March 15, 1932. W. E. WUNDERLICH 1,849,394

SPRING ASSEMBLING MACHINE

Filed May 28, 1930 5 Sheets-Sheet 1

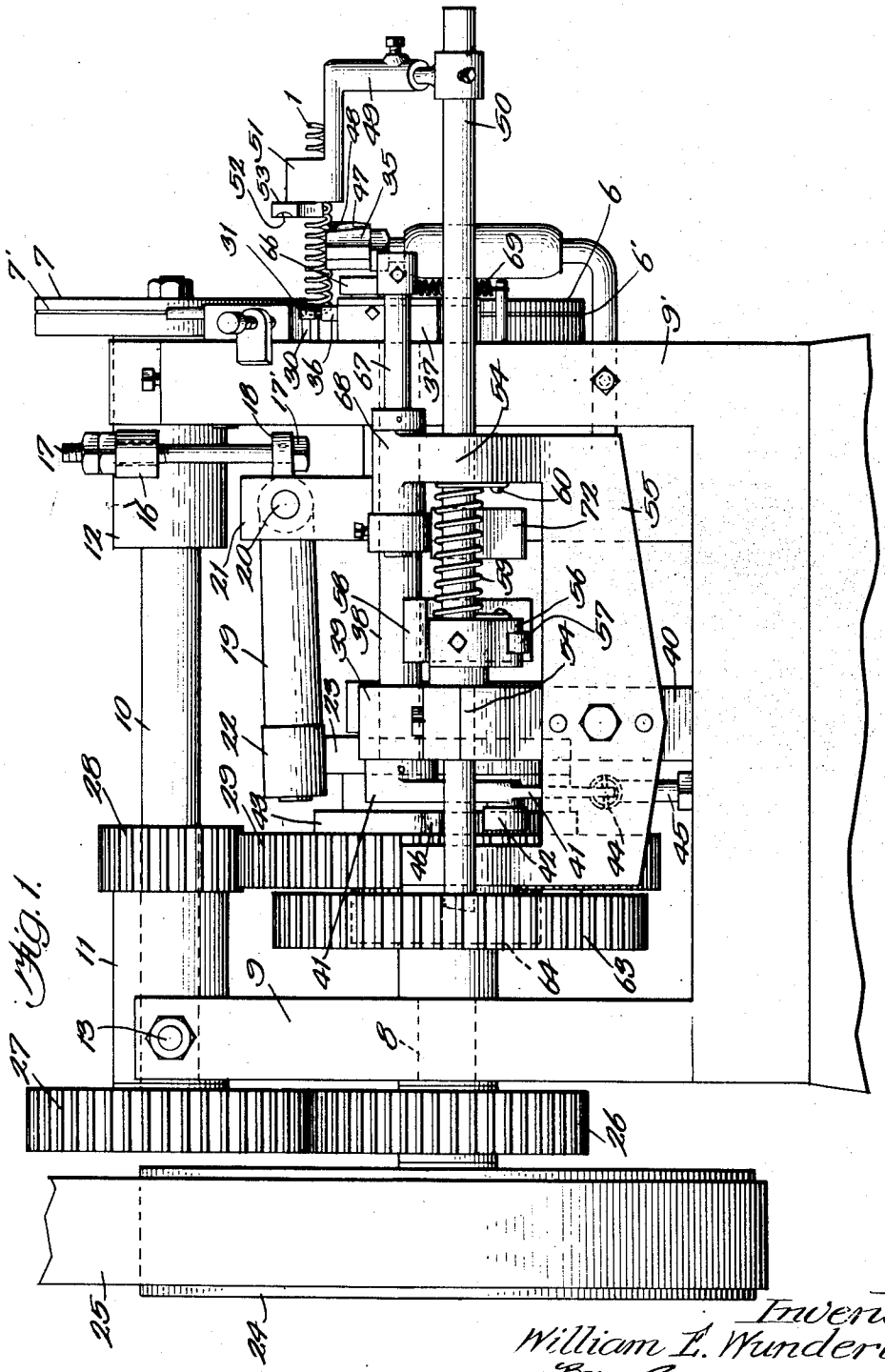


Fig. 1.

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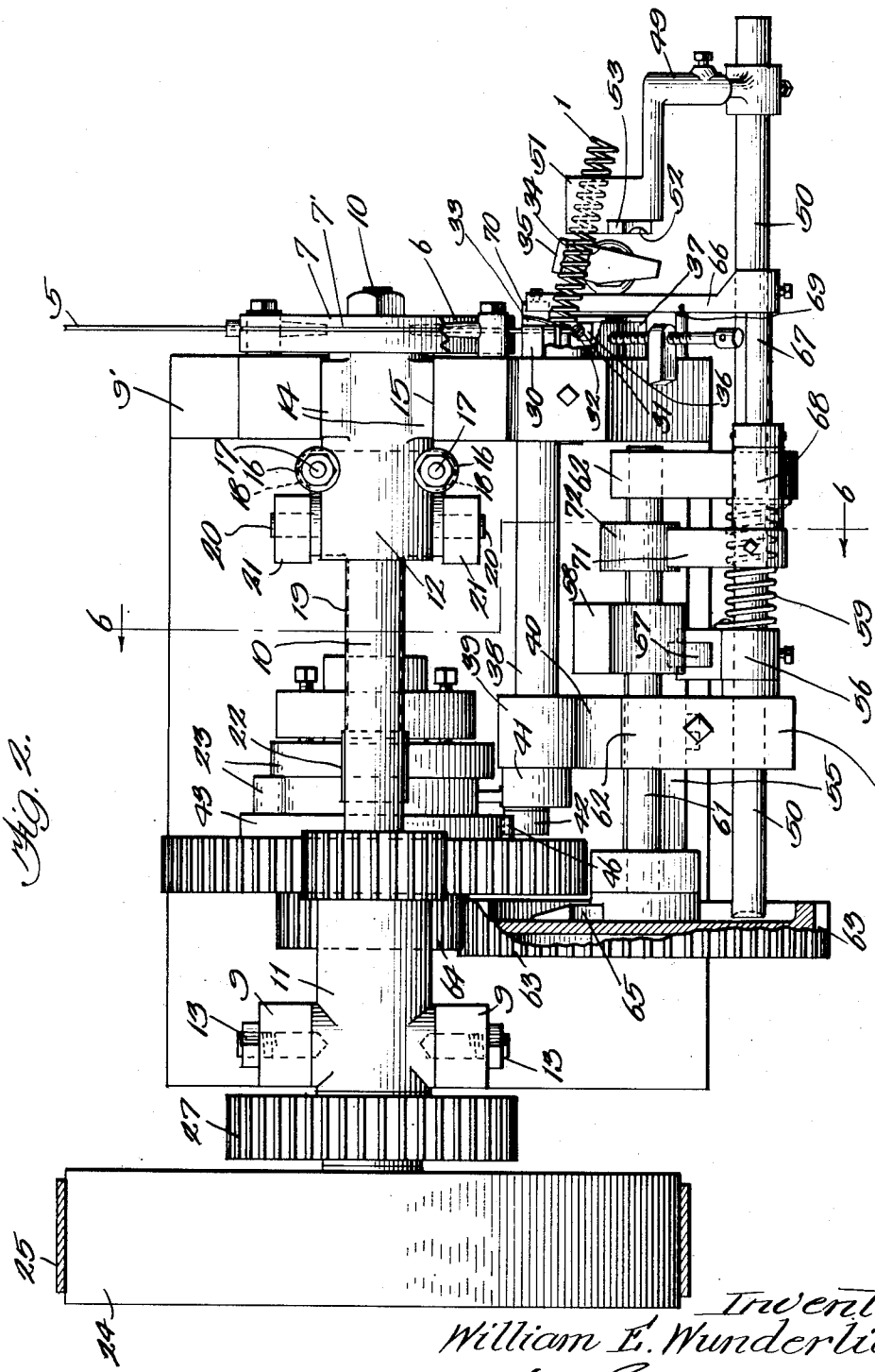


Fig. 2.

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Fig. 3.

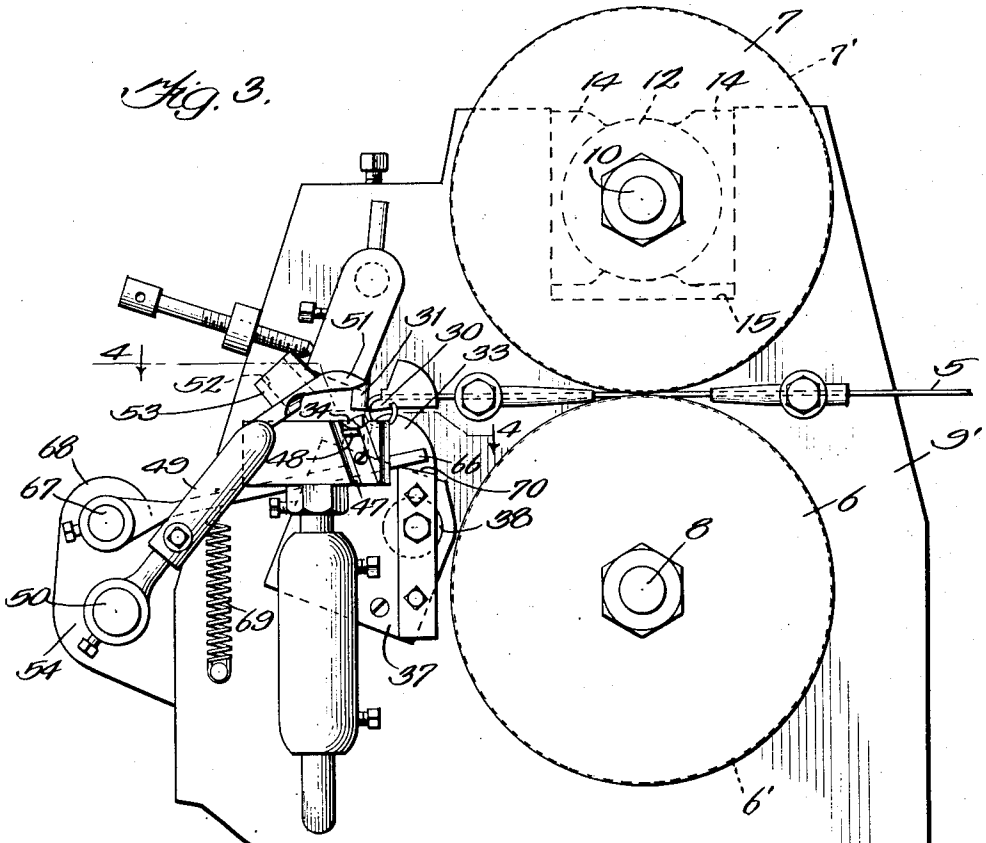


Fig. 4.

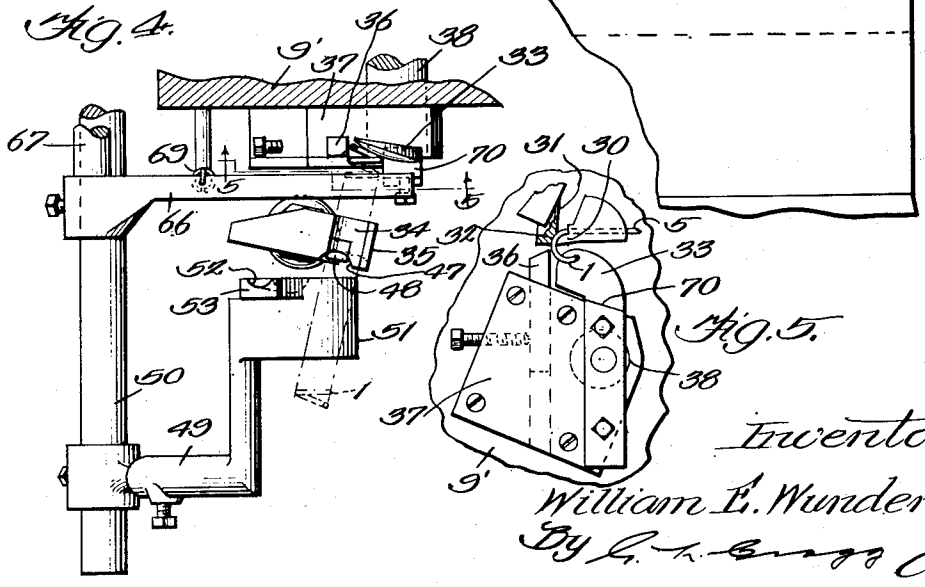


Fig. 5.

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SPRING ASSEMBLING MACHINE

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Fig. 6.

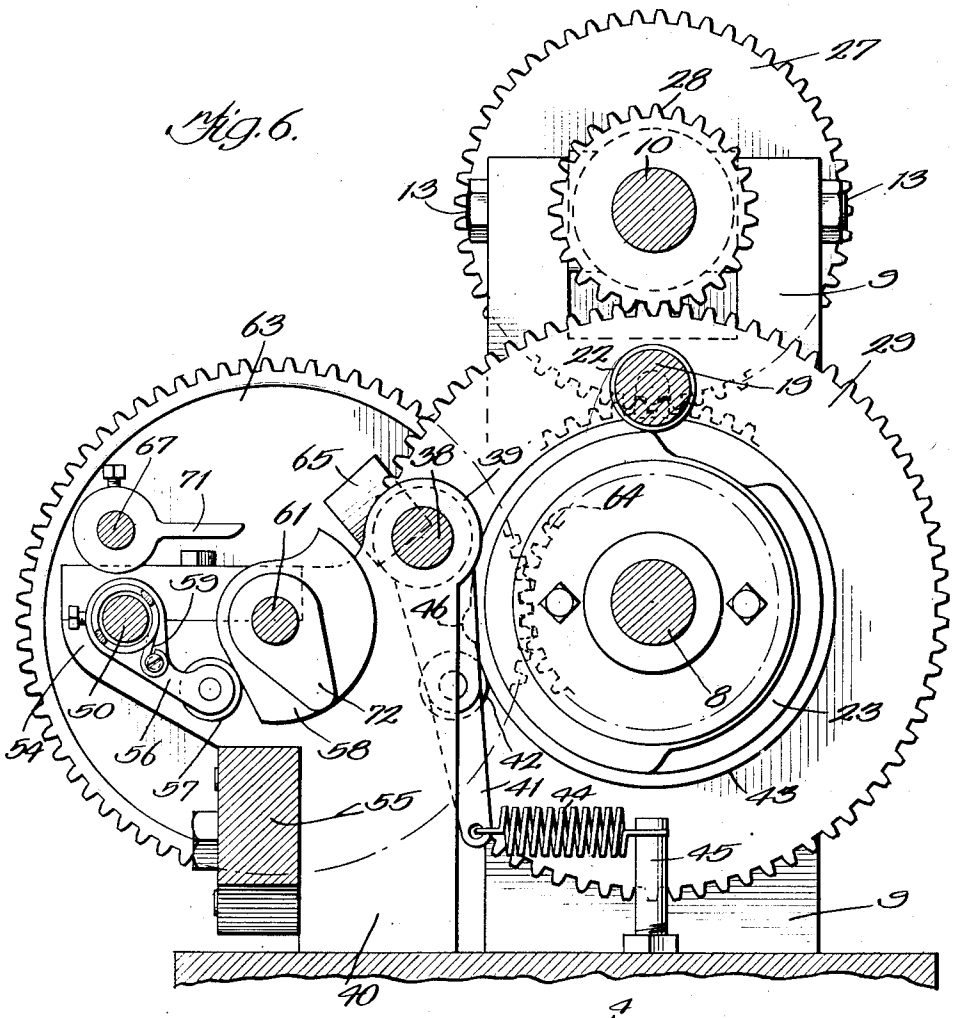
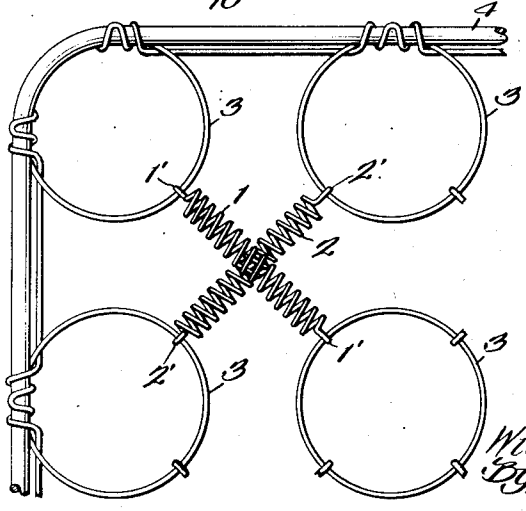


Fig. 7.



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Fig. 8

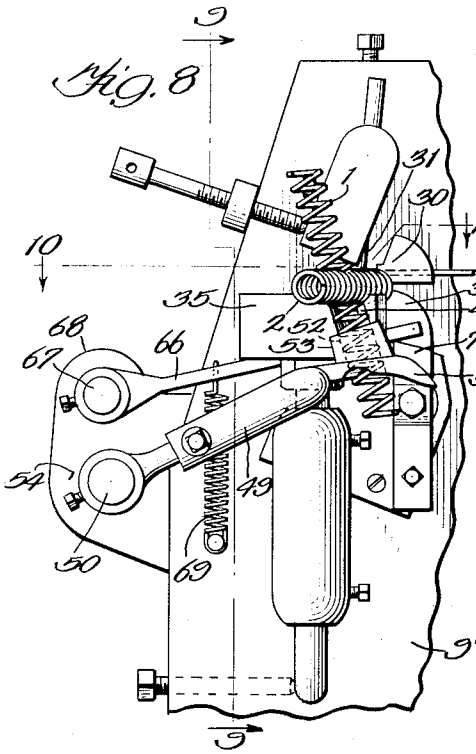


Fig. 9.

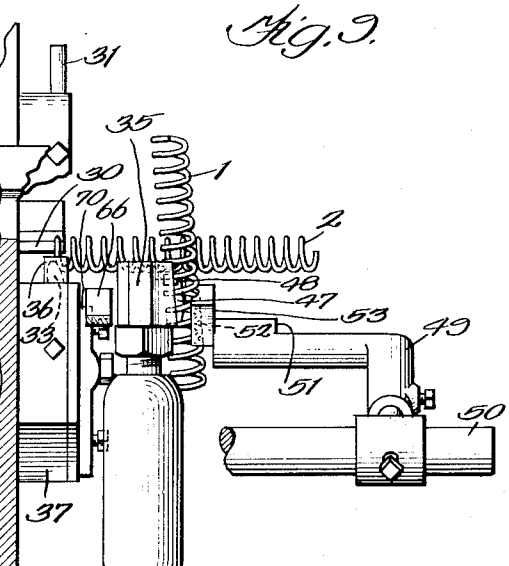


Fig. 10.

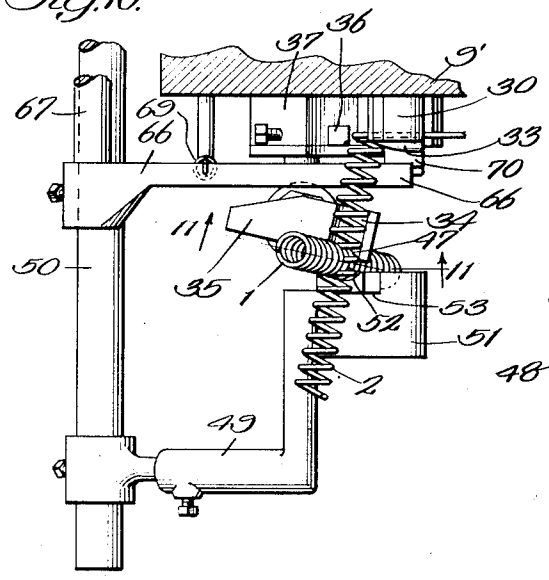


Fig. 11.

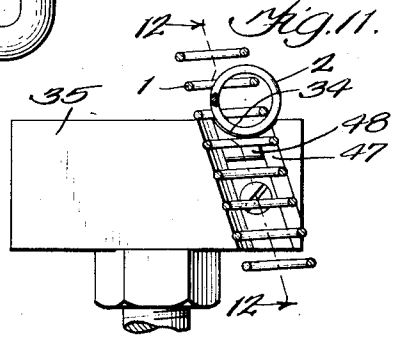
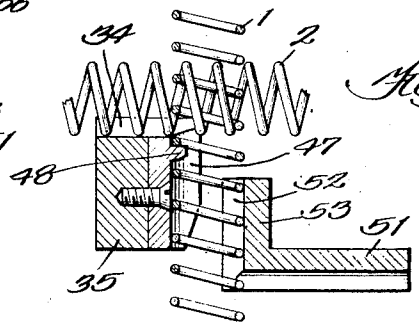


Fig. 12.



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Patented Mar. 15, 1932 1,849,394

UNITED STATES PATENT OFFICE

WILLIAM E. WUNDERLICH, OF MUNCIE, INDIANA, ASSIGNOR TO THE MOORE COMPANY, OF MUNCIE, INDIANA, A CORPORATION OF INDIANA

SPRING ASSEMBLING MACHINE

Application filed May 28, 1930. Serial No. 456,568.

My invention relates to machines for assembling coiled springs in cruciform arrangement. My invention has for its object the provision of improved mechanism for relatively positioning the springs that are to be arranged in cruciform fashion and thereafter effecting the interthreading or intermeshing thereof. In carrying out the invention means are provided for placing the springs with the axis of one in non-coincidence or offset relation with the axis of the other, so that as one of the springs is turned upon its axis in effecting threading engagement with the other, it is permitted to have free intermeshing action unobstructed by any abutting engagement of one spring with the other. My invention finds particular utility in connection with a machine by which the springs are formed, means being provided for swinging the first of each pair of springs angular to the second spring of such pair as the latter spring is being produced and in a manner to cause this latter spring to thread the first spring during the formation of such latter spring.

I will explain my invention more fully in connection with the accompanying drawings in which Fig. 1 is a side elevation of the preferred embodiment of the invention; Fig. 2 is a plan view with parts broken away; Fig. 3 is a front elevation, on a larger scale; Fig. 4 is a sectional view on line 4—4 of Fig. 3; Fig. 5 is a sectional view on line 5—5 of Fig 4; Fig. 6 is a sectional view on line 6—6 of Fig. 2, on a larger scale; Fig. 7 is a view showing the product of the illustrated machine after the ends of the coiled springs have been turned into hooks by means extraneous to the machine, this figure also illustrating one use to which the cruciform spring structure may be put; Fig. 8 illustrates some of the parts appearing in Fig. 3, in changed positions; Fig. 9 is a sectional view on line 9—9 of Fig. 8; Fig 10 is a sectional view on line 10—10 of Fig. 8; Fig. 11 is a sectional view on line 11—11 of Fig. 10, on a larger scale; and Fig. 12 is a sectional view on line 12—12 of Fig. 11.

The machine is designed to intertwine intermediate portions of two coiled springs 1 and 2 to impart a cruciform arrangement to these springs. Springs in such cruciform arrangement have been employed for connecting the top coils of upright vertical compressible bed springs 3 to constitute therewith a spring mattress which is usually provided with a surrounding border framework of which a part 4 is illustrated. My invention resides in mechanism for so relatively positioning the coiled springs 1 and 2 and so imparting relative motion thereto as to assemble them in the desired cruciform arrangement. My invention may be incorporated with a machine which also produces these springs. These coil springs have their terminals 1′, 2′ turned to lie along and preferably coplanar with the axes of these springs, respectively, to constitute hooks through which the end coils of the springs 3 are passed. These hooks 1′, 2′ are preferably formed after the springs 1 and 2 have been assembled. I do not wish to be limited, in all embodiments of the invention, to the inclusion of my improved mechanism with a machine for forming the coiled springs 1 and 2 as these springs may be otherwise produced for the purpose of being operated upon by my improved mechanism.

I will first describe the operation of the illustrated machine for producing the coiled springs 1 and 2 and will thereafter describe the mechanism of my invention.

The wire 5 out of which the springs 1 and 2 are to be formed is furnished from a suitable supply reel, not shown. This wire is received between the coplanar feeding discs 6 and 7, being received within the adjacent portions of peripheral grooves 6′, 7′ in these discs and being pressed into these grooves by the gripping action of the discs. These discs turn in a vertical plane, the lower disc 6 having a fixed horizontal axis of rotation by being carried upon a horizontal shaft 8, which is journaled in the uprights 9, 9′ forming parts of the framework of the machine. The disc 7 is journaled upon a projecting end of a shaft 10 which is journaled in bearings 11 and 12. The bearing 11 is journaled upon a horizontal axis that intersects the axis of the shaft 10 and is at right angles thereto,

pivot pins 13 carried by the upright 9 entering pivotal recesses in this bearing, as indicated in Fig. 2. The bearing 12 is provided with a square block extension 14 which is vertically movable within the upright channel way 15 in the other upright 9'. The bearing 12 has two lateral ears 16 having upright bores through which the upright rods 17 are freely passed. These upright rods are in the nature of bolts, having heads 17' at their lower ends. These rods are freely passed through the ears 18 that are provided upon the lever arm 19, the ears resting upon said heads 17'. This lever arm has a fixed horizontal axis of rotation, adjacent the rods 17, and extending at right angles to the axis of the shaft 10. For this purpose a horizontal shaft 20 passes through the lever arm 19 and is journaled upon and within frame portions 21, shafts 20 being at right angles to the shaft 10. The disc 7 is caused to exert clamping action by a downward movement of the ears 18 upon the rod heads 17' during the formation of a spring. Each time a spring has been completed these ears are lifted to release such clamping action. To this end I employ cam mechanism which is inclusive of a cam roller 22 coaxial with the lever arm 19 and a cam disc 23 upon which said roller rests by gravity, the roller being remote from the shafts 20 as compared with the location of the ears 18. Power for operating the machine is furnished from a driving pulley 24 which may be driven by a belt 25. This pulley is fixed upon the aforesaid shaft 8 upon which is also fixed a spur gear 26. This spur gear is in mesh with a spur gear 27 that is fixed upon the shaft 10. These spur gears cause the feeding discs 6 and 7 to be turned in opposite directions at the same peripheral speeds. A spur pinion 28, fixed upon the shaft 10, is in mesh with a spur gear 29 which turns loosely upon the shaft 8. The cam 23 and the spur gear 29 are in fixed relation to turn together, the gearing ratio being such that the cam 23 is turned to elevate and release the roller 22 at proper times.

The wire is fed over a curling horn 30 and against an abutment 31, this horn and abutment being so related as to coil the wire into a spring of the selected diameter. Said abutment is provided with a notch 32 that receives the wire and serves to direct it against another horn 33 which has a curved wire engaging face that defines the pitch of the spring. Shortly after the coiled wire leaves said horns and abutment it enters a groove 34 in a normally stationary block 35 which is fixed upon the frame of the machine, and is, incidentally, a part of the invention. As the formation of the spring progresses, it is fed through this groove until its mid-portion extends slightly beyond the block or holder 35. When the spring undergoing formation has reached this position, it is severed, at its trailing end, by the oscillating knife 36 which is moved clockwise, Fig. 5, for this purpose, this knife cooperating with the horn 30 in the severing operation. Said knife is carried upon a block 37 which is mounted to turn upon a horizontal axis, the block being fixed upon a horizontal shaft 38. This shaft is mounted to turn in a bearing 39 carried by the frame portion 40. The shaft is oscillated to oscillate the knife. For this purpose, a lever arm 41 is fixed upon the shaft 38. This lever carries a cam roller 42 at an intermediate portion of the lever. This roller is pressed against a cam 43 by a spring 44 having one end attached to a post 45 and its other end attached to the lower end of the lever arm 41. The cam 43 has a single rise 46 which engages the cam roller 42 each time the knife 36 is to cut the wire. The cam 43 is in fixed relation with the gear 29, whereby the knife is operated at the proper time.

I will now describe the portion of the illustrated machine which, with the block 35, is inclusive of my invention. When each formed and severed spring 1 has entered and passed along the groove 34 to a point where the mid-portion of this spring is slightly beyond the block 35. said spring is turned from its horizontal position to a vertical position. The immediately succeeding spring 2, as it is being formed, is threaded through one or two convolutions of the spring 1. When the latter spring has been turned to a vertical position or to a position substantially at right angles to spring 2, it enters a groove 47 also in the block 35, Fig. 12. An abutment tooth 48 enters the space between two adjacent coils of the spring 1, this tooth being located closely adjacent the position of the spring 2 to firmly fixed the contiguous portion of the spring 1 to hold this spring in position while it is being threaded by the spring 2.

The means for turning the spring 1 to an upright position or position angular to the spring 2 is inclusive of an arm 49 which is fixed upon a shaft 50. This arm carries a cam extension 51 which engages the spring 1 and turns it to an upright position as the arm is downwardly turned upon the corresponding clockwise movement of the shaft 50. The cam portion 51 places the spring 1 in a groove 52 which is provided in an enlargement or holder 53 of the cam portion 51. The spring 1 remains within the groove 52 and the groove 47 while the spring 2 is being threaded into the spring 1. The shaft 50 oscillates in bearings 54 which are carried by the stirrup 55, which is fixed upon the frame portion 40 of the machine. An arm 56 is fixed upon the shaft 50 and carries a cam roller 57. This cam roller is pressed against a cam 58 by means of a spring 59 which is anchored at 60 to the stirrup 55 and is joined with the arm 56 at its other end. The cam 58 is fixed upon a shaft 61. This shaft is mounted with-

in bearings 62 on the stirrup 55. The shaft 61 is turned by a spur gear 63 that is fixed thereon. This spur gear is in mesh with a spur pinion 64 that is loose upon the shaft 8 and fixed with respect to the gear 29. The ratio of the gears 63 and 64 and the shape of the cam 58 are such as to oscillate the shaft 50 at the proper intervals. The grooves 47 and 52 are so positioned with respect to the groove 34 as to locate the spring 1 with its axis to one side of the axis of the spring 2 and at right angles thereto, whereby the interthreaded or intermeshed springs are placed in exact right angular cruciform arrangement. It will be observed that the axis of the tilted spring 1 is angular to the plane of rotation of the lever arm 49 and, particularly, the clamping continuation or holder 53 of this lever, whereby the spring 1 is firmly pressed into the grooves 47 and 52 as the said lever arm reaches the concluding portion of its spring adjusting movement. In order that the best results may be procured, the groove 52 is substantially tangential to the circle on which it turns with the lever arm 49 and is substantially perpendicular to the radius of such circle that intersects the point of tangency.

After the spring 2 has been formed and threaded upon spring 1 with the middles of the two springs coincident, the spring 2 is severed by the knife 36, as has been hitherto described. The shaft 50 is next moved axially to withdraw the clamping continuation 53 of the lever arm 49 sufficiently away from the spring 1 to permit the two springs to be removed, as a unit, such unit being preferably positively ejected as will later appear. The shaft 50 is moved axially for the purpose stated by means of a cam 65 on the inner face of the gear 63. The shaft is angular to the plane of rotation of said cam and has one end maintained against the cam by the spring 59 which is expansive along its axis as well as being torsional. After the pair of springs in cruciform arrangement have been discharged, the said spring restores the shaft to its normal plane of oscillation. Where it is desired positively to eject the two springs, I preferably employ an ejecting arm 66 which is mounted upon an oscillatable shaft 67. This arm extends beneath the trailing end of the spring 2 and is moved in a counterclockwise direction after the clamping jaw 53 has been withdrawn. The shaft 67 is journaled in a bearing 68. The shaft 67 and the arm 66 are normally held stationary with the arm out of the path of the spring 2 by means of an upright coiled spring 69 which is anchored, at its lower end, to the frame of the machine and is secured at its upper end to said arm 66. This spring normally holds the unmounted end of the arm against a stop 70 which may be a shoulder formation upon the horn 33. After the spring 2 has been severed and properly assembled with the spring 1, the shaft 67 is turned in a counterclockwise direction to bring the arm 66 into ejecting engagement with the spring 2. This shaft carries a finger 71 which is engaged by the cam 72 that is fixed upon the shaft 61 once during each revolution of this shaft. The cam has sudden and quickly escaping engagement with said finger to cause a snappy ejection of the cruciform springs.

Changes may be made without departing from the invention.

Having thus described my invention, I claim:

1. Mechanism for interthreading coiled springs including holders for the springs which position the springs with their axes in offset and angular relation, one of these holders permitting the spring therein to be turned upon its axis and the other holder having an abutment closely adjacent the position of this spring and engaging the other spring to hold it during the intermeshing operation.

2. Mechanism for interthreading coiled springs including holders for the springs which position the springs with their axes in angular relation, one of these holders having an abutment closely adjacent the position of one of the springs and engaging the other spring between its coils to hold it during the intermeshing operation.

3. Mechanism for interthreading coiled springs including a holder in which each of two coiled springs of a pair that are to be interthreaded may successively travel; and means for placing and holding one of these springs angular to the other while the latter is in said holder to permit interthreading of the springs when one of them is turned upon its axis, this means including a second holder which engages the first spring of the pair and holds it against the first holder.

4. Mechanism for interthreading coiled springs including a holder in which each of two coiled springs of a pair that are to be interthreaded may successively travel; and means for turning the first axially moved spring upon and holding it against said holder, whereby the two springs are arranged in angular relation permitting their interthreading when one of them is turned, this means including a second holder which engages the first spring of the pair and holds it against the first holder.

5. The combination with a machine for forming wire into coiled springs; of a holder on which the springs are successively turned upon their axes; and means for placing and holding the first of a pair of produced springs angular to the other of such pair as the latter is being formed and in relation thereto to be threaded thereby, this means including a second holder which engages the first spring of the pair and holds it against the first holder.

6. The combination with a machine for forming the wire into coiled springs; of a holder on which the springs are successively turned upon their axes; and means for turning the first of a pair of produced springs angular to the other of such pair and holding it to permit the other spring of such pair to thread it as such other spring is being formed, this means including a second holder which engages the first spring of the pair and holds it against the first holder.

7. Mechanism for interthreading coiled springs including a holder in which each of two coiled springs of a pair that are to be interthreaded may successively travel; means for placing and holding one of these springs angular to the other while the latter is in said holder to permit interthreading of the springs when one of them is turned upon its axis, this means including a second holder which engages the first spring of the pair and holds it against the first holder; and means for oscillating the second holder.

8. Mechanism for interthreading coiled springs including a holder in which each of two coiled springs of a pair that are to be interthreaded may successively travel; means for turning the first axially moved spring upon and holding it against said holder, whereby the two springs are arranged in angular relation permitting their interthreading when one of them is turned, this means including a second holder which engages the first spring of the pair and holds it against the first holder; and means for oscillating the second holder.

9. The combination with a machine for forming wire into coiled springs; of a holder on which the springs are successively turned upon their axes; means for placing and holding the first of a pair of produced springs angular to the other of such pair as the latter is being formed and in relation thereto to be threaded thereby, this means including a second holder which engages the first spring of the pair and holds it against the first holder; and means for oscillating the second holder.

10. The combination with a machine for forming wire into coiled springs; of a holder on which the springs are successively turned upon their axes; means for turning the first of a pair of produced springs angular to the other of such pair and holding it to permit the other spring of such pair to thread it as such other spring is being formed, this means including a second holder which engages the first spring of the pair and holds it against the first holder; and means for oscillating the second holder.

11. Mechanism for interthreading coiled springs including a holder in which each of two coiled springs of a pair that are to be interthreaded may successively travel; means for placing and holding one of these springs angular to the other while the latter is in said holder to permit interthreading of the springs when one of them is turned upon its axis, this means including a second holder which engages the first spring of the pair and holds it against the first holder; and means for oscillating the second holder, the plane of oscillation of the second holder being angular to the spring engaging face of the second holder.

12. Mechanism for interthreading coiled springs including a holder in which each of two coiled springs of a pair that are to be interthreaded may successively travel; means for turning the first axially moved spring upon and holding it against said holder, whereby the two springs are arranged in angular relation permitting their interthreading when one of them is turned, this means including a second holder which engages the first spring of the pair and holds it against the first holder; and means for oscillating the second holder, the plane of oscillation of the second holder being angular to the spring engaging face of the second holder.

13. The combination with a machine for forming wire into coiled springs; of a holder on which the springs are successively turned upon their axes; means for placing and holding the first of a pair of produced springs angular to the other of such pair as the latter is being formed and in relation thereto to be threaded thereby, this means including a second holder which engages the first spring of the pair and holds it against the first holder; and means for oscillating the second holder, the plane of oscillation of the second holder being angular to the spring engaging face of the second holder.

14. The combination with a machine for forming wire into coiled springs; of a holder on which the springs are successively turned upon their axes; means for turning the first of a pair of produced springs angular to the other of such pair and holding it to permit the other spring of such pair to thread it as such other spring is being formed, this means including a second holder which engages the first spring of the pair and holds it against the first holder; and means for oscillating the second holder, the plane of oscillation of the second holder being angular to the spring engaging face of the second holder.

In witness whereof, I hereunto subscribe my name.

WILLIAM E. WUNDERLICH.