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A. R. COLE & P. J. DONNELLY.

APPARATUS FOR THE CONTINUOUS MANUFACTURE OF SPIRAL SPRINGS OR COILS.

(Application filed Oct. 16, 1901.)

(No Model.)

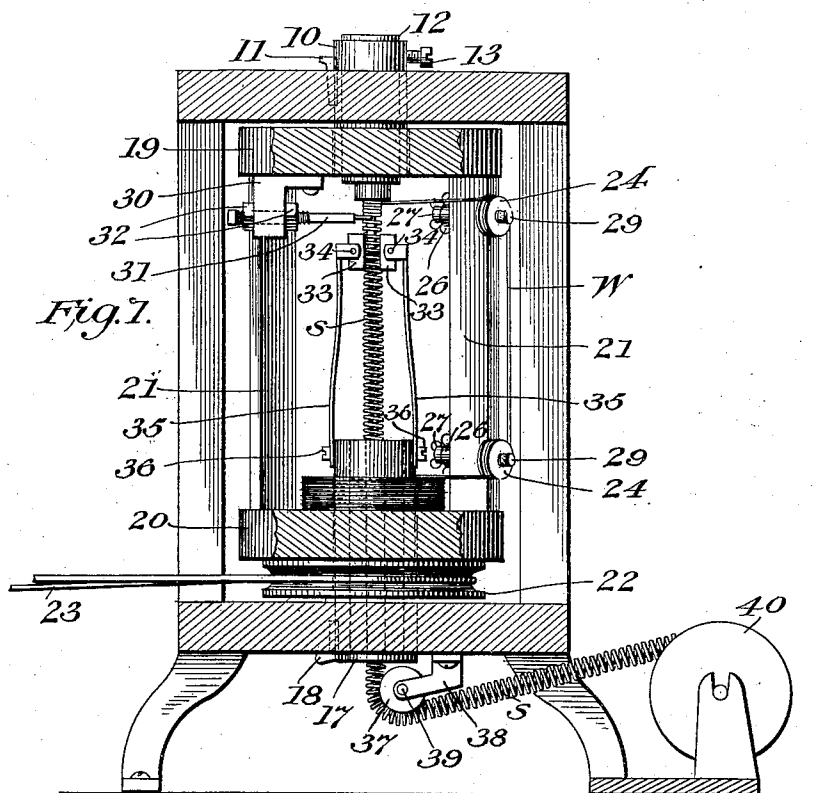
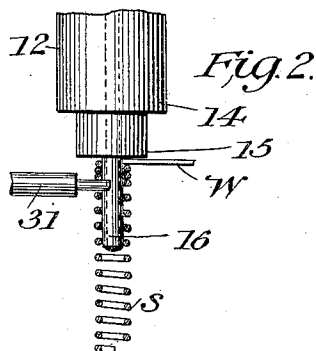
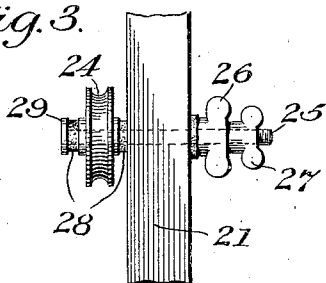


Fig. 3.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE CONTINUOUS MANUFACTURE OF SPIRAL SPRINGS OR COILS.

SPECIFICATION forming part of Letters Patent No. 708,128, dated September 2, 1902.

Application filed October 16, 1901. Serial No. 78,802. (No model.)

To all whom it may concern:

Be it known that we, ALFRED R. COLE and PATRICK J. DONNELLY, citizens of the United States, residing at Spencer, in the county of Worcester and State of Massachusetts, have invented a new and useful Apparatus for the Continuous Manufacture of Spiral Springs or Coils, of which the following is a specification.

Several ways have been previously suggested for the manufacture of spiral springs or coils of indefinite length. One of these ways consists in forcing the wire through a helical groove formed around a stationary mandrel, so that the wire will be forced through said groove and formed into a coil which will issue off the end of said mandrel. Another way which has been suggested consists in leading the wire to the mandrel and in revolving the mandrel to draw the wire onto the mandrel and form the same into a coil which will slip off the end of the mandrel. In both these ways of making spiral springs or coils it will be noted that the spiral or coil as it leaves the end of the mandrel will have a rotation or twist—that is, one turn for every complete spiral. In shop parlance, the spring or coil as it comes off the end of the mandrel in either of these ways is “live” or is twisting and turning on itself. This makes it very difficult to make a spring of indefinite length, because this twist is apt to injure or distort the spring and prevents the easy delivery. Another way which has been proposed is to use a mandrel wire or rod which advances with the spiral or spring as it is formed. This involves either the leaving of the mandrel wire or rod inside of the finished product or the stopping of the machine for short lengths of spiral and the readjusting of the mandrel-rod and means for holding the spiral or spring. As distinguished from these old ways of making coils we have invented a new way by which the coil or spring as it comes off the end of the mandrel is “dead”—that is, it has no twist or rotation. By this improved way the coil or spring can be made of any desired length or delivered in any desired manner. To accomplish this most desirable result, we use a stationary mandrel, provide a means for leading the

wire to this mandrel, and a mechanism for bodily rotating this means around said mandrel to lay the wire thereon in the form of a coil in such manner that the spiral will slide off the end of the mandrel without rotation.

Many different forms of apparatus may be devised for practicing this invention. In the accompanying drawings, forming part of this application, we have shown what is the best form now known to us for this purpose.

Referring to the said drawings and in detail, Figure 1 is a sectional elevation through a coiling device constructed according to our invention. Fig. 2 is an enlarged view of the end of the mandrel, and Fig. 3 is an enlarged view of one of the friction-pulleys.

Referring to the drawings and in detail, A designates a suitable framing. Secured in the top part of said framing is a quill 10, which is held in place by a key 11. Fitted in said quill is an arbor or mandrel 12, a screw 13 being tapped through the quill 10 to adjustably hold said mandrel in position. Thus it will be seen that the mandrel is stationary. Said mandrel is reduced by a shoulder 14 and is again reduced by a shoulder 15 to form the working end or active part 16 of the mandrel. This part 16 in some instances is slightly tapered down to its end. The mandrel is preferably bored out or made hollow, as shown.

Fitted in the lower part of the framing A is a hollow bearing or escape-pipe 17, which is held in place by a key 18. A disk 19 is journaled on the mandrel 12, and a disk 20 is journaled on the pipe 17, which disks are connected by spider-arms 21 21, thus forming a revoluble frame. A pulley 22 is secured to the lower disk 20, and a belt is led from a suitable source of power around said pulley, thus forming a means for rotating said frame and the parts hereinafter described. A bundle, coil, reel, spool, or bobbin of wire C is dropped on the escape-pipe 17 and rests on the disk 20 of the revoluble frame, so as to turn therewith. The wire W from said bundle is led around pulleys 24, which are journaled on one of said spider-arms, as shown. The wire is preferably given a complete turn around one or both of the pulleys 24 to take the kinks out of the same.

Each pulley 24 is loosely mounted on a stud 25, which is passed through the spider-arm and which has its end screw-threaded, and on which screw-threaded end is arranged a nut 26 and a check-nut 27. Each stud is provided with a head 29, and arranged under said head and between the same and the pulley 24 and also between the pulley 24 and the arm 21 are friction-washers 28 28. By adjusting the nut 26 and the check-nut 27 the pulley 24 can be made to turn with any desired degree of friction, thus putting a tension on the wire. From the upper pulley 24 the wire is passed to the working part 16 of the mandrel under the shoulder 15.

A bracket 30 is secured to the lower part of the disk 19, and loosely passing through the same is a spacer or separator 31, which has an end which is grooved to fit snugly on the mandrel end 16. This spacer or separator is held in adjusted position by check-nuts 32 32.

One or more pressers or formers 33 are arranged to bear on the coil as it issues from the end of the mandrel. Two of these pressers are preferably used. Each presser consists of a hard-steel block, which is pivoted, as at 34, to a strong spring-arm 35, which spring-arm 35 is pivoted by screw 36 to the escape-pipe 17.

A roller or pulley 37 is mounted in a bracket 38, secured to the framing A, by being journaled on a shaft 39 fitting therein.

40 designates a roll or device for receiving the finished coil or spring. The same preferably consists of a roll which is rotated at a slow speed to wind up the spiral.

The operation is as follows: The pressers or formers 33 are bent out and a coil of wire C is dropped on the end of the escape-pipe to rest on the disk 20. The pressers or ironers are then snapped back in position at the end of the mandrel. The wire is led from the coil C around the lower pulley 24 and is preferably given a twist or turn around the upper pulley 24. From here the wire is led to the mandrel 16. The end of the wire is given a few turns around the mandrel to start the device in operation, and the end is led out through the escape-pipe 17. Power is then applied to the device. This will rotate the means which leads the wire to the mandrel around the mandrel and will lay the wire in the form of a coil on the mandrel under the shoulder 15 in such manner that a coil or spring will be formed and forced off the end of the mandrel. The coil or spring S as it issues from the mandrel will be dead or will move forward to the delivery without rotation. The separator or spacer 31 revolving with said means for laying the wire on the mandrel will properly space or give the desired distance between each spiral of the wire. This spacer revolving around the mandrel synchronously with the laying of the wire thereon will greatly help and assist the delivery of the coil or spring off the end of

the mandrel. Various-sized mandrels and spacers are provided for different kinds of springs or coils. As the coil or spring issues from the end of the mandrel it will be kept in proper shape for some distance by the ironers or pressers 33 33. The coil or spring is led down through the escape-pipe 17 and around the pulley 37 to the reel or delivery device 40. In this way a spring or coil of indefinite length can be formed.

A form of spring now used in electrical work consists of a rope or central wire or wires, around which a spiral spring or coil is led and given an added degree of flexibility. Our device can be used for making such springs by leading the wire or rope R through the hole in the mandrel, which is indicated in dotted lines in Fig. 3.

While the device previously described in which the delivery of the coil or spring takes place through the coil of wire is a desirable one for the purpose described, we are aware that this is not a necessary feature of our broad invention, as many other arrangements and devices can be provided for practicing the broad principle of our invention and many other modifications made by a skilled mechanic without departing from the scope of our invention as expressed in the claims.

The device can be arranged to work vertically, as shown, or horizontally, if desired. In most work the vertical arrangement is preferred, as it leaves the coil of wire in horizontal position, so that the same will unwind without kinking.

We believe we are the first to use a stationary mandrel in the manufacture of spiral springs—meaning by this a mandrel which does not rotate and which does not advance with the spiral as it is made. We further believe that we are the first to use a shoulder on a mandrel of this kind which will act to form the spiral and crowd the same continuously off the end of the mandrel. We further believe that our spacer, arranged in conjunction with the previous devices and bearing in between the coils to determine the pitch of the spring or spiral and to help in forcing the spiral off of the end of the stationary mandrel as fast as it is formed or laid thereon, is a broadly new point. In view, therefore, of the novelty of our mechanism we do not wish to be limited to details of construction.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an apparatus for coiling wire, the combination of a stationary non-rotating mandrel, means for leading the wire thereto, and mechanism for rotating the means around said mandrel, whereby the wire will be laid thereon, and formed into a spiral of indefinite length, which will slide off the end of said mandrel without rotation.

2. In an apparatus for coiling wire, the combination of a stationary non-rotating mandrel,

a support for carrying a bundle of wire, means for leading the wire from said bundle to said mandrel, and means for rotating said support and said means, whereby the wire will be laid on said mandrel and formed into a spiral of indefinite length which will slide off the end of the mandrel without rotation.

3. In an apparatus for coiling wire, a stationary non-rotating mandrel, means for leading the wire thereto, a separator or spacer carried by said means, and mechanism for rotating this means around the mandrel.

4. In an apparatus for coiling wire, a hollow stationary non-rotating mandrel, means for leading the wire thereto, and mechanism for rotating this means around the mandrel to lay the wire thereon and form the coil.

5. In an apparatus for coiling wire, a stationary non-rotating mandrel having a shoulder, means for leading the wire to said mandrel to wind on the same under said shoulder, and mechanism for rotating this means around the mandrel.

6. In an apparatus for coiling wire, a stationary non-rotating mandrel arranged to have its axis vertical, a support for a bundle or reel of wire arranged in line with the axis of said mandrel, and mechanism for rotating said means and support around said axis.

7. In an apparatus for coiling wire, the combination of a mandrel, an escape-pipe arranged in line with said mandrel, a frame journaled on said mandrel and escape-pipe, means carried by said frame for leading the wire to the mandrel, and mechanism for rotating said frame.

8. In an apparatus for coiling wire, the combination of a mandrel, an escape-pipe arranged in line with said mandrel, disks journaled on said mandrel and escape-pipe, spider-arms connecting said disks, means carried by one of said spider-arms for leading the wire to the

mandrel, and mechanism for rotating the frame formed by said disks and said arms.

9. In an apparatus for coiling wire, a stationary non-rotating mandrel, a shoulder formed on said mandrel, means for leading the wire thereto, mechanism for rotating the means around said mandrel, and a spacer carried by said means, arranged to fit in between the coils of the spiral to force the same off of the end of the mandrel as fast as it is laid under said shoulder, and to determine the pitch or spacing of the spring or coil.

10. In an apparatus for coiling wire, the combination of a stationary non-rotating mandrel having a working shoulder, said mandrel being slightly tapered from said shoulder, means for leading the wire thereto, and mechanism for rotating this means around the mandrel.

11. In an apparatus for coiling wire, a stationary non-rotating hollow mandrel having a working shoulder, means for leading the wire to said mandrel to lay the same under the shoulder, and mechanism for rotating this means around the mandrel.

12. In an apparatus for coiling wire, a mandrel, an escape-pipe, a frame journaled thereon, means for rotating the frame, and one or more pressers or formers carried by the end of the escape-pipe and pivoted thereon, so that they can be swung out, and the bundle or reel of wire placed on the end of the escape-pipe.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

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Witnesses:

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