one or both elements, the movement of the traveler on the ring lacks the even, steady and continuous qualities which are desired and necessary during the spinning operation. Vibration of the traveler with respect to its normal plane when in motion at spinning speed, and irregular or jerky forward motion in its progress around the ring, impart strains to the material being spun or twisted which are detrimental to its quality, and which, in the case of weak or delicate yarns, may cause frequent breakage. The fineness of the yarn which can be commercially produced by the ring-spinning process is limited, to a considerable extent, by the strains imposed upon it in moving the traveler in its path around the ring. A cooperating relation between the ring and traveler elements which will reduce the average strain, and avoid individual or intermittent strains of excessive magnitude, will permit the production of finer yarns by this process, which is an object commercially desirable.

Quite universally in practice rings having I or T shaped sections, and a C shaped traveler enclosing the upper horizontal flange of the ring, are employed in the textile processes of spinning and twisting.

The irregularities of traveler movement which develop as the result of continued cooperation of these two elements have two major causes: (1) sliding metallic contact, at high rates of speed, of the bearing area of the traveler against the under and inner surfaces of the periphery of the ring flange, usually without perceptible lubrication, thus inducing abrasion of the contact surfaces; (2), an unstable position assumed by the traveler, as a resultant of a number of different forces to which its peculiar form is subjected in its travel, with reference to its bearing area against the ring. The resultant of the several forces usually causes the traveler to stand oblique or inclined with respect to the radius of the ring or its path of revolution, and also oblique or inclined with respect to the vertical plane of the radius of revolution, and also oblique or inclined with respect to the vertical axis of revolution. Furthermore, as the ordinary traveler usually has its main bearing on the ring between one of the horns of the traveler and the under and inner surfaces of the periphery of the ring-flange, while the point where the yarn passes about the traveler, at which point the forces imparted to the traveler are consequently exerted, is located not only above the bearing area of the traveler and ring, but even above the ring itself, an unbalanced or unstable relation exists, tending toward uneven motion or chattering whenever there is any slight inequality in the material or surface of the portion of the ring traversed by the traveler, or other causes which tend to increase or lessen the frictional resistance to motion at different positions in the progress of the traveler around the ring.

The object of the present invention is to provide a novel cooperating construction of ring and traveler wherein the various elements and forces determining the movement of the traveler on the ring are correlated so as to insure a more even, smooth and continuous movement of the traveler on the ring during the spinning operation than usually obtains when employing the ordinary forms of these elements.

The object of the invention is further to provide a construction in which the inner periphery of the ring presents an upper bearing surface and a lower bearing surface with these surfaces converging inwardly and therefore toward each other, and in which the upper of these surfaces is preferably slightly convex and a surface of revolution about the central vertical axis of the ring and in which the traveler is so shaped that it conforms to both of these surfaces, the in-

ner horn riding on the lower bearing surface, while the inner side of the traveler runs opposite the upper surface with the yarn acting as a separating bearing medium between them.

The object of the invention is further to provide a construction in which the yarn where it passes around the traveler is forced to take and maintain a position between the traveler and the upper inner bearing surface of the ring so that the yarn forms a separating bearing medium between the traveler and the ring.

The object of the invention is further to provide a construction which will permit the use of any desired angle of the upper and lower bearing surfaces with respect to their common vertical axis, in order to regulate the position, on the upper bearing surface, at which the yarn passes between the traveler and said surface.

The object of the invention is further to provide a construction which will permit, by proper selection of the angle of the upper and lower bearing surfaces with respect to their common vertical axis, by a proper convexity of the upper bearing surface, and by suitably positioning the center of gravity of the traveler, the concentration of pressure forces upon the yarn at its point of passage between the traveler and the bearing surface of the ring, and the diminution of pressure between contacting metallic surfaces of the traveler and ring.

The object of the invention is further to provide a construction in which the traveler is symmetrical with respect to the axis extending in its plane midway between its horns and in which the bow section adjoining each horn and preferably the entire bow is of arcuate shape and of a curvature conforming to the convexity of the upper bearing surface of the ring and in which the traveler otherwise is generally of a square figure.

The object of the invention is further to provide a construction which will permit the positioning of the center of gravity of the traveler, for the purpose of coordinating its centrifugal force with other forces acting upon it, by extending its horns.

The object of the invention is further to provide a construction in which the yarn will automatically be maintained between the traveler and the upper inner bearing surface of the ring to form a separating bearing medium.

These and other objects and features of the invention will appear more fully from the accompanying description and drawings and will be particularly pointed out in the claims.

Since the operation of ring spinning and the various mechanisms employed for performing this operation are well-known and familiar to those skilled in the art, and since the present invention relates to the ring and traveler elements, it is only necessary here to illustrate and describe the features of construction and their operation with which the present invention is particularly concerned.

In the drawings:

Fig. 1 represents a detail partially in vertical cross section and much enlarged showing a portion of a bobbin, a ring, and a traveler embodying a preferred form of the present invention and in the relation existing when in a spinning frame.

Fig. 2 is a top plan view of the construction shown in Fig. 1.

Fig. 3 is a view in elevation of a portion of the ring and the traveler as shown in Figs. 1 and 2.

Fig. 4 is an enlarged view in cross section showing one form of cross section of traveler.

Fig. 5 is a view similar to Fig. 4 showing another form of cross section of traveler.

Fig. 6 is a front elevation of a form of traveler embodying the invention.

Fig. 7 is a view similar to Fig. 6 of another form of traveler.

Fig. 8 is a view similar to Fig. 6 of a third form of traveler.

Fig. 9 is a view in enlarged cross section of a form of ring embodying the invention.

Fig. 10 is a view similar to Fig. 1 showing a slightly different form of construction.

Fig. 11 is a plan view of the construction shown in Fig. 10.

Fig. 12 is a front elevation of a slightly different form of traveler from that shown in Figs. 10 and 11.

Fig. 13 is a front elevation of two forms of traveler similar to Fig. 12, but with horns of different lengths.

Fig. 14 is a detail in vertical cross section showing a portion of the ring construction.

Fig. 15 is a detail in side elevation looking toward the left of Fig. 11.

Fig. 16 is a detail in vertical cross section showing another variation of the ring construction.

In the operation of ring spinning, the yarn passes from the draft rolls through a guide eye and thence downwardly through the traveler and to the bobbin or other yarn carrier upon which it is wound. A relative vertical movement is given to the ring and yarn carrier to secure the traverse of the yarn lengthwise of the yarn carrier. So far as the present invention is concerned, it is immaterial whether the ring or the yarn carrier is thus moved while the other remains stationary vertically.

In the construction illustrated, the yarn 1 is shown passing down through and around the traveler mounted on the ring, which is held against rotation, and extend-

ing from the traveler horizontally and being wound upon the bobbin 2, which is rotating in the direction of the arrow 3.

The present invention will be best understood by having in mind the nature and direction of the principal forces acting to effect the position and movement of the traveler during the spinning operation. The traveler moves at a very high rate of speed, and although it is quite small, it nevertheless is of substantial weight. Consequently it is subject to a strong centrifugal force which holds it in contact with the inner periphery of the ring throughout its revolution. This centrifugal force, of course, acts radially of the ring. The force of gravity also acts upon the traveler depending upon its proportions, but always tending to rock the outer side of the traveler downward. The movement of the traveler along the ring is imparted to it entirely by the yarn. The movement of the yarn in turn is caused by the rotation of the bobbin or yarn carrier, which is not only drawing the yarn through the traveler, but is also carrying the run of yarn extending from the bobbin up to the thread eye bodily around the axis of rotation. This affects the position and movement of the traveler in several ways. The yarn between the traveler and the guide eye balloons out more or less, depending upon the speed of rotation, the weight and quality of the yarn and other factors, so that the yarn approaches the traveler at an angle determined thereby. The yarn as it passes around the traveler is fed downwardly at one face of the traveler by the spinning mechanism and is pulled away from the traveler at the other face by the rotating yarn carrier and the resulting difference in tension on the yarn between the portion passing to, and the portion passing from, the traveler tends also to twist the plane of the traveler.

In the preferred construction illustrated in Figs. 1 to 9, as an embodiment of the present invention, the base 4 and web 5 of the ring may be of any suitable shape. The upper portion or flange of the ring or the portion traversed by the traveler is shaped in a general way to correspond with the shape of the traveler. The outer upper peripheral surface 6 and the outer lower peripheral surface 7 are of little importance because these surfaces are not engaged by the traveler when in operation. It is with the inner upper peripheral surface 8 and the inner lower peripheral surface 9, over which surfaces the traveler rides when in operation, that the present invention is particularly concerned.

The traveler itself is preferably formed of the usual stock of which travelers are made, either round in cross section, as shown in Fig. 4, or flat in cross section, as shown in Fig. 5. In the preferred forms of construction illustrated in Figs. 1–9, inclusive, the traveler, see Fig. 6, for example, presents a bow section 10 of substantially circular arcuate form, the sides of which merge by smooth curves into the horns 11. In Fig. 6, the horns terminate in outwardly curved extensions 12. The traveler is symmetrical with respect to the axis 13 extending in its plane midway between the horns and the horns preferably extend at an angle of forty-five degrees to this axis.

The advantages of the present invention are not to be limited to a symmetrical traveler because only one side and one horn of the traveler perform the yarn guiding and the ring bearing functions, but it is very desirable that the traveler should be symmetrical because the operatives will not be bothered with examining the travelers, which are of very small size, to see which way they should be placed upon the ring.

The inner periphery of the ring flange over which the traveler moves, as already pointed out, comprises the lower bearing surface 9 and the upper bearing surface 8, which converge inwardly and therefore toward each other. The lower surface 9 is preferably frustro-conical, while the upper surface 8 is slightly convex and formed as a surface of revolution about the central vertical axis of the ring. The curvature of this convex surface 8 in a radial plane of the ring is substantially concentric to the arcuate curve of the bow section of the traveler. Preferably the radius of curvature 14 of this surface, as shown in Fig. 9, is less than the radius of curvature 15 of the bow section of the traveler, as shown in Fig. 6, by the estimated diameter of an average yarn to be used in connection therewith.

The inner peripheral bearing surfaces of the ring thus present the required bearing surfaces and also, which is very important, lend themselves readily to the mechanical operations which are necessary in the formation, polishing and finishing thereof to secure the high degree of hardness and smoothness that is necessary.

The traveler, as usual, is made somewhat larger in cross section than the ring flange, as illustrated, and the space between the horns is such that the traveler may readily be snapped over the flange of the ring in the usual manner. To assist in this operation the tip 16 of the ring flange may be slabbed off as shown. The weight and size of the traveler will otherwise vary in accordance with the weight and quality of the yarn, or as determined by the usual considerations in ring spinning. The traveler and the ring flange are curved and rounded to avoid sharp corners, but the inner horn and the adjacent bow section, and preferably each horn and its adjacent bow section, present

the same angular relation, as do the inner peripheral bearing surfaces 8 and 9 of the ring. In the construction illustrated, it will be seen that the horn 11 and the surface 9 both extend at an angle of forty-five degrees to the vertical. The yarn is assumed normally to pass around the traveler at the point 17 and the bow section is so related to the horn that a tangent to the curve of the bow at this point also extends at an angle of forty-five degrees to the vertical. So also the curve of the surface 8 is so located that a tangent to this curve on the radial line 18, which extends parallel with the surface 9 and at the same distance therefrom as the radial line 15 is from the inner surface of the horn, makes an angle of forty-five degrees with the vertical.

The weight and size of the traveler are correlated to the forces acting upon it during its revolution, in this invention, so that as a result the horn 11 rides on the lower inner bearing surface 9, while the adjacent section of the bow 10 extends substantially equidistant from, or in a general way parallel with, the upper inner bearing surface 8. The horn has an extended bearing throughout its length upon the surface 9, any minute discontinuity of contact owing to the slight tipping of the traveler carrying the horn out of the radial plane being compensated by wear.

Owing to the position and relation of the upper inner bearing surface 8 of the ring and the opposed side or section of the bow 10, the yarn as it is drawn through and about the traveler in the spinning operation pulls down toward the angle between the bow section and the horn and runs normally through the traveler at about the point 17 and between the bow section of the traveler and the bearing surface 8 of the ring. There is involved in this certain very important features of the invention; first, there are two bearing areas between the traveler and the ring substantially symmetrically disposed with respect to the horizontal axis or the plane in which the run of yarn from the traveler to the bobbin moves; second, the yarn constantly runs between the traveler and the upper surface 8 of the ring thus forming a bearing medium which prevents actual metallic contact of the traveler against this surface; third, the pull exerted by the yarn on the traveler is brought down near the center of gravity of the traveler or where it will have little tendency to cause the traveler to rock or chatter and, fourth, owing to the curvature and relation of the bow section of the traveler and the convex surface 8 of the ring, any temporary change in the running conditions tending to cause the yarn to shift its position away from its normal position on the traveler, such as the point 17, is automatically offset by the tendency of the curvature of the traveler and of the cooperating surface 8 to force the yarn back to this normal position.

Among the forces acting to determine the position of the traveler, as already pointed out, is gravity. Hence the weight of the traveler itself and the disposition of this weight with respect to the center of gravity of the traveler are of importance. In Figs. 1, 2, 3, and 6, the center of gravity 19 is shown with respect to the axes 13 and 20. If now the yarn extensions 12 are omitted, as in the form of traveler shown in Fig. 7, the center of gravity 20 is shifted upward, while if the yarn extensions are prolonged, as shown at 21, in the form of traveler illustrated in Fig. 8, the center of gravity 22 is below the position shown in Fig. 6. Consequently the center of gravity may be shifted materially by varying the length of the horns and by bending them outwardly so as not to interfere with the operation of the traveler.

The construction shown in Figs. 10, 11 and 15 embodies many of the features already described, but in this case the flange 23 of the ring is shown as of generally square cross section with the traveler having a corresponding shape. Consequently the upper inner bearing surface 24 of the ring is frustro-conical or of the same shape as the lower bearing surface 25.

So long as the conditions obtaining and the forces acting are such as to keep the yarn running between the side bow section of the traveler and the upper inner bearing surface 24 of the ring, this construction is satisfactory. Under some conditions, depending upon the quality and weight of the yarn and size and weight of the traveler corresponding, the required position of the yarn between the traveler and the upper inner bearing surface of the ring may be maintained by forming the flange of the ring at a greater or less angle to the horizontal, an instance of which is shown in Fig. 14, where it will be seen that the transverse axis of the ring has been tipped into the position shown in 26. This principle of construction may also be employed regardless of the particular shape of the traveler and cooperating bearing surfaces.

In either form of the invention, therefore, the variation in the angular position of the bearing surfaces of the ring with respect to the vertical axes in coordination with the other forces acting upon the traveler assist in regulating the position on the inner upper bearing surface of the ring at which the yarn passes between the traveler and the said surface.

The substantially square type of traveler may also be shaped to vary the conditions obtaining. In Fig. 12 the central portion

27 of the bow section is shown as of a flatter curvature than in Fig. 10. In Fig. 12 the horns are not extended, and the center of gravity is consequently at the point 28, while in Fig. 13 the center of gravity is either at 29 or 30, as determined by the length of the horn extensions. Thus it is possible to regulate the amount of pressure upon the yarn at its point of passage between the traveler and the bearing surface of the ring with relation to the pressure between the contacting metallic surfaces of the traveler horn and ring.

In the construction illustrated in Fig. 10, the central vertical axis of the web of the ring coincides on the line 31 so that the inner lower bearing surface 25 is of the same width as the outer lower peripheral surface 32. The width of the important inner bearing surface may be increased by shifting the web radially with respect to the flange. This has been done in the form shown in Fig. 1 and Fig. 9 where, without changing the angle of the flange from the vertical, the central vertical axis 33 of the web is radially beyond the vertical axis 34 of the flange, thus giving a wide inner lower bearing surface 9. The same thing is illustrated in Fig. 16, where the vertical axis 35 of the web is separated from the vertical axis 36 of the flange, giving a wide inner lower bearing surface 37.

The construction, especially in the preferred forms illustrated, both of traveler and of ring, is readily and efficiently manufactured. Not only are the surfaces of the ring, in particular the bearing surfaces, readily formed, finished and polished, but the upward slope of the lower bearing surface at a substantial angle, preferably about 45°, to the web of the ring provides ample clearance for a cutting tool in the formation of the ring.

This application is a continuation of my application Serial No. 64,548, filed October 24, 1925, as to the subject matter common thereto.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper and lower inwardly converging bearing surfaces, the upper surface being convex and a traveler shaped so that, when it is running with its inner horn riding on the said lower bearing surface, the inner side of the adjacent bow section will extend substantially equidistant from, and close to, said upper bearing surface with the yarn running, and forming a bearing, therebetween.

2. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper convex and lower frustro-conical inwardly converging bearing surfaces and a traveler shaped so that, when it is running with its inner horn riding on the said lower bearing surface, the inner side of the adjacent bow section will extend substantially equidistant from, and close to, said upper bearing surface with the yarn running, and forming a bearing, therebetween.

3. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper and lower inwardly converging bearing surfaces, the upper surface being convex, and a traveler having its inner horn and the adjacent bow section presenting the same angular relation as the said surfaces, the draft on the yarn as it is wound and the centrifugal force generated by the revolution of the ring acting to cause the traveler to run with its inner horn riding on the said lower bearing surface of the ring and with the inner side of the adjacent bow section extending substantially equidistant from and close to said upper bearing surface with the yarn running, and forming a bearing, therebetween.

4. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper and lower inwardly converging bearing surfaces, the upper surface being convex, and a traveler having its inner horn and the adjacent bow section presenting the same angular relation as the said surfaces, in which the weight, size and proportions of the traveler are correlated to the forces acting on the traveler during its revolution to cause the traveler to run with its inner horn riding on the said lower bearing surface of the ring and with the inner side of the adjacent bow section extending substantially equidistant from and close to said upper bearing surface with the yarn running, and forming a bearing, therebetween.

5. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper and lower inwardly converging bearing surfaces, the upper surface being convex, and a symmetrical traveler having each horn and adjacent bow section presenting the same angular relation as the said surfaces, in which the weight and size of the traveler are correlated to the forces acting on the traveler during its revolution to cause the traveler to run with its inner horn riding on the said lower bearing surface of the ring and with the inner side of the adjacent bow section extending substantially equidistant from and close to said upper bearing surface with the yarn running, and forming a bearing, therebetween.

6. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper convex and lower frustro-conical inwardly converging bearing sur-

faces and a symmetrical traveler having each horn and adjacent bow section presenting the same angular relation as the said surfaces, in which the weight and size of the traveler are correlated to the forces acting on the traveler during its revolution to cause the traveler to run with its inner horn riding on the said lower bearing surface of the ring and with the inner side of the adjacent bow section extending substantially equidistant from and close to said upper bearing surface with the yarn running, and forming a bearing, therebetween.

7. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper and lower inwardly converging bearing surfaces and a traveler having a horn and adjacent bow section presenting the same angular relation as the said surfaces, and in which the angular relation of the said bearing surfaces to the vertical, the position of the center of gravity of the traveler and the other forces acting on the traveler during its revolution are correlated to cause the traveler to run with its inner horn riding on the said lower bearing surface of the ring, with the inner side of the adjacent bow section extending substantially equidistant from and close to said upper bearing surface, and with the yarn running at a predetermined point, and forming a separating bearing medium between, the traveler and the ring.

8. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper and lower inwardly converging bearing surfaces and a traveler having a horn and adjacent bow section presenting the same angular relation as the said surfaces, and in which the angular relation of the said bearing surfaces to the vertical, and the other forces acting on the traveler during its revolution are correlated to cause the yarn to run and form a separating bearing medium between the traveler and the upper bearing surface at a predetermined point.

9. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper and lower inwardly converging bearing surfaces and a traveler having a horn and adjacent bow section presenting the same angular relation as the said surfaces, and in which the angular relation of the said bearing surfaces to the vertical, the position of the center of gravity of the traveler and the other forces acting on the traveler during its revolution are correlated to cause the traveler to run with its inner horn riding on the said lower bearing surface of the ring, with the inner side of the adjacent bow section extending substantially equidistant from and close to said upper bearing surface, with the yarn running at a predetermined point, and forming a separating bearing medium, between the traveler side and the ring, and with the pressure exerted by the traveler upon the said yarn and by the traveler upon the said lower bearing surface distributed in a predetermined ratio.

10. A spinning mechanism comprising a spinning ring, the inner periphery of which comprises upper and lower inwardly converging bearing surfaces, and a traveler having a bow and horns, the traveler when mounted radially on the ring having one of its horns extending substantially parallel to and in engagement with the lower bearing surface and having the inner side of its adjacent bow section and the opposed element of the upper bearing surface substantially concentrically arcuate.

11. A spinning mechanism comprising the construction defined in claim 10 in which the said upper and lower bearing surfaces of the ring are surfaces of revolution about the central, vertical axis of the ring.

12. A spinning mechanism comprising the construction defined in claim 10 in which the said upper and lower bearing surfaces of the ring are surfaces of revolution about the central, vertical axis of the ring, and in which the lower surface is frustro-conical and the upper surface formed by a convex circular arc.

13. A spinning mechanism comprising the construction defined in claim 10 in which the said upper and lower bearing surfaces of the ring are surfaces of revolution about the central, vertical axis of the ring, in which the lower surface is frustro-conical and the upper surface formed by a convex circular arc, and in which a tangent to the said circular arc at the point where the yarn normally bears is at substantially the same angle to the horizontal as the angle between an element of the lower frustro-conical surface and the horizontal.

In testimony whereof, I have signed my name to this specification.

CHARLES F. MERRILL.