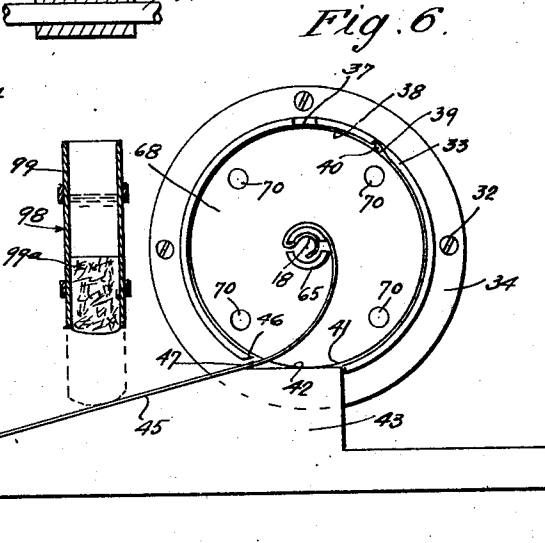
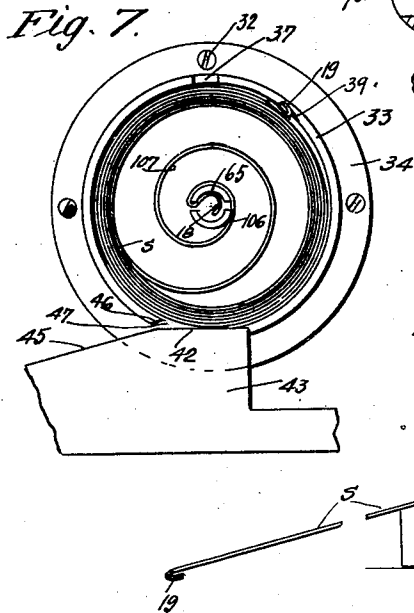
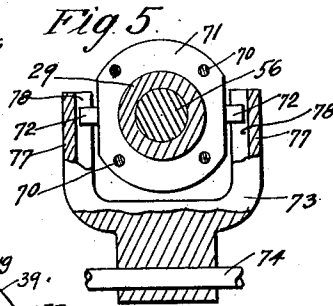
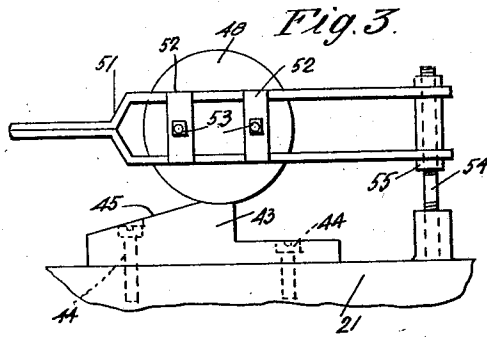
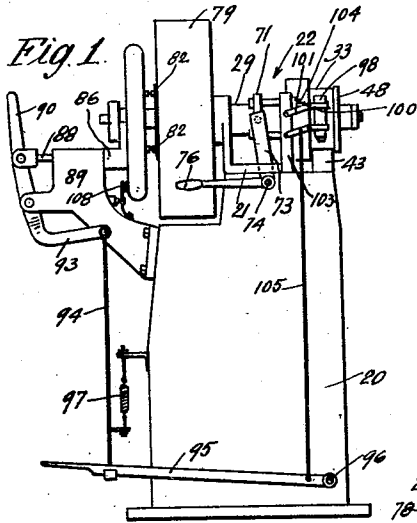


Jan. 27, 1931.

J. P. APPLEBY
MACHINE FOR WINDING SPIRAL SPRINGS AND
INSERTING THE WOUND SPRINGS IN DRUMS
Filed Jan. 3, 1927

1,790,218

3 Sheets-Sheet 1



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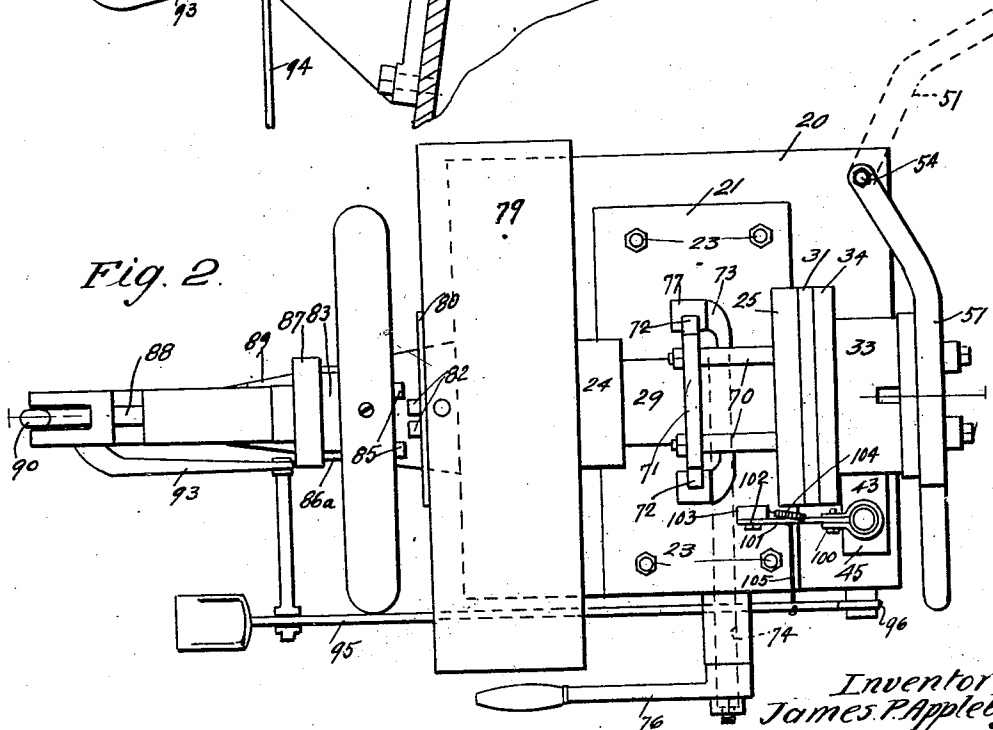
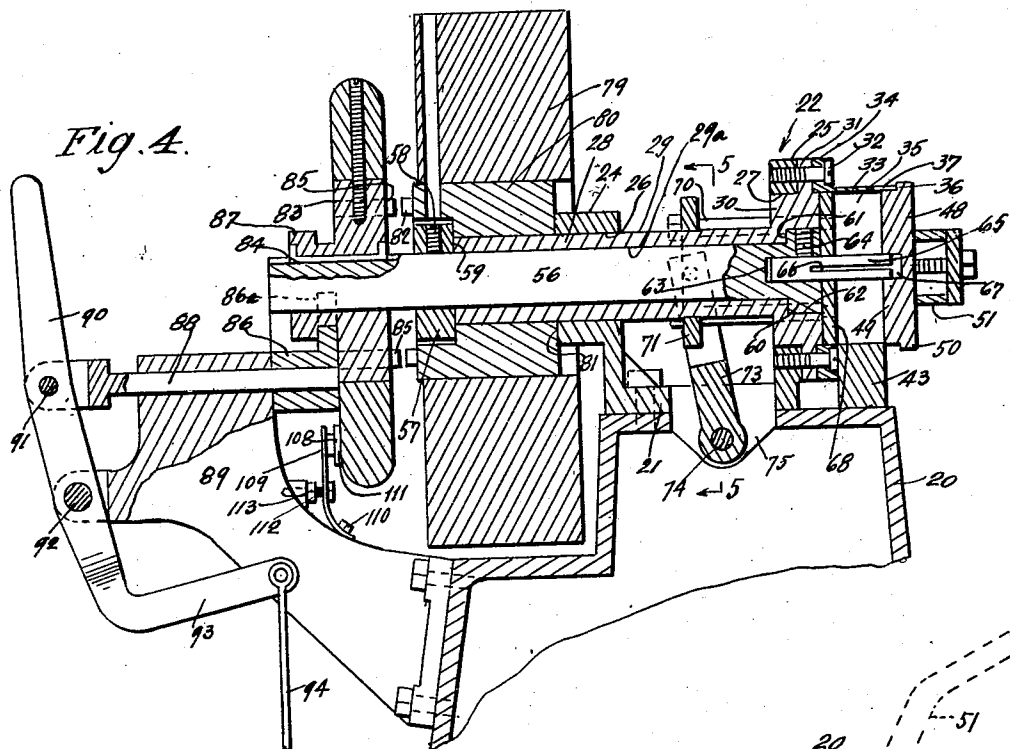
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 9.

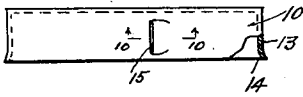


Fig. 8.

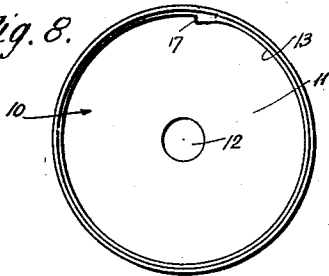


Fig. 10.

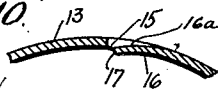


Fig. 11.

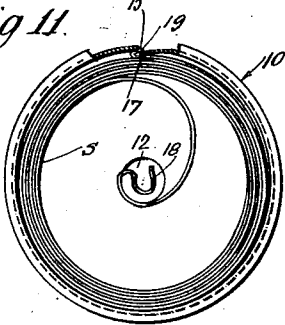


Fig. 12.

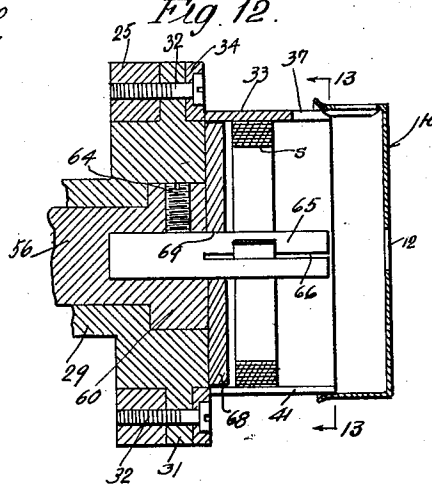


Fig. 14.

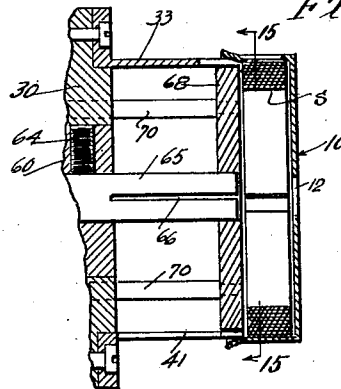


Fig. 13.

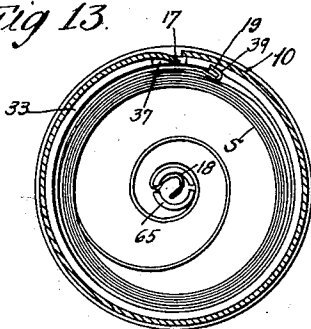
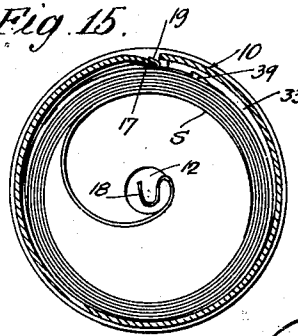


Fig. 15.



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UNITED STATES PATENT OFFICE

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MACHINE FOR WINDING SPIRAL SPRINGS AND INSERTING THE WOUND SPRINGS IN DRUMS

Application filed January 3, 1927. Serial No. 158,587.

This invention has to do generally with spring winding machines and is more particularly concerned with machines for winding flat springs into spirals. It is also concerned with means for ejecting the wound springs from the winding cylinder or compartment of the device and bodily transferring them to the bores of barrels or drums with which they are to be assembled.

While the invention may be embodied in spring-winding machines irrespective of the ultimate disposition of the wound springs, it may be applied with particular advantage to the winding of sash-balance springs and to the disposition of such springs in the winding drums of such balances. Furthermore, it is particularly effective in the transfer of wound springs to drums wherein a hooked end of the spring is to be put into connection with the peripheral wall of the drum, for my machine is adapted to make such connection without necessitating effort on the part of the operator or requiring any special mechanism.

I have also provided novel means for lubricating the spring as it is wound, it having been found entirely unsatisfactory to attempt lubrication by the application of so-called "penetrating-oils" or by packing the drums with hard oil after the spring has been inserted.

Generally, the object, of my invention is to provide a simple, efficient device of the character described, whereby spring winding and insertion may be accomplished with facility, accuracy and speed, thus contributing greatly to the efficient manufacture of sash balances and the like.

Other objects and novel features of the invention may be discussed to much better advantage in connection with the following detailed description, reference being had to the accompanying drawings, in which:

Fig. 1 is a side elevation of a device embodying my invention;

Fig. 2 is an enlarged plan view of Fig. 1;

Fig. 3 is a fragmentary, enlarged view of Fig. 1 looking from the right thereof, certain rearwardly lying parts being omitted for sake of simplicity;

Fig. 4 is a section partly in elevation on line 4—4 of Fig. 2;

Fig. 5 is a section about on line 5—5 of Fig. 4;

Fig. 6 is an enlarged fragmentary view of the face of the winding cylinder showing one step in the operation of the device;

Fig. 7 is a view similar, in part, to Fig. 6 but showing another step in the operation;

Fig. 8 is an elevation of a cup-shaped drum into which my device is adapted to insert a wound spring;

Fig. 9 is a top, plan view of Fig. 8;

Fig. 10 is a fragmentary section on line 10—10 of Fig. 9;

Fig. 11 is a view similar to Fig. 8, but partly in broken-away section and showing a spring inserted therein;

Fig. 12 is a sectional view of the cylinder end of the device showing a spring wound therein and ready to be transferred to a winding drum;

Fig. 13 is a section on line 13—13 of Fig. 12;

Fig. 14 is a view similar to Fig. 12 but showing the spring transferred to the drum; and

Fig. 15 is a section on line 15—15 of Fig. 14. As stated above, my device is adapted to wind springs irrespective of their ultimate disposition, though it is especially efficient in winding sash balance springs and disposing them within sash balance winding drums. Furthermore, it is particularly well adapted to insert the wound springs in drums of the type illustrated in my copending application for U. S. Letters Patent entitled Sash balance, filed April 20, 1926, Serial No. 103,247 (Patent No. 1,699,267, dated January 15, 1929), the nature of drums of this type being such that there are presented certain difficulties in inserting the springs which do not exist in other types, though these difficulties are readily overcome by my device. However, it is to be thoroughly understood that this showing and reference to a particular type of drum and description of the insertion of a spring thereinto are not to be construed as limitative on my invention, considered in its broader aspects, though they

will make it apparent to those skilled in the art how the invention may be applied with advantage to other situations.

In order that a better understanding may be had of what the machine is intended to do and the problems overcome thereby, I will first describe a particular drum in which the spring is ultimately to be disposed, reference being had especially to Figs. 9, to 11, inclusive.

Drum 10 is cup shaped, the bottom 11 being centrally apertured at 12 to take a shaft or axle (not shown) of the sash-balance assembly. The peripheral wall or flange portion 13 of the cup is preferably flared outwardly slightly at 14 and is pierced at 15 and struck inwardly at 16 adjacent slit to provide a shoulder 17 spaced inwardly from the inner peripheral face of the flange. It will be noted that slit 15 is not of a nature to permit a spring to be wound therethrough into the cup hollow.

Spring S, which comes from the factory in flat, straight ribbon form, is provided with hooks 18 and 19 at its opposite ends, and the problem is to dispose this spring in the form of a spiral within the cup 10, to dispose hook 18 approximately over aperture 12 so it may be readily hooked into the axle (not shown) projecting through said aperture in the assembled sash balance, and to hook the hooked end 19 over shoulder 17, the free extremity of said hook 19 to lie in facial depression 16a formed by striking down flange portion 16. This condition is shown in Fig. 11. It will be noted that flange portion 16 may be considered as an inwardly extending lip, the end 17 of said lip forming a hook-taking shoulder. Since slit 15 is closed at both ends, it will be seen that hook 18 may not be moved sidewise into engagement with shoulder 17, this preclusion necessitating certain provisions in order that hook engagement may be accomplished automatically.

In Fig. 1 I have illustrated a standard 20 to the top of which a base 21 of an operating head, generally designated at 22, is bolted at 23. Extending from base 21 are the spaced uprights 24, 25 having axially aligned bores 26, 27, respectively. Shank portion 28 of quill 29 is taken in bore 26, while quill-head 30 is taken in bore 27, said head having an annular flange 31 secured by screws 32 to upright 25 to hold the quill against displacement in every direction.

Screws 32 also serve to hold the winding barrel or cylinder 33 to quill-head 30 and upright 25, said screws passing through cylinder flange 34 for this purpose. The bore of cylinder 33 is indicated at 35 and it will be noted that the forward edge 36 of the cylinder wall (Fig. 6) is notched inwardly at 37, while the inner peripheral wall 38 of the cylinder has a notch 39 which opens to forward edge 36 and is spaced angularly from

notch 37. Notch 39 presents a square-cut shoulder 40 extending longitudinally of the cylinder and faces away from notch 37. The purposes of these notches will appear presently.

The cylinder wall is also cut away at 41 to admit the top 42 of shoe 43, said shoe being secured at 44 (Fig. 3) to base 21 and having upper face 45 inclining from top 41. The shoe and cylinder-wall shoulder 46 define the aperture 47 through which spring S is admitted to bore 35.

There is provided a gate 48 for closing the open end of cylinder 33, said gate having a body portion 49 adapted to enter said bore, and a flange portion 50 adapted to shoulder against edge 36. This gate is mounted for movement to and from a position of closure by means of an operating lever 51, connection between the gate and lever being made through straps 52 and bolts 53. The lever, in turn, is pivotally mounted on the base-carried stud 54, being held in the proper horizontal plane by the stud-carried nut 55. Movement of lever 51 to and from the dotted line position of Fig. 2, swings the gate open and closed.

Having rotational bearing in the bore 29a of quill 29 is a coaxial shaft or mandrel 56, said shaft being releasably held against longitudinal displacement by the engagement of collar 57, positioned on the shaft by set screw 58, with quill-end 59, and the engagement of mandrel head 60 with the bottom wall 61 of the countersink 62 provided in quill-head 30. Held in mandrel bore 63 by set screw 64 and with its free end extending into bore 35, is a chuck 65, said chuck being characterized as a tubular spindle having longitudinally extending slot 66 opening to its free end, said end projecting substantially to cylinder edge 36 and being taken in body bore 67 when gate 48 is closed. It will be understood, of course, that mandrel 56, chuck 66 and cylinder 33 are preferably coaxial.

A disk-like ejector head 68 is mounted in bore 35 for movement in the direction of the cylinder axis, said head being centrally apertured at 69 to take chuck 66 with sliding fit. Extending rearwardly from head 68 are slide rods 70, said rods being adapted to slide through suitable apertures in quill-head 30 and being secured at their rearward ends to ring 71 which is slidably mounted on quill-shank 28 and carries oppositely disposed pins or lugs 72 (Fig. 5). A shifter fork 73 is rigidly carried on a rock shaft 74, the latter being journaled in depending base ears 75 and extending through and beyond one of the standard walls to take operating handle 76. The fork arms 77 have longitudinally extending ways 78 into which pins 72 fit.

It will be seen that oscillation of shaft 74 is adapted to move head 68 from inoperative or retracted position (in which position it en-

gages the end of quill head 30, see Figs. 4 and 12) to operative or ejecting position (see Fig. 14) when it is substantially flush with edge 36 and the end of the chuck; and vice-versa.

Any suitable means may be employed for rotating mandrel 56, but I have here shown means which is preferable due to its simplicity and general efficiency. A pulley 79, adapted to be driven from any suitable power-source (not shown) carries a tight bushing 80 which has rotational bearing on quill shank 28, collar 57 and the opposing face 81 of upright 24 limiting the end play of the pulley on the quill. Bushing 80 carries clutch pins 82 projecting towards clutch disk 83 which is keyed to mandrel 56 at 84, though capable of limited movement longitudinally along said mandrel. When disk 83 is in the position of Fig. 4, pulley 79 merely idles on quill 29, but when it is moved sufficiently to the right, as viewed in this figure, its clutch pins 85 are drivingly engaged by pins 82, and mandrel 56 and chuck 65 are rotated in a counter-clockwise direction, as viewed in Fig. 6.

As a preferred means for moving disk 83 into and out of operative connection with pulley 79, I provide a shifter fork 86, the arms 86a of which are entered between disk 83 and its integral, spaced flange 87. The fork is carried on slide rod 88 which is slidably mounted in the standard-carried bracket 89. A hand operating lever 90 is pivotally connected, with suitable lost-motion, to rod 88 and bracket 89 at 91 and 92, respectively, it being evident that pivotal movement of said handle is adapted to engage or disengage the clutch.

As a convenience, provision may be made for foot operation of the clutch. For instance, lever 90 may have an angular or crank extension 93 connected through tension rod 94 to a foot lever 95 which is pivoted to standard 20 at 96, a spring 97 being applied to the standard and rod 94 in a manner tending normally to lift said rod and thus hold the clutch out of engagement. On the other hand, depression of lever 95 causes downward movement of rod 94 and hence brings about clutch engagement.

As will hereinafter be made apparent, spring S is drawn over shoe 47 as it is wound into the cylinder and I provide means for lubricating the spring as it is thus being drawn. This method of lubricating is a superior one, as it is found that attempts to lubricate the springs (either by "penetrating" or hard oils) after insertion in their drums, do not result successfully.

For this purpose I provide an oiler 98 (Figs. 1 and 6) which is supported above shoe 43. This oiler is preferably in the form of a vertical, tubular reservoir 99 in the lower end of which is introduced a swab 99a which may vary as to oil absorbing and pass-

ing characteristics to meet various lubricating needs. A suitable supply of oil, which may be easily replenished through the upper, open end of the tube, serves to keep the swab saturated.

It is preferable that the oiler be kept well clear of shoe 43 while springs are being placed in starting position (Fig. 6) in order not to interfere with this operation. Therefore, I have pivotally connected the tube at 100 to the outer ends of parallel, equi-length links 101 which are pivotally connected at 102 to standard-carried post 103, a spring 104 being employed between the post and one of the links to hold the tube normally appreciably spaced above shoe 43. A pull cable 105 extends from the lower link to foot lever 95, it following that depression of said lever to cause rotation of chuck 65 and consequent movement of the spring into the cylinder (as will be made apparent shortly) exerts a pull on cable 105 and depresses the oiler (dotted lines in Fig. 6) and brings swab 99a into position to apply oil to spring S. Release of lever 95 allows spring 104 to retract oiler 98 to elevated position.

I will now describe a typical cycle of operation of my device. On end of spring S is slipped sidewise through opening 47 and hook 18 is engaged with chuck 66 as shown in Fig. 6. Gate 48 is then closed and disk 83 is drivingly engaged with pulley 79 to cause rotation of mandrel 56 and chuck 65. For an instant the operator holds back relatively hard on the free end of spring S in order that the inner end of said spring may have a relatively sharp bend 106 adjacent hook 18, and then the operator holds back less strongly so the spring adjacent bend 106 curves easily at 107 towards the periphery of the cylinder. These precautions are taken to insure that the spring, as finally disposed in drum 10, may have its hook 18 approximately over aperture 12.

The winding then continues until hook 19 is drawn into the drum, said hook finally engaging shoulder 40 to prevent further movement of that end of the spring (Fig. 7). Rotation of the chuck preferably is continued for a few turns until the spring is somewhat tight and then disk 83 is unclutched. Mandrel 56 now being free to turn, spring S has an unwinding tendency which imparts clockwise movement (as viewed in Fig. 7) thereto. A certain amount of this movement is desirable, but the desirable amount is limited. There is sought a certain, fairly critical extent of movement which will somewhat loosen the hold of spring S on chuck 65 and yet not allow the spring to unwind sufficiently to expand it too tightly against the cylinder wall. With the spring too tight on the chuck or too tight against the cylinder, its ejection from bore 35 would be too difficult.

I control this reverse rotation of the man-

drel by a friction brake 108 which includes a flat spring 109 anchored at one end to bracket 89 by bolt 110 and having a friction shoe 111 at its other end. When disk 83 is unclutched from pulley 79, shoe 111 is adapted to engage the side face of the disk with sufficient force to allow only the desired, predetermined amount of reverse rotation of said disk and mandrel under the influence of the spring. The effective braking force of shoe 111 may be varied by adjustment of screw 112 which extends through spring 109 into bracket 89, there preferably being a lock nut 113 for holding the adjustment.

Gate 48 is now swung aside to clear the cylinder end, and drum 10 is applied to the cylinder in the manner shown in Fig. 12. The flare 14 of the drum is of such inside diameter that the drum edge slightly overlaps the cylinder, and the lip 16 is adapted to be taken in notch 37 (Figs. 12 and 13) shoulder 17 then facing in the same direction as shoulder 40 but being angularly spaced in advance thereof. Notch 37 may thus be considered as cooperating with lip 16 to force the positioning of the drum on the cylinder so it is assured that there be angular spacing between shoulders 40 and 17. The inside diameter of the drum, proper, is somewhat greater than that of the cylinder, it following that when ejector head 68 is moved outwardly to full ejecting position (Fig. 14) by the mechanism previously described, hooks 18 and 19 are slid off the ends of the chuck and shoulder 40, respectively, and the spring is bodily and freely movable into the drum, though immediately it clears the cylinder it expands radially into contact with the drum flange. At the same time the inherent characteristics of the wound spring moves hook 18 around the flange of the drum in a counter-clockwise direction (as viewed in Fig. 13) said hook finally being drawn into slit 15 and hooking over shoulder 17, (Fig. 15). The drum and spring when removed from the cylinder are in the condition shown in Fig. 11, as is desired.

It is believed a full understanding of the invention will be had from the foregoing but it will be understood the drawings and description are to be considered merely as illustrative of and not restrictive on the broader claims appended hereto, for various changes in design, structure and arrangement may be made without departing from the spirit and scope of said claims.

I claim:

1. In a machine of the character described, a relatively stationary cylinder open at its forward end, said cylinder having an opening through its peripheral wall for the admission of a flat spring to its bore, a revolvable chuck substantially coaxial with the cylinder bore and extending thereinto from the

rearward end of the cylinder, said chuck being adapted to hold one end of the spring in a manner whereby rotation of the chuck winds the spring thereabouts and into the cylinder, and means for rotating the chuck; said chuck being characterized as a tubular spindle having a slot through its peripheral wall, said slot extending substantially parallel to the axis of rotation of the spindle and opening to the forward spindle end.

2. In a machine of the character described, a relatively stationary cylinder open at its forward end, said cylinder having an opening through its peripheral wall for the admission of a flat spring to its bore, a revolvable chuck substantially coaxial with the cylinder bore and extending thereinto from the rearward end of the cylinder, said chuck being adapted to hold one end of the spring in a manner whereby rotation of the chuck winds the spring thereabouts and into the cylinder, means for rotating the chuck; said chuck being characterized as a spindle having a slot extending substantially parallel to its axis of rotation and opening to the forward spindle end, said slot being adapted to take a hook provided on the end of the spring; and an ejector adapted both to thrust the wound spring from the cylinder and to move said hook through the slot and off the end of the spindle.

3. In a machine of the character described, a relatively stationary cylinder open at its forward end, said cylinder having an opening through its peripheral wall for the admission of a flat spring to its bore, a revolvable chuck substantially coaxial with the cylinder bore and extending thereinto from the rearward end of the cylinder, said chuck being adapted to hold one end of the spring in a manner whereby rotation of the chuck winds the spring thereabouts and into the cylinder; means for intermittently applying rotative spring winding force to said chuck, and means yieldably resisting movement of said chuck in a spring-unwinding direction when said force is relieved therefrom.

4. In a machine of the character described, a relatively stationary cylinder open at its forward end, said cylinder having an opening through its peripheral wall for the admission of a flat spring to its bore, a revolvable chuck substantially coaxial with the cylinder bore and extending thereinto from the rearward end of the cylinder, said chuck being adapted to hold one end of the spring in a manner whereby rotation of the chuck winds the spring thereabouts and into the cylinder, means for intermittently applying rotative spring winding force to said chuck, and adjustable means yieldably resisting movement of said chuck in a spring-unwinding direction when said force is relieved therefrom.

5. In a machine of the character described,

a relatively stationary cylinder open at its forward end, said cylinder having an opening through its peripheral wall for the admission of a flat spring to its bore, a shoe over which the spring is led towards said peripheral opening, a revoluble chuck substantially coaxial with the cylinder bore and extending thereinto from the rearward end of the cylinder, said chuck being adapted to hold one end of the spring in a manner whereby rotation of the chuck winds the spring thereabouts and into the cylinder, means for rotating the chuck, and means for applying a lubricant to the portion of said spring overlying said shoe as said spring is wound into the cylinder.

6. In a machine of the character described, a relatively stationary cylinder open at its forward end, said cylinder having an opening through its peripheral wall for the admission of a flat spring to its bore, a shoe over which the spring is led towards said peripheral opening, a revoluble chuck substantially coaxial with the cylinder bore and extending thereinto from the rearward end of the cylinder, said chuck being adapted to hold one end of the spring in a manner whereby rotation of the chuck winds the spring thereabouts and into the cylinder, means for intermittently applying rotative spring winding force to said chuck, lubricating means movable into and out of engagement with the spring where it overlies said shoe as said spring is wound into the cylinder, and means for moving said last-named means into engagement with the spring only when said rotative force is applied to the chuck.

7. In a machine of the character described, a relatively stationary cylinder open at its forward end, said cylinder having an opening through its peripheral wall for the admission of a flat spring to its bore, a revoluble chuck substantially coaxial with the cylinder bore and extending thereinto from the rearward end of the cylinder, one end of the spring being adapted to be engaged with the chuck in a manner whereby rotation of the chuck winds the spring thereabouts and into the cylinder, said one spring end being disengageable from the chuck by movement endwise of the chuck, means for rotating the chuck, and means movable longitudinally through the cylinder bore and effective by virtue of such longitudinal movement both to positively disengage said one spring end from the chuck and to thrust the wound spring from the cylinder bore out through said open end.

8. In a machine of the character described, a relatively stationary cylinder open at its forward end, said cylinder having an opening through its peripheral wall for the admission of a flat spring to its bore, a revoluble chuck substantially coaxial with the

cylinder bore and extending thereinto from the rearward end of the cylinder, one end of the spring being adapted to be engaged with the chuck in a manner whereby rotation of the chuck winds the spring thereabouts and into the cylinder, said one spring end being disengageable from the chuck by movement endwise of the chuck, means for rotating the chuck, and means movable longitudinally through the cylinder bore and effective by virtue of such longitudinal movement both to positively disengage said one spring end from the chuck and simultaneously to thrust the wound spring from the cylinder bore out through said open end.

In witness that I claim the foregoing I have hereunto subscribed my name this 15th day of December, 1926.

JAMES P. APPLEBY.