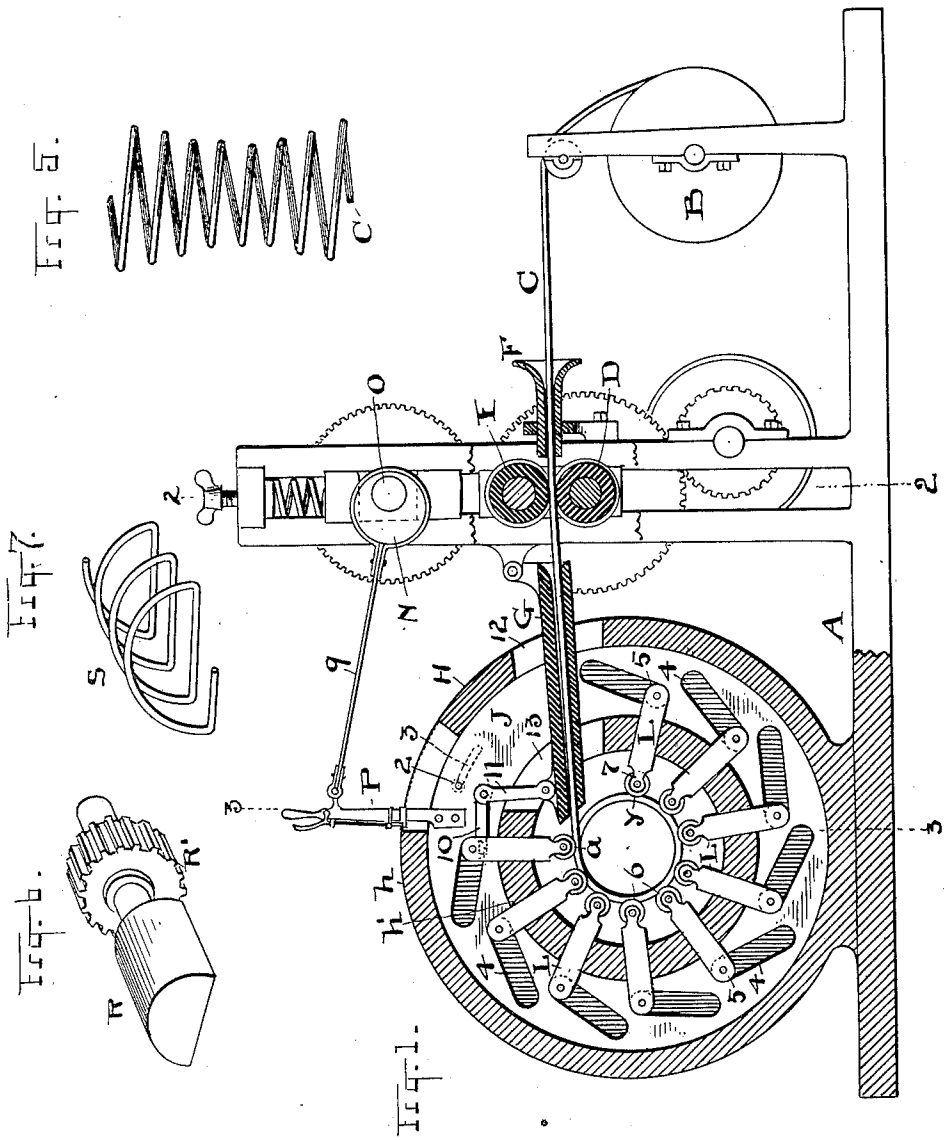
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WIRE SPRING COILING MACHINE.

(Application filed Nov. 27, 1899.)

(No Model.) 2 Sheets—Sheet 1.



ATTEST
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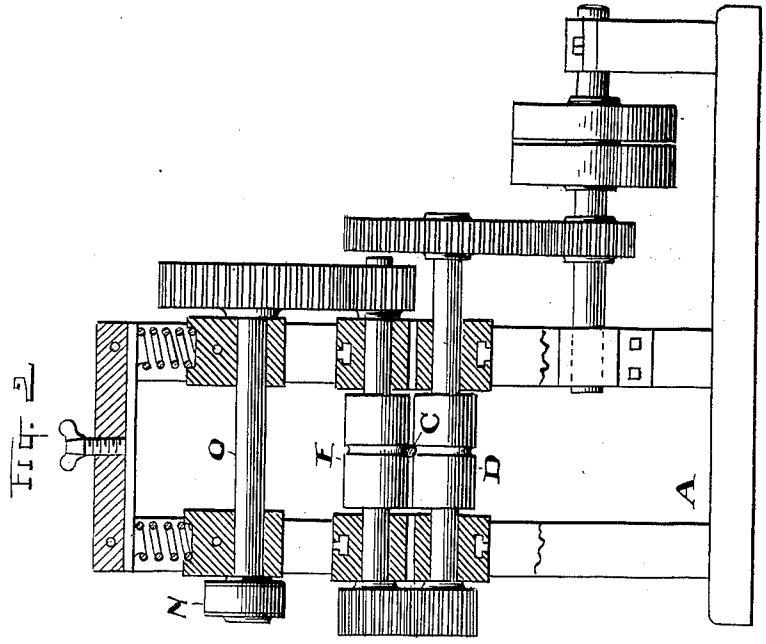


Fig. 2.

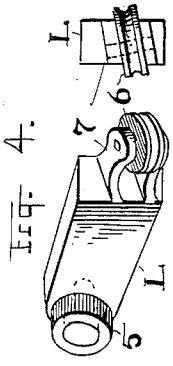


Fig. 4.

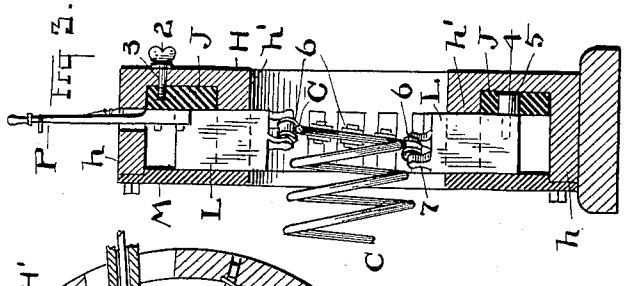


Fig. 3.

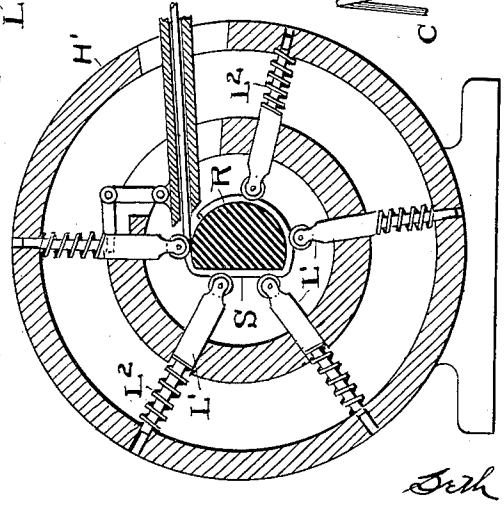


Fig. 5.

Attest.

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UNITED STATES PATENT OFFICE.

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WIRE-SPRING-COILING MACHINE.

SPECIFICATION forming part of Letters Patent No. 657,878, dated September 11, 1900.

Application filed November 27, 1899. Serial No. 738,258. (No model.)

To all whom it may concern:

Be it known that I, SETH KIRK, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Wire-Spring-Coiling Machines; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a novel construction in wire-spring-coiling machines; and the invention consists in a machine having the functions and features substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional elevation of my new and improved machine, taken on the line of the wire-feed. Fig. 2 is a cross-section of the power portion of the machine, showing an elevation on line 2 2, Fig. 1. Fig. 3 is a cross-section on line 3 3, Fig. 1, representing the coiling portion of the machine. Fig. 4 is a group view of one of the several so-called "plungers," showing both a perspective and a direct elevation of one of said plungers. Fig. 5 is an elevation of a portion of a wire coil which is the product of my machine in one of its several coil-forming operations. Fig. 6 is a perspective view of a portion of a substantially D-shaped mandrel which may be used to form a flat-sided coil, as shown in Fig. 7, and both of which are hereinafter more fully described. Fig. 8 is a sectional view showing the modified form of the machine for making the flat-sided coil.

I am of course aware that a number of wire-spring-coiling machines of different patterns and styles are known and used, and I do not claim to be first and original in the art in the production of such a machine, broadly; but I do not know nor believe that any one has ever before known or used a machine embodying the novel features and having the possibilities of this invention. Having reference therefore again to the drawings, A represents the frame of the power portion of the machine, which may be of any pattern or style which will carry the operating parts and in one or more pieces, and these parts, as here shown, comprise a spool B for carrying the roll of wire C, the feed-rolls D and E, and other active members hereinafter fully described. The wire passes to the rolls D and E through a short guide-piece F, and the said wire passes from the said rolls through the guide-tube G to the coil-forming mechanism at its inner end. This mechanism in the form of machine here shown comprises a circular forming-shell H, having two concentric flanges or portions h and h' of the requisite depth laterally within which to effect the coiling of the wire to any and all of the forms desired and herein fully described, and of course greater depth than this is not needed. This shell or coil forming casing stands in this instance on the frame A and is open through its center the full width inside the flange h'. Between the flanges h and h' at their base is a flat ring-shaped cam-plate J, adapted to be rotated in certain operations of the machine and to be held stationary in others, and a confining bolt or screw 2 passes through a short segmental slot 3 in the shell H into said plate J to fix or fasten it when rotation is not wanted. This or any equivalent means of securing said plate may be used. The said plate J has a series of tangential slots 4, all sustaining exactly the same relation to the axis of the plate and casing and designed to have the functions of a series of cams to actuate the spring-forming plungers or members L. These plungers also are all alike in construction and service and are block-shaped members, Fig. 4, set into radial slots in flange h', wherein they are laterally confined by the removable face-plate M, forming their bearing on this side. Each plunger has a roller 5 at its outer end and side operating in its cam-slot 4, while on its opposite end there is a grooved wire guiding roller or wheel 6, supported in this instance directly on the end of the plunger by a suitable double-armed bracket 7, between which the roller 6 rests.

While the plungers or members L all alike occupy their slots in the flange h' within the same vertical plane, there are two features of arrangement which account for the spiral formation of the wire. The first of these is the setting of the roll-brackets 7 on the ends

of the plungers in such order that by the time the circle is completed the desired pitch of the coil is obtained. The other peculiarity of the arrangement is that the rollers or guide-wheels 6 are set diagonally to the sides of the plungers, Fig. 4, sufficiently to give the requisite lead for the wire from the roll next behind to the one next before. The wire is thus compelled to take a spiral pass of a predetermined pitch, and when it has made the circuit from the initial roll *a* to the exit-roll *y* its coil is fixed, and it is ready to pass from the machine.

In the foregoing it is assumed that a wire spring of uniform character is the product and that having ascertained the exact diameter wanted the cam-plate was locked against movement during the operation; but in the event that a concave coil be wanted, as in Fig. 5, or a convex one, (not shown,) but the reverse of Fig. 5, the cam-plate is rotated back and forth at a speed which may be changed and which in the present case is determined by the rotation of the eccentric N on shaft O, operating the lever P, rigid with the cam-ring J and united therewith by means of connecting-rod 9. A continuous coil will thus be given an undulating or wavy construction, and it can be cut into lengths—say as seen in Fig. 5—for bed and other springs. Obviously if the wire were cut at the narrower instead of the wider places the spring would have a convex rather than a concave center. Disconnecting lever P from the eccentric enables the cam-plate to be fastened and straight coils only produced.

The guide-tube G feeds to initial roll *a*, and in order that the said tube and roll may always hold their proper relation notwithstanding adjustments and back and forth operating movements in the plunger L, carrying roll *a*, I fix a short arm 10 rigidly to said plunger and connect its outer end by link 11 with tube G. This insures correct guiding of the wire at all times.

I can by the foregoing mechanism coil wire to any desired diameter and may exchange plungers when the full difference wanted is not provided for in the cam-slots, and I can run any gage of wire cold from one fourth of an inch down. Above that size it is desirable to heat the wire to cherry-red.

It will be noticed that this construction of machine has all the elements of simplicity and convenience, and the face-plate is removable, so as not only to expose all the inner parts, but to enable them to be conveniently reached on occasion. Open slots 12 and 13 through flanges *h* and *h'* enable the feed-tube to be run into the center of the machine and everything otherwise is within the housing or shell H and its plate M.

In Fig. 6 I show a section or portion of a flat-sided mandrel R, which may be used in the machine to form a spring S, having a substantially D shape in cross-section. (Seen in Fig. 7.) These springs are coming to be extensively used in buggy and vehicle tires, and they can be readily formed in my machine by employing the mandrel R of any desired size in the space or opening between the plungers L' (shown in Fig. 8) and made to revolve through pinion R', supported in a bearing fixed at the back of the machine, while the plungers are themselves controlled by springs L^2 instead of cam-plates, so that they follow the shape of the mandrel. Other-shaped springs can be as easily made by employing different-shaped mandrels.

The two rolls E and D have a friction-bearing on the wire C to feed it along, producing a force-feed in against the forming mechanism for the coil, and power is applied to these rolls and the eccentric N through suitable driving-shafts and gearing operated by pulleys or any other available means. (See Fig. 2.)

What I claim is—

1. In a spiral-spring-forming machine, a former having a series of radially-disposed adjustable plungers, and a cam-plate to determine the position of the plungers, substantially as described.

2. The housing for the forming mechanism, having bearings for a series of radially-disposed plungers, a plate having slots to adjust the plungers, and engaging parts on the plungers in said slots, substantially as described.

3. The housing having two concentric flanges on one side, the inner flange having slots at intervals and plungers in said slots, and a rotatable cam-plate between said flanges with which the plungers are connected, substantially as described.

4. The double-flanged housing and the rotatable cam-plate therein having a series of tangential slots, plungers adapted to slide in bearings in the inner of said flanges, and rollers on the side thereof engaged in said slots, substantially as described.

5. The housing having inner and outer flanges on one side, a rotatable cam-plate between the base of said flanges, and means to secure the plate in any adjusted position, substantially as described.

6. The double-flanged housing and the plate between the flanges, a lever fixed on said plate, and means connected with the lever to rotate the plate back and forth successively, substantially as described.

7. The machine described having a series of coil-forming members, a casing in which said members are supported, rollers on the ends of said members set in spiral relation from first to last, and devices to feed the stock to said members, substantially as described.

8. The housing and the movable ring therein having a series of tangential slots, in combination with a series of plungers engaged at one end in said slots and having rollers on their other ends in spiral arrangement, substantially as described.

9. The housing and the radially-disposed plungers having rollers on their inner ends,

and a wire-guide arranged to feed the wire beneath the first roller in the series, and a support for said guide from the first plunger, substantially as described.

10. The housing and the series of wire-forming plungers therein, a cam-plate to actuate said plungers, and an eccentric and lever connections for actuating said plate, substantially as described.

11. In a spiral-wire-forming machine, a series of plungers, means to actuate said plungers simultaneously comprising a member with which all the plungers are connected, an eccentric and connections therefrom to said member, and means to rotate said eccentric, substantially as described.

12. The housing and the plungers therein, and means to operate said plungers, in combination with mechanism in advance of the first plunger to force the wire past all the plungers, substantially as described.

13. In a machine for making coiled springs, the combination of the coil-forming members and the supports therefor, with a stock-guiding device for the said members, and stock-feeding rolls outside said device to force the stock forward, substantially as described.

14. In a machine for making coiled springs, a series of forming members set in radial and spiral relation from first to last, and stock-feeding mechanism constructed to force-feed the stock in its formations between said forming members, substantially as described.

15. In a coil-spring-forming machine, a series of radially-disposed forming members having spiral-forming ends, and means to feed the stock to said spiral-forming ends comprising a feed-tube leading to one of said ends, substantially as described.

16. In a spiral-spring-forming machine, a former having a series of radially-disposed adjustable plungers, means to set said plungers for varying diameters of springs, and means to forcibly feed the wire to the plungers, substantially as described.

17. In a spiral-wire-spring-forming machine, the combination of a set of forming-plungers, a feed-guide for the wire leading to the first plunger, means to move said plungers and guide together, and means to feed the wire forcibly through said guide, substantially as described.

18. In a spiral-spring-forming machine, a series of wire-coil-forming plungers radially disposed, means to automatically move said plungers back and forth lengthwise to form a varying-diameter spring, said means comprising an eccentric rotatable member and connections therefrom to all the said plungers, and means outside said plungers to force-feed the wire thereto, substantially as described.

19. In a spiral-spring-forming machine, the combination of a set of forming-plungers, and a feed-guide for the stock, means to actuate said plungers and guide together, and means to feed the stock to said guide, substantially as described.

20. In a spiral-spring-forming machine, a series of coil-forming plungers, and means to automatically actuate said plungers back and forth to form a varying diameter of spring, substantially as described.

Witness my hand to the foregoing specification this 18th day of November, 1899.

SETH KIRK.

Witnesses:
H. E. MUDRA,
R. B. MOSER.