C. I. SHIRLEY.

MACHINE FOR REDUCING SPIRALLY WOUND ROLLS.

APPLICATION FILED AUG. 13, 1910.

994,693. Patented June 6, 1911.

Fig. 1.

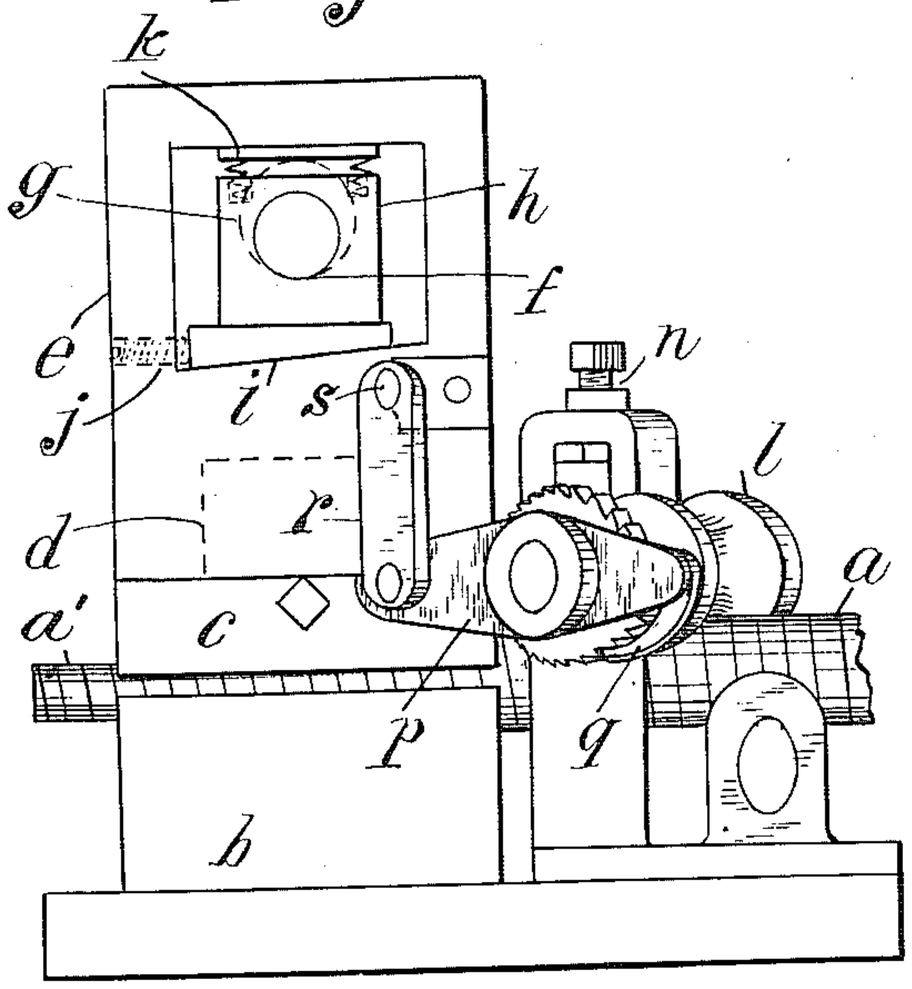

Fig. 3.

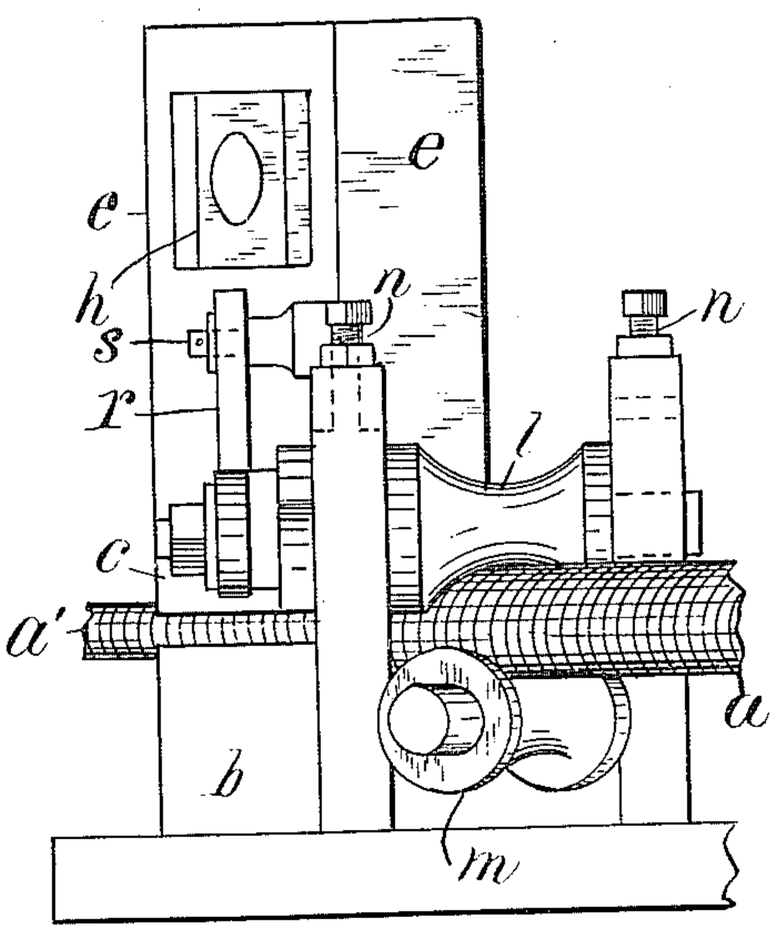

Fig. 2.

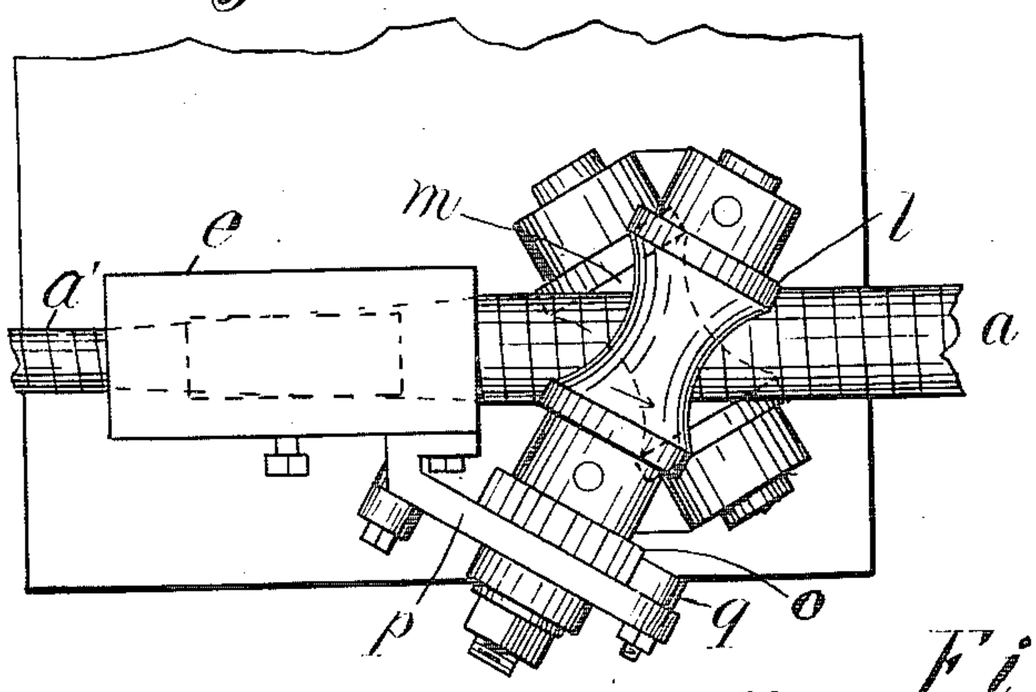

Fig. 5.

Fig. 4.

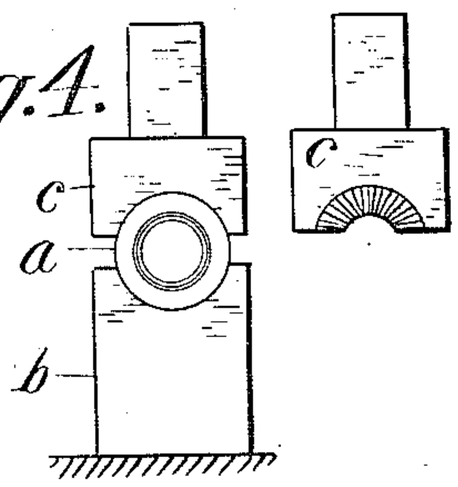

Fig. 8.

Fig. 6.

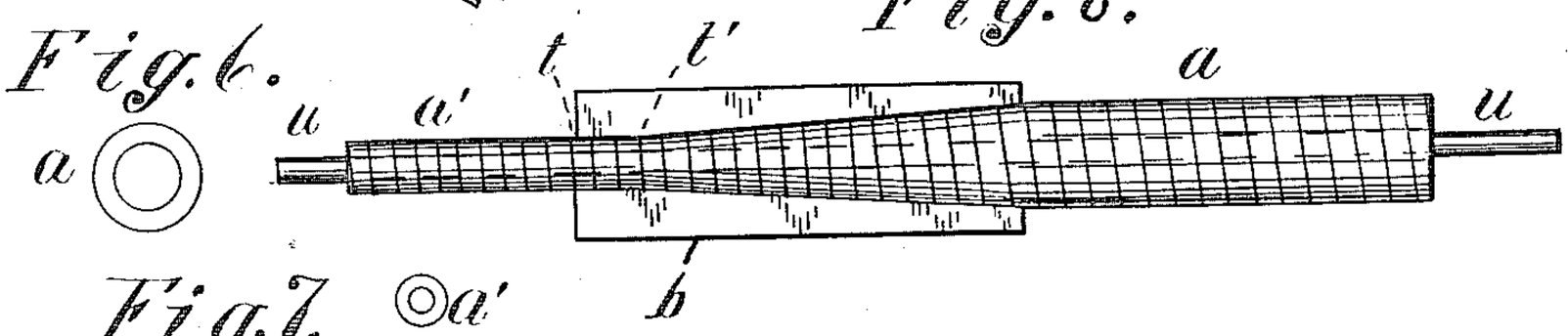

Fig. 7.

Witnesses
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Clifton I. Shirley, per
Thomas S. Crane, Atty.

UNITED STATES PATENT OFFICE.

CEPHAS I. SHIRLEY, OF NEWARK, NEW JERSEY, ASSIGNOR TO HYATT ROLLER BEARING COMPANY, OF HARRISON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MACHINE FOR REDUCING SPIRALLY-WOUND ROLLS.

994,693. Specification of Letters Patent. Patented June 6, 1911.

Original application filed February 2, 1910, Serial No. 541,510. Divided and this application filed August 13, 1910. Serial No. 577,023.

To all whom it may concern:

Be it known that I, CEPHAS I. SHIRLEY, a citizen of the United States, residing at 319 Clifton avenue, Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Machines for Reducing Spirally-Wound Rolls, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to facilitate the manufacture of spirally wound rolls with a bore small in relation to the diameter of the roll, that is, smaller than could be produced by winding a strand directly upon a mandrel.

This application is a division of my application No. 541,510 filed February 2, 1910 for patent on machine for making spirally wound rolls.

The invention consists of a specifically organized machine for reciprocating grooved dies toward and from one another upon the roll-blank, and for feeding the blank through the said dies.

Cylindrical spirally wound coils are largely used in the manufacture of anti-friction rolls for roller-bearings, and as such roller bearings are now employed to sustain much heavier loads than heretofore, it is desirable to form the coils of the rolls with a very thick strand and a relatively small bore.

As a thick strand cannot easily be wound upon a relatively small mandrel, I have devised the special machine herein described for making such heavy rolls, in which machine I utilize cylindrical coils which have been already wound larger than the desired size, and progressively compress them upon their exterior until they are brought to the desired size.

The mechanism which I have devised embodies a reciprocating press-arm actuated by an eccentric crank-pin upon the end of a crank-shaft, a pair of grooved rolls operating upon opposite sides of the blank at opposite inclinations to one another, ratchet-mechanism upon one of the said rolls, and means connected with the reciprocating ram for vibrating the pawl of the ratchet-mechanism.

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

Figure 1 is a front elevation of the dies and means for feeding the coiled rolls through the same; Fig. 2 is a plan of the same; Fig. 3 is an elevation of the same parts as Fig. 1 viewed at right angles to the upper feeding roller; Fig. 4 shows the dies operating upon a roll; Fig. 5 is an end view of the upper die; Fig. 6 is an end view of the roll before reduction; Fig. 7 an end view of the roll after reduction; and Fig. 8 is a plan of the lower die with the roll and mandrel therein.

a designates the blank or roll of spiral coils to be reduced, and *a'* the reduced roll.

b and *c* are dies with tapering grooves fitted at one end to the blank roll *a* and at the other end to a roll *a'*, the intermediate portions forming a frustum of a hollow cone so that the advance of the blank roll *a* into the space between the dies, when they are reciprocated, operates gradually to reduce it to the size of the roll *a'*. The periphery of the roll *a'*, is much smaller than that of the blank roll *a*, and the strip from which the roll *a* was formed therefore suffices to make more coils in the roll *a'*, and the compressed blank roll which results from the operation is therefore much longer than the uncompressed roll. By this operation, strands one-sixth of an inch thick can be formed into a roll having coils one-half an inch diameter with bore one-fourth of an inch, and the same produced from a roll originally one inch in diameter and a bore five-eighths of an inch, the relative proportions of the larger and smaller rolls appearing approximately as shown in Figs. 6 and 7, and the roll in the process of reduction appearing as in Figs. 4 and 8.

The upper die is shown with a shank *d* secured in the lower end of a press-ram *e*

actuated by an eccentric crank-pin *f* upon the end of a crank-shaft *g*, as is usual in power-presses. The remainder of the press is not shown as it forms no part of the present invention.

A crank-block *h* is shown upon the crank-pin *f* and the lower end of such block supported upon a wedge *i* fitted adjustably within the ram so that when pressed endwise by the adjusting-screw *j* it may force the ram downward and produce a greater compression of the roll within the dies. The block *h* is shown provided with a spring-cap *k* which operates to lift the ram in the upward movement of the crank-pin and to compensate for the adjustment of the block within the ram by the wedge *i*.

Feed-rollers *l* and *m* with concave bearing surfaces are set diagonally above and below the path of the roll *a* adjacent to the larger end of the dies, and the upper roll is adjustable in its housing by screws *n* so as to make the feed-rollers grip and propel the roll *a*. These feed-rollers are set obliquely to the axis of the blank roll *a* in order that they may rotate it at the same time that they advance it toward the dies.

A ratchet-wheel *o* is attached to the upper feed-roller, and a rocker-arm *p* is journaled upon the shaft of the roller and provided at one end with a ratchet-pawl *q* engaging the teeth of the wheel. At the opposite end, the arm *p* is connected by a link *r* with a stud *s* upon the ram *e*, so that when the ram rises the pawl slightly rotates the feed-roller *l* which remains stationary when the ram descends to compress the blank roll *a*.

The operation of reducing the blank roll *a* consists merely in inserting it through the feed-rollers into the larger end of the dies, and then reciprocating the upper die, which causes the blank roll *a* to be slowly advanced into the die and continually turned as it is advanced to subject different sides of its surface to the action of the dies. This rotation of the blank roll is very desirable, because the coils are forced to rotate within the die as they gradually attain a smaller diameter, and such movement is productive of considerable friction, which is relieved by the constant opening of the dies and the constant turning of the roll as it is advanced through the tapering channel.

In Fig. 8, a portion of the die between dotted lines *t* and *t'* is shown of cylindrical form, of the exact size desired for the finished roll, such portion of the die operating repeatedly upon the coils as they advance slowly through it, and thus subjecting all sides of these coils to the operation of the dies before their discharge. A mandrel *u* is shown within the rolls *a* and *a'* in Fig. 8 adapted to fill the bore of the reduced roll *a'* and operating to support the coils while the cylindrical portion of the die between the points *t* and *t'* is operating repeatedly upon them. The interior of the coils is thus supported during this stage of the process, while all sides of the exterior are subjected to the repeated action of the dies, and the product may thus, if desired, be made more perfect in shape and size.

My invention consists in the special arrangement over the die *b* of the reciprocating ram which carries the die *c*, the relation of the feed-rolls *l* and *m* thereto, with the ratchet-wheel *o* upon the end of one of the rolls, and the rocker-arm *p* upon the end of such roll-shaft adjacent to the ratchet-wheel, with a direct connection by means of the link *r* to the ram *e*.

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

1. The roll-reducing machine having the grooved die *b* arranged to operate upon one side of the blank roll, the ram *e* carrying the die *c*, the crank-shaft *g*, the crank-pin *f* and the crank-block *h* reciprocating the ram opposite to the die *b*, feed-rolls for rotating the blank roll and propelling it into the dies, and the ratchet-connection between the ram *e* and the feed-rolls, as and for the purpose set forth.

2. The roll-reducing machine having the grooved die *b* arranged to operate upon one side of the blank roll, the ram *e* carrying the die *c* opposite to the die *b*, the crank-shaft *g*, the crank-pin *f* and the crank-block *h* reciprocating the ram, the wedge *i* fitted adjustably within the ram for varying the operation of the die *c* upon the blank roll, the feed-rolls *l* and *m* with concave bearing surfaces set diagonally above and below the blank roll *a*, means for adjusting the rolls toward one another, and a ratchet-connection between the rolls and the reciprocating ram *e*.

3. A roll-reducing machine having the grooved die *b* arranged to operate upon one side of the blank-roll, the ram *e* carrying the die *c* opposite the die *b*, the dies having concave tapering faces extended through a part of their length and reduced concave cylindrical faces through the remainder of the length, the crank-shaft *g*, the crank-pin *f* and the crank-block *h* reciprocating the ram, means for varying the operation of the dies upon the blank roll, the feed-rolls *l* and *m* with concave bearing surfaces set diagonally at opposite sides of the blank roll to be operated upon adjacent to the larger end of the dies, means for adjusting the dies, a shaft extended from the upper feed-roller with the ratchet-wheel *o* attached thereto, and a rocker-arm *p* journaled thereon and

provided at one end with a ratchet-pawl *q* engaging the teeth of the ratchet-wheel, and a link *r* jointed to the opposite end of the rocker-arm and to the stud *s* upon the ram *e*, whereby the reciprocation of the ram intermittingly actuates the feed-rolls.

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

CEPHAS I. SHIRLEY.

Witnesses:
WILLIAM D. BROWN,
IVY W. ASLIN.