C. S. LOCKWOOD.

PROCESS OF MAKING HELICAL ROLLS.

APPLICATION FILED SEPT. 25, 1912.

1,064,975. Patented June 17, 1913.

Fig. 1.

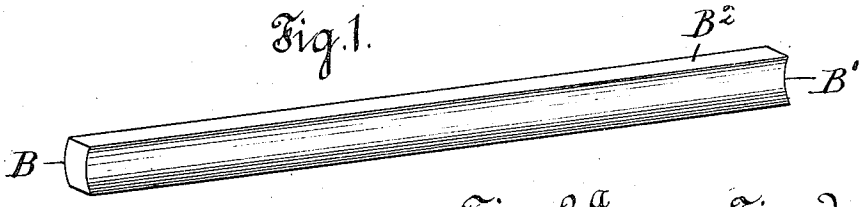


Fig. 2ª

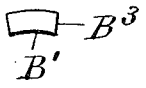


Fig. 2.

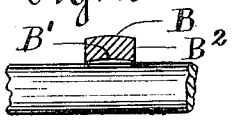
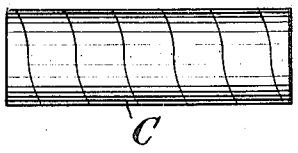


Fig. 3.



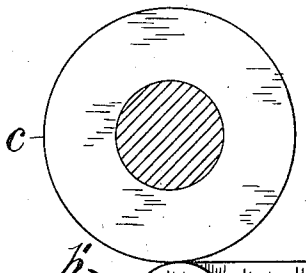
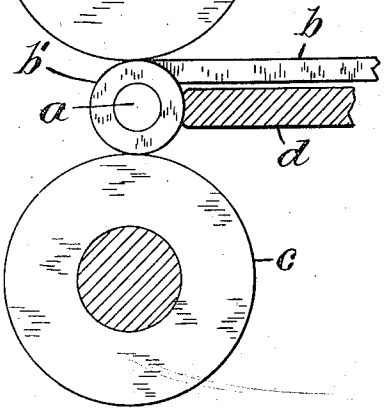


Fig. 5.



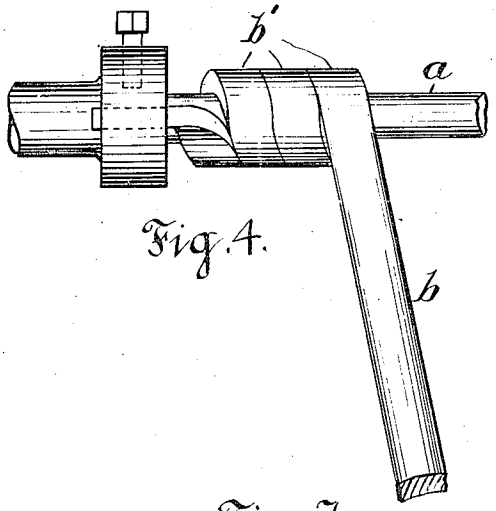


Fig. 4.

Fig. 7.

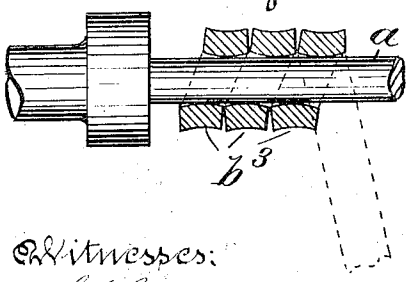
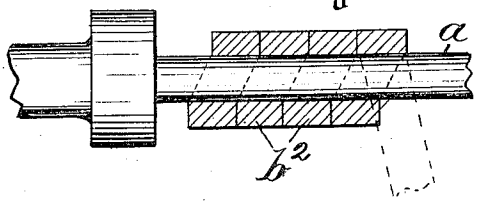


Fig. 6.



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Thomas S. Crane, Atty.

UNITED STATES PATENT OFFICE.

CHARLES S. LOCKWOOD, OF NEWARK, NEW JERSEY, ASSIGNOR TO HYATT ROLLER BEARING COMPANY, OF HARRISON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PROCESS OF MAKING HELICAL ROLLS.

1,064,975. Specification of Letters Patent. Patented June 17, 1913.

Application filed September 25, 1912. Serial No. 722,186.

To all whom it may concern:

Be it known that I, CHARLES S. LOCKWOOD, a citizen of the United States, residing at 289 Market street, Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Processes of Making Helical Rolls, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of the present invention is to obviate the objections to the use of rectangular or flat strips, in the formation of rolls by winding flat strips upon a mandrel, and such object is attained by making a strip of arc-shaped section and applying the concave side of such strip to the mandrel in the winding operation.

The objections to the use of a flat strip will be fully described herein, and they have become especially serious in the increasing demand for strong spirally wound rolls to resist heavy loads, thus necessitating the use of strips much thicker than those heretofore employed. Strips exceeding in thickness one-third the bore of the roll and often equaling one-half of such bore are now employed in the winding of helical rolls to sustain heavy loads, such as are imposed upon them in automobile bearings and under similar conditions of comparatively recent origin. It is common to use strips that are wide in proportion to the diameter of the roll, so as to increase the bearing surface of each coil, and such a strip therefore makes a considerable angle to the axis of the roll. Whatever the thickness of the strip its winding upon the mandrel at a considerable angle tends to compress the inner side of the strip and stretch its outer side, and to thus give the strip a shallow trough-shaped cross-section which produces an elevation at each side of the strips, with resulting ridges upon the roll at the joints of the coils. With soft steel of ductile character, such ridges can be easily effaced by rolls while the coils are winding upon the mandrel, but at the present time strips of high-carbon steel are employed so that the rolls can be hardened and ground to avoid wear.

In winding a relatively thin strip upon a mandrel it is comparatively easy, by tension upon the strip and pressure by winding rolls, to conform the strip accurately to the mandrel and thus make the exterior of the rolls cylindrical; but when a strip of relatively great thickness is made of high-carbon steel and wound upon a relatively small mandrel, the difficulty of conforming the strip to the mandrel and producing coils with a cylindrical exterior is enormously increased. This difficulty is practically overcome in the present invention by anticipating the change of form which the winding of the strip produces, and forming the strip primarily of such a shape as to counteract or neutralize the said change. I have found that the required compensation can be produced by using a strip of arc-shaped cross-section and applying the concave side of the strip to the mandrel during the winding operation, and proportioning the curves upon the inner and outer sides of the strip to equal the change of form which is produced by winding upon a mandrel of a certain size.

The invention will be understood by reference to the annexed drawing, in which—

Figure 1 is a perspective view of a strip having the arc-shaped section; Fig. 2 shows a section of the strip as applied to a mandrel; Fig. 2ª shows a modification of the strip having flaring sides or edges; Fig. 3 is an elevation of a roll wound from such strip; Fig. 4 is a plan of a mandrel with the strip partially wound thereon; Fig. 5 is a diagram showing the operation of bending-rollers upon the strip during the winding operation; Fig. 6 is an elevation of the mandrel with a section of four coils wound thereon having the required arc-shaped section; and Fig. 7 is an elevation of the mandrel with a section of three coils wound from a rectangular strip.

Figs. 4 and 5 show a mandrel *a* having a strip *b* applied thereto and wound into coils *b'* which are bent and compressed by bending-rollers *c* during the winding operation. A gage *d* is, in practice, held rigidly at the rear side of the coils *b'* so that the strip can be held back during the winding operation without bending the mandrel, and thus produce a tension of any desired degree upon the coils. Such tension and the pressure of the bending-rollers *c* serve to bend the highly resistant strip around the small mandrel shown.

Fig. 7 exhibits the change of cross-section which occurs when a thick rectangular strip is wound upon relatively small man-

drel, the angle of the coils and the compressing and expanding of the strip upon its inner and outer sides tending to throw the edges upwardly and to narrow the outer side of the strip. Such a deformation of the strip produces ridges at the joints of the coils which cannot be satisfactorily rolled down to secure an even cylindrical surface if thick strips of high-carbon steel be used; but the present invention obviates the production of such ridges by forming the strip, in advance, of arc-shaped section and placing it, as shown in Fig. 2, with its concave side upon the mandrel when winding it thereon. Such provision anticipates the elevation of the outer edges of the strip during the winding operation, and when the curvature is properly proportioned to the diameter of the mandrel and the width and thickness of the strip, which is readily determined by experiment, the outer edges become elevated during the winding operation into line with the middle portion of the strip, so that it fits the cylindrical surface of the mandrel, as shown in the coils b^2 of Fig. 6, and presents a truly cylindrical exterior with far less pressure by the bending-rollers than would be required to prevent the deformation of the coils b^3 shown in Fig. 7.

The strip with convex outer surface B and concave inner surface B′ is readily shaped by suitable rolls, and when made with parallel edges B^2, as shown in Fig. 2, the extension of the metal upon the outer side of the strip would tend to narrow the outer side and form wedge-shaped grooves or channels between the coils as shown in Fig. 7; but without forming ridges upon the exterior of the roll as shown in that figure.

The grooves are not undesirable, as they serve to hold and distribute upon the axle and casing the lubricant which is supplied to the rolls in a roller-bearing. If, however, it is desired to wind the rolls with not only a cylindrical exterior but without the channels, the strip may be made as shown in Fig. 2^a with flaring sides B^3 proportioned to compensate for the contraction in the outer width of the strip when wound into a roll of given size.

By my invention, spirally wound rolls can be manufactured with more rapidity, with greater uniformity, with less strain upon the machinery and with less necessity for grinding to give them the size and finish desired.

Having thus set forth the nature of the invention, what is claimed herein is:

1. The process of forming helical rolls, which consists in applying a strip of arc-shaped section progressively to a mandrel with its concave side resting thereon, winding the strip upon the mandrel and drawing the inner side of the strip into conformity with the mandrel as it is bent thereon.

2. The process of forming helical rolls, which consists in applying a strip of arc-shaped section progressively to a mandrel with its concave side resting thereon, winding the strip upon the mandrel and pressing and drawing the strip into conformity with the cylindrical surface of the mandrel.

3. The process of forming cylindrical helical rolls, which consists in winding a strip of arc-shaped section upon a cylindrical mandrel with its concave side next the mandrel, and the convexity of the strip being proportioned to automatically bring the outer corners of the strip even with the middle portion when wound.

4. The process of making helical rolls which consists in forming a strip of arc-shaped section with flaring edges B^3, applying the strip to a mandrel with its concave side resting thereon, and winding the strip upon the mandrel and pressing and drawing the strip into conformity with the cylindrical surface of the mandrel.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES S. LOCKWOOD.

Witnesses:
G. C. Stults,
H. E. Saul.