

June 6, 1939.

C. H. PETERSON ET AL

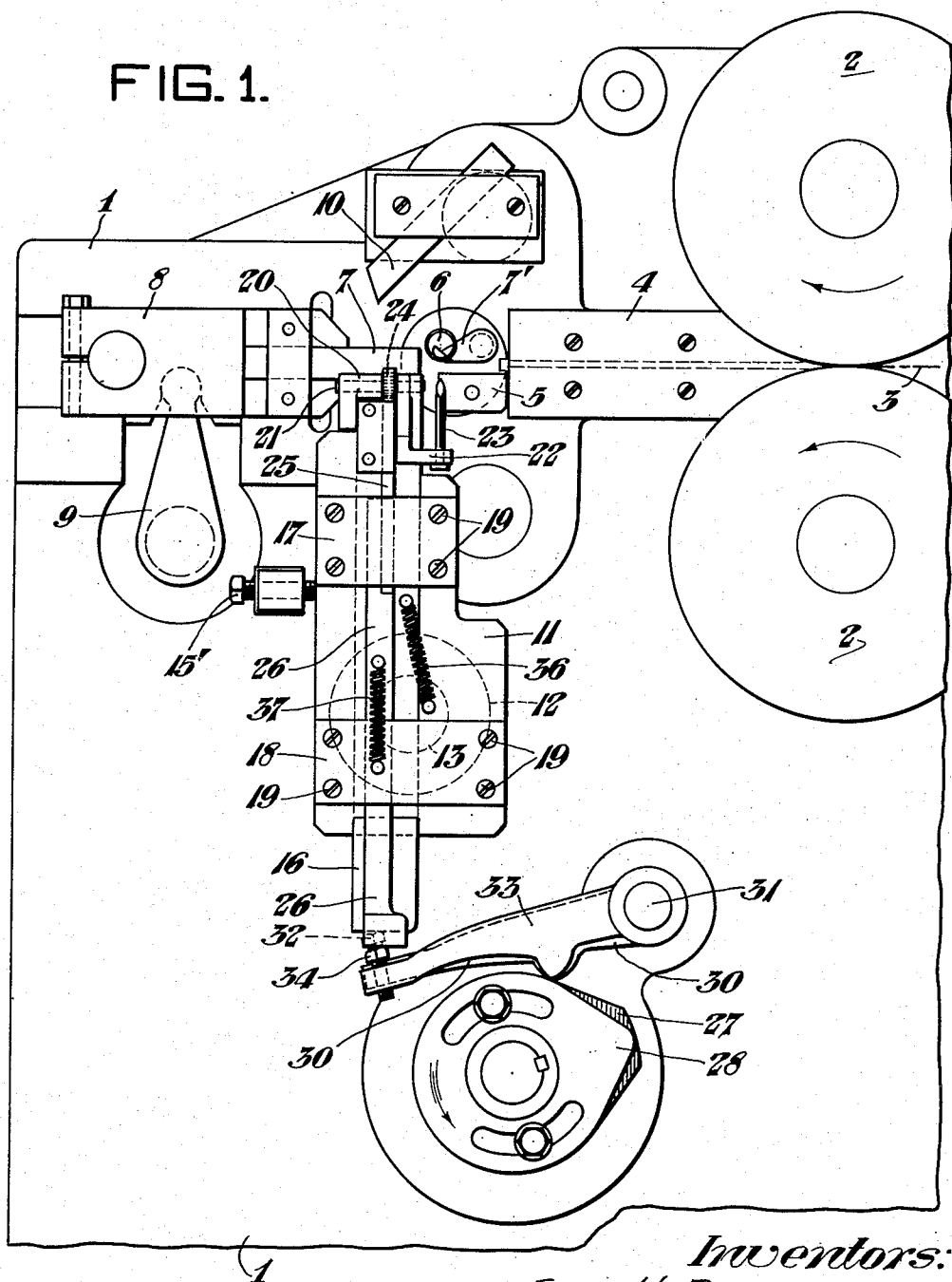
2,161,084

SPRING MACHINE APPLIANCE

Filed Jan. 3, 1939

4 Sheets-Sheet 1

FIG. 1.



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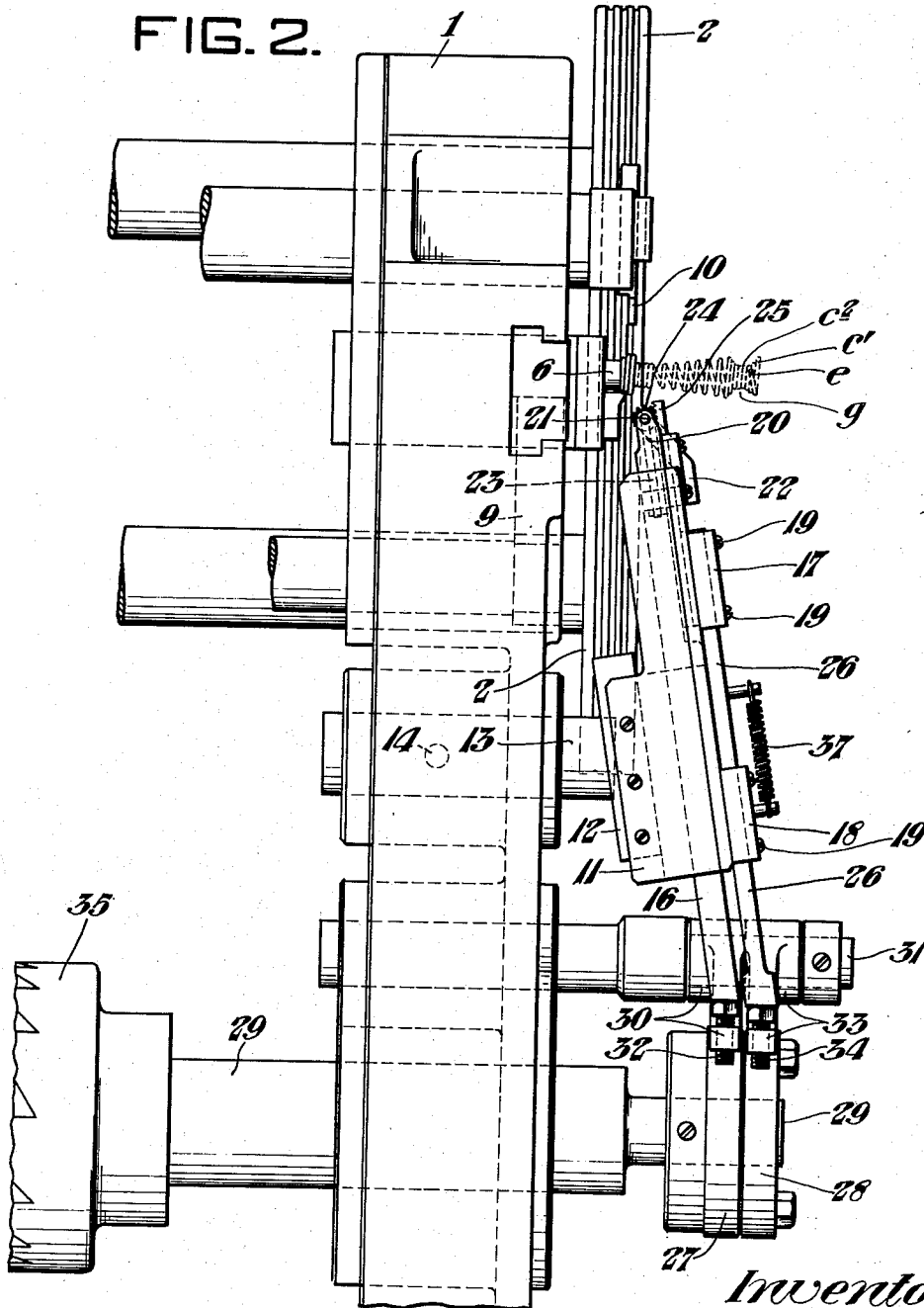
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4 Sheets-Sheet 2



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SPRING MACHINE APPLIANCE

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4 Sheets-Sheet 3

FIG. 3.

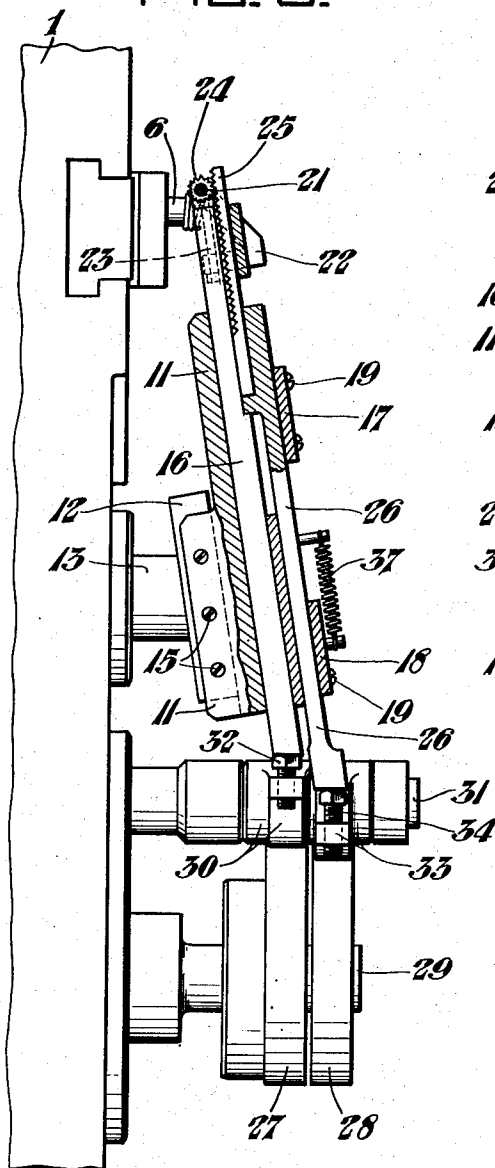


FIG. 4.

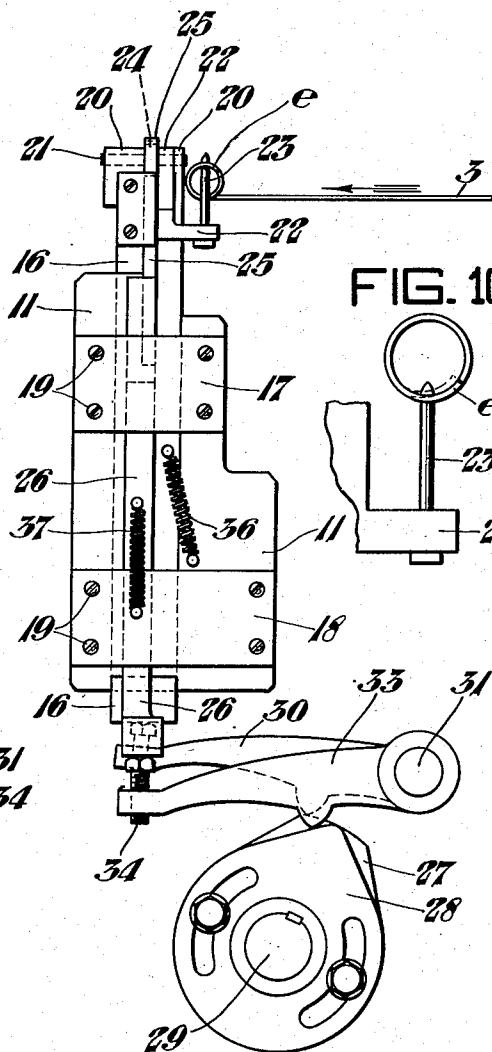
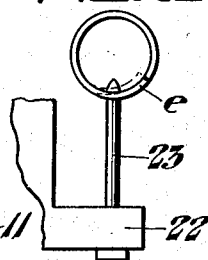


FIG. 10.



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4 Sheets-Sheet 4

FIG. 5.

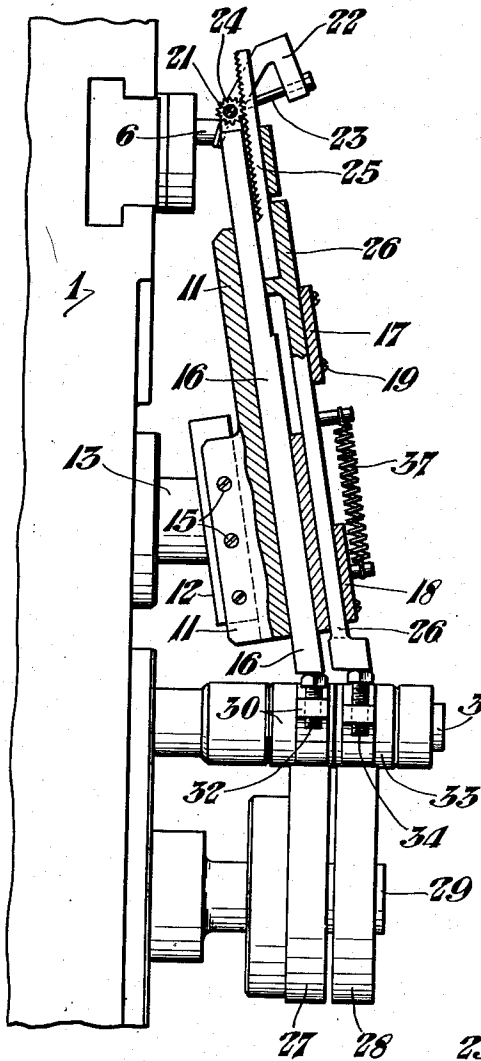


FIG. 6.

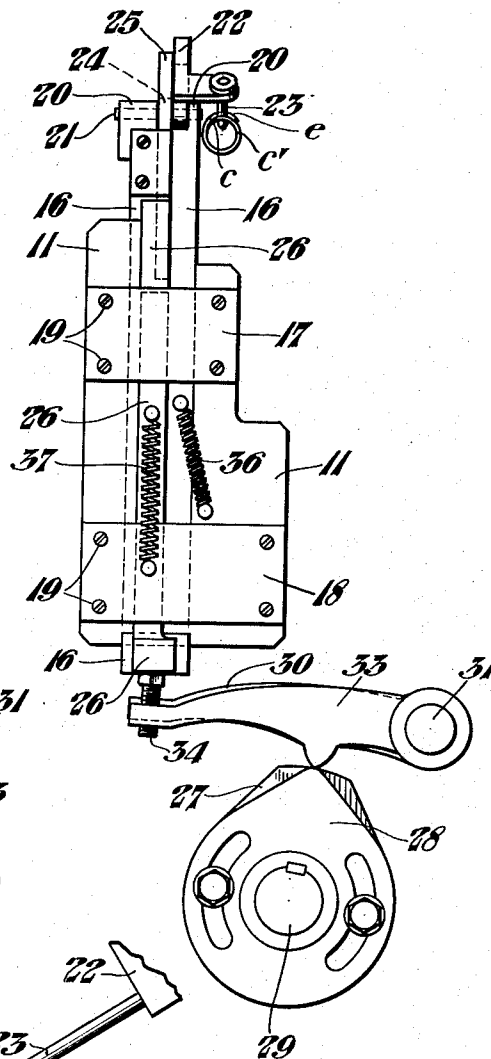


FIG. 7.

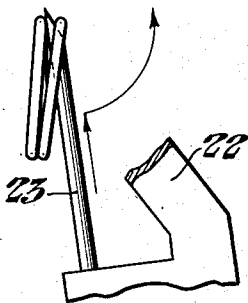


FIG. 8.

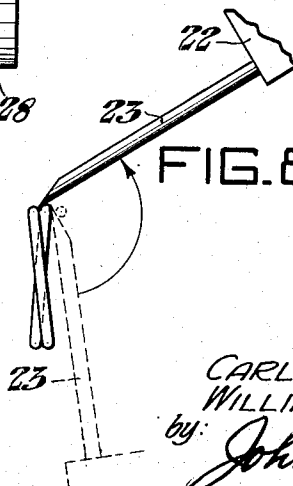
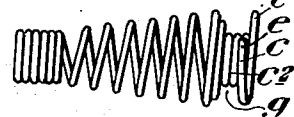


FIG. 9.



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UNITED STATES PATENT OFFICE

2,161,084

SPRING MACHINE APPLIANCE

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Application January 3, 1939, Serial No. 249,120

10 Claims. (Cl. 140—79)

This invention relates broadly to a method and means for displacing the end of a coil spring in relation to the coil or coils adjacent thereto, so that the free end in the finished spring will be disposed inwardly of the spring considered as a whole.

More particularly, the invention aims to provide means adapted to be applied to conventional types of spring coiling machines so that springs made thereby will have the ultimate positions of their respective free ends arranged in cross relationship with a coil or coils adjacent such free ends.

The above and other detail features of the invention will be fully apparent from the following detailed disclosure and claims, when read in connection with the following drawings.

Figure 1 is a view, in side elevation, illustrating a preferred means for carrying out the improved method and embodying features of the invention;

Figure 2 is a view, in side elevation, of the mechanism shown in Figure 1, illustrating the position of certain of the parts before or at the initiation of the displacing movement of the end coil of the spring;

Figure 3 is a view similar to Figure 2, but with parts shown in section in an intermediate operating position;

Figure 4 is a front elevation of Figure 3;

Figure 5 is a view, partly in side elevation and partly in section, showing certain parts of the mechanism in the positions which they occupy at the end of their cycle of effective movement;

Figure 6 is a front elevation of Figure 5;

Figure 7 is a diagrammatic detail illustrating an initial step in the displacing of an end coil of a spring with respect to a coil or coils adjacent thereto;

Figure 8 is a similar diagram, illustrative of the mode of operation of the coil displacing means;

Figure 9 is a side elevation of a coiled spring, one extremity of which has been displaced relative to another coil or coils of the spring in accordance with the present invention; and

Figure 10 is a diagrammatic view illustrative of means whereby the terminus of the end coil of a spring is deflected inwardly over an adjacent coil.

Referring in detail to the drawings, Figures 1 and 2 show a machine effective to carry out the improved method herein claimed and embodying novel means for displacing an end coil of the spring with relation to other coils thereof. The

machine illustrated comprises a housing 1 in which is journaled, for intermittent operation, a pair of feed rolls 2 for delivering the wire 3 to be formed into a spring, through guides 4 and 5 to an arbor 6, about which the wire is wrapped by a coiling point 7 adjustably disposed adjacent the arbor. The coiling point is moved axially by a sliding tool holder 8 which is actuated by a rocker arm 9. Such motion of the coiling point effects a change in diameter of the coils being formed. A pitch finger 7' is effective to engage the coils of wire formed on the arbor 6 so as to control the "pitch" of the helix; that is, the nearness of one coil of spring to an adjacent coil.

A cutter 10 is disposed adjacent the arbor 6 for coaction therewith in severing completed coil springs from the supply of wire advanced by the said rolls 2 through the guide 4. The mechanism thus far described in detail is of conventional design and arrangement and only so much of the mechanism as is necessary for a complete understanding of the invention has been illustrated and described, inasmuch as the present invention is directed particularly to the means for displacement of end coils of springs quite regardless of the specific mechanism employed for winding or coiling such springs.

The novel mechanism for displacing the end coil relative to other coils includes a relatively stationary slide bearing 11 which is maintained in a substantially upright position, being secured to a mounting block 12 carried on a supporting bar 13 supported by the housing 1. The supporting bar may be adjusted toward and from the housing by sliding the same relative to the housing and clamping it in the desired position of adjustment by any suitable means, such as a setscrew 14. The mounting block is fixed to the outer end of the supporting bar 13 and a substantially vertical slide bearing is adjustably secured thereto by fastenings 15. By loosening the fastenings the slide bearing may be raised or lowered and then made fast, thus providing a desirable range of adjustment. The effective axis of the slide bearing can be adjusted laterally with relation to the arbor 6 by rocking it about the axis of the supporting bar 13. This adjustment can be made with precision by turning the setscrew 15' and, once the desired adjustment is secured, the parts will be held in the desired position by tightening the setscrew 14 or other suitable clamping means.

The slide bearing 11 is provided on its outer face with suitable guideways for accommodation

of a slide member 16 which is retained by closure plates 17 and 18 bridging the guideways and held in place by screws 19. At its upper extremity the slide member 16 carries a substantially horizontal pivot bearing 20 in which a shaft 21 is journaled. Rigidly secured to the shaft 21 (as best shown in Figures 1 and 5) is a crank-like member having a lateral extension 22 carrying a pry pin 23 which is disposed substantially parallel to the slide 16 and which terminates in a point substantially or approximately coincident with the pivotal axis of the shaft 21.

Rigidly secured to the shaft 21 adjacent the member 22 there is a pinion 24 by means of which the shaft 21, member 22 and pry pin 23 are actuated. Motion is imparted to the pinion by means of a rack 25 secured to a slide 26 which is slidably mounted in the slide 16. As thus arranged the rack is capable of sliding motion relative to the slide 16.

The slides 16 and 26 are independently reciprocated by respective cams 27 and 28 secured to a shaft 29, the extremity of which projects through the housing 1 at a point below, and to one side of, the paths of movement of the slides (see Figures 1 and 2). The slide 16 is lifted by the cam 27, acting through a follower tappet 30 pivoted on a stud 31 projecting from the housing 1. The tappet, at its outer end, carries a setscrew 32 by means of which the distance between the outer end thereof and the lower extremity of the slide 16 can be varied.

The slide 26 is lifted by the cam 28, acting through a follower tappet 33 freely pivoted on the stud 31. This tappet also carries a setscrew 34 for varying the distance between the extremity thereof and the bottom of the rack slide 26. Respective tension springs 36 and 37 serve to retract the slides 16 and 26.

In operation, the cutter 10, in severing the previously formed spring from the arbor, leaves one or more coils of wire remaining thereon. Upon engagement of a clutch 35, the coiling mechanism is actuated to feed the wire forward for the formation of one or more coils upon the arbor, whereupon the clutch 35 automatically renders the coiling apparatus non-operative and establishes a driving connection to the cam shaft 29. The cams are rotated relative to the tappets 30 and 33, and the cam 27 causes the lever 30 to rock upwardly to a position effective to insert the pry pin 23 between the outermost coil of the spring retained on the arbor 6 and the coil adjacent thereto in a manner suggested in Figures 4 and 7. At this time the cam 28 commences to rock the tappet 33, which, in turn, lifts the rack slide 26 and with it the associated rack 25. The movement of the rack turns the pinion 24, thus causing the member 26 to be raised through an arcuate path and thereby impart an upward movement to the pry pin 23. The pin moves in a plane which passes approximately through the longitudinal axis of the arbor 6, as will be apparent from the relative position of these parts illustrated in Figures 1 and 6.

As the pry pin 23 travels upwardly, its pointed end (as best shown in Figure 7) is inserted between the outermost coil of the spring and the one adjacent thereto. Upon further revolving movement, the pin makes a fulcruming engagement with the coil next adjacent the end coil, thus prying the end coil upwardly across said adjacent coil, as suggested in Figure 8, where-

upon, due to its inherent resiliency, the end coil slips from the pry pin and springs substantially to the position shown in Figures 2, 8 and 9. Once the end coil has been thus sprung into position, it will there remain because of the inherent resilient character of both the spring as a whole and the wire used in its formation.

After the free end of the spring has been pried to its final resting position as described, the cam 28 moves to a position effective to permit the tension spring 36 to return the slide 26 to its starting position, whereupon the associated parts controlled by the pinion 24 are likewise returned to starting position. Similarly, the cam 27 allows the tappet 30 to fall, thus permitting the slide 16 to be pulled downwardly by the tension spring 37, returning the assembly to the starting position of Figures 1 and 2. At this time the clutch 35 automatically disengages the cam shaft 29 from the power drive and restores the drive to the coiling device which then proceeds to complete the spring, as is shown in Figure 1. The cutter mechanism is then actuated to sever the spring from the supply of wire, leaving one of more coils on the arbor, as has already been mentioned, and the spring is discharged by gravity, thus completing one cycle in the operation of the machine.

It will be appreciated that springs of almost any shape may be acted upon in accordance with the present invention without regard to the diameter of end coils affected thereby. In case appreciably larger or smaller coils are to be wound, the setscrews 32, 34 may be adjusted to vary the initial settings of the slide 16 and rack slide 26 and the cams may be plotted, to increase or decrease the effective ranges of movements of the respective slides. For extremely fine work, the pry pin 23 may be made much smaller to suit the requirements of the job.

In some instances a space is provided beyond the adjacent coil over which the terminal coil is pried and into which the end of the terminal coil may fit and be held fast. This may be accomplished by making the two end coils C and C' of larger diameter than the barrel of the spring, as illustrated in Figure 9, or by making the third, and perhaps other coils C², of relatively smaller diameter, as shown, to form an annular groove g into which the turned back end e may lie.

In the described operation the pry pin operates to snap the end coil of the spring over the coil adjacent thereto, thus what was the extremity of the coil spring is displaced inwardly from the end of the spring considered as a whole. In the prying operation described, the extremity of the spring before being displaced is uppermost, as shown in Figure 4, thus the upward fulcruming movement of the pry pin 23 causes the end coil to be lifted over an inner coil adjacent thereto, whereupon the end coil snaps back of the adjacent coil. It will be understood, however, that, in much the same manner as suggested in Figure 10, if the extremity of the end coil were lowermost or below the center line of the arbor, the fulcruming motion of the pry pin may be made effective to lift the end coil inwardly of the spring, whereupon it would be snapped inwardly over the adjacent coil and thus be disposed in cross relation to the adjacent coil. In short, the cross relationship of the end coil with the adjacent coil may be secured by either snapping the end coil outwardly over the exterior of the adjacent coil, as illustrated in Figures 4, 7

and 8, or the end coil may be snapped inwardly of the adjacent coil when the cooperating parts are properly positioned.

Although we have shown and described a specific method of forcing the free end of a spring to a position of rest wherein it will be disposed in cross relation to an adjacent coil and have shown specific means for carrying out such method, we do not wish to be limited thereto since various modifications and substitutions may be made without departing from the scope of the invention, as defined by the following claims.

We claim:

1. In a machine of the character described, coiling means for forming coil springs, mechanism for deflecting a portion of an end coil of a spring being formed across a contiguous coil comprising means for prying said end coil across said contiguous coil, and means for retracting said prying means to a zone clear of said spring coiling means.

2. In a machine for making coil springs including an arbor about which the springs are formed, means for displacing an end coil of a spring being formed comprising a pry pin, means for causing the insertion of said pry pin between the terminal coil of a spring and a coil adjacent thereto, means for rocking the pry pin relative to the spring so as to pry the end coil into cross relationship with one of the other coils thereof, and means for retracting said pin, thus leaving said coils in cross relationship.

3. In a machine for making coil springs, mechanism for turning back an end coil of a spring being formed to overlie adjacent coils comprising a pry pin, means associated therewith to move it into and out of engagement with coils of the spring, and other means for revolving the pin about an axis at an angle to the longitudinal axis of the spring.

4. In a machine for making coil springs, mechanism for turning back a portion of an end coil of the spring being formed to overlie a contiguous coil comprising a pry pin, means associated therewith to move it in directions of its length, and other means for revolving said pin bodily about an axis substantially or approximately perpendicular to the longitudinal axis of the spring.

5. In a machine for making springs, coiling means, a normally fixed bearing, a slide movable therein, a revolving element carried by said slide, a pry pin carried by the revolving element, means for moving the slide toward and from said coiling means, and means actuated in predeter-

mined timed relationship with respect to the movements of the slide for actuating said revolving element.

6. In a machine for making springs, coiling means, a normally fixed bearing, a slide movable therein, a revolving element carried by said slide, a pry pin carried by the revolving element, a pinion for revolving said element, a rack actuating the pinion, and respective means for intermittently reciprocating said slide and said rack.

7. In a machine for making springs, coiling means, a normally fixed bearing, a slide movable therein, a revolving element carried by said slide, a pry pin carried by the revolving element, means for moving the slide toward and from said coiling means, and adjustable supporting means for said slide for varying the relationship between said coiling means and said revolving element.

8. In a machine for making springs, coiling means, a normally fixed bearing, a slide movable therein, a revolving element carried by said slide, a pry pin carried by the revolving element, a pinion for revolving said element, a rack actuating the pinion, respective intermittently actuated tappets for reciprocating said slide and said rack, and means to vary the effective relationship between said tappets and the respective parts with which they coast.

9. In a machine for making springs, coiling means, a normally fixed bearing, a slide movable therein, a revolving element carried by said slide, a pry pin carried by the revolving element, a pinion for revolving said element, a rack actuating the pinion, respective intermittently actuated tappets for reciprocating said slide and said rack, said tappets carrying respective adjustable elements through which motion is transmitted to said slide and said rack, and adjustable supporting means for said slide, said rack and parts actuated thereby whereby this relationship to said coiling means may be varied to suit the requirements of the particular type or size of coil to be wound.

10. In the manufacture of helical spring-like articles, the method which comprises forming successive coils about a forming axis from a continuous supply, forcing the free end coil into cross relationship with one of the previously formed coils, thereafter forming additional coils to form a complete unit, and severing said unit from the continuous supply at a point to leave at least one coil encircling said forming axis.

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55