Sept. 20, 1955 M. J. NELSON ET AL 2,718,315

STACKER MECHANISM FOR COIL SPRINGS

Filed Oct. 6, 1954 4 Sheets-Sheet 1

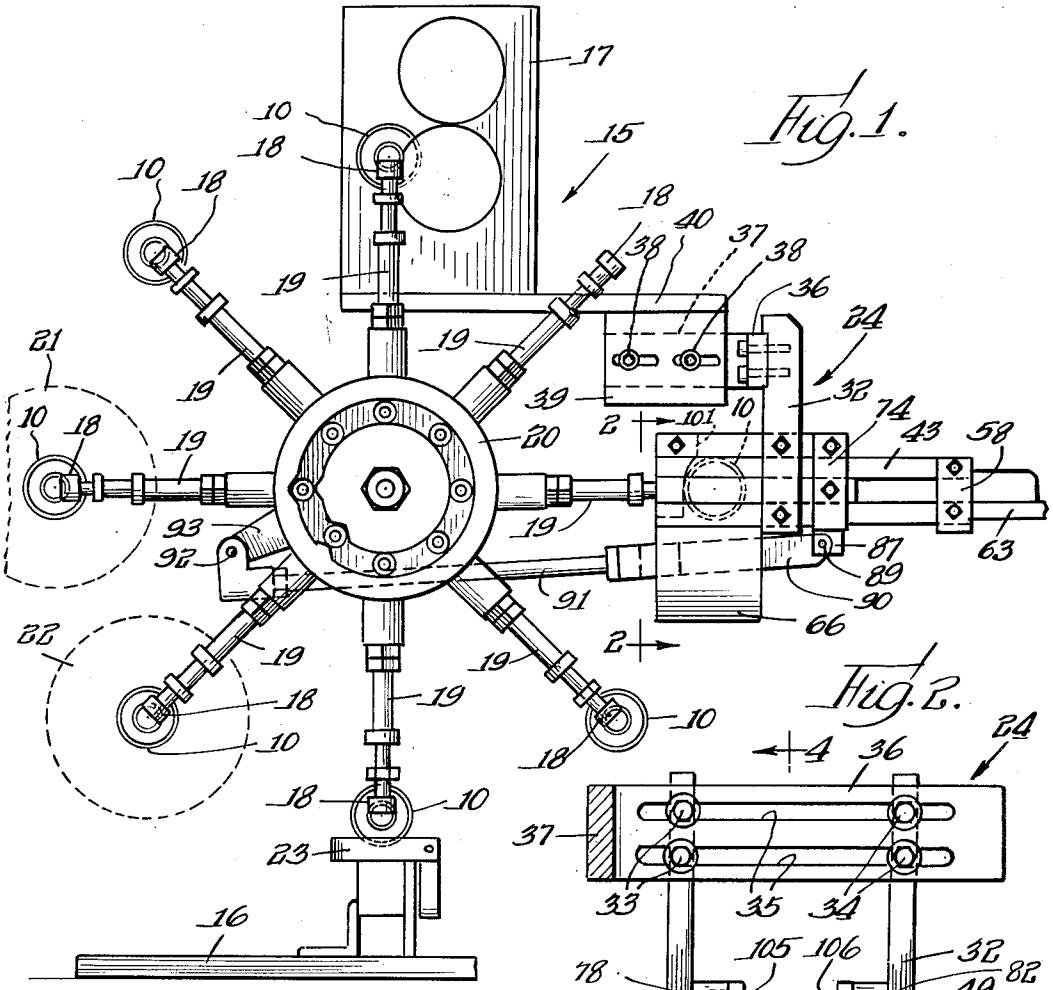

Fig. 1.

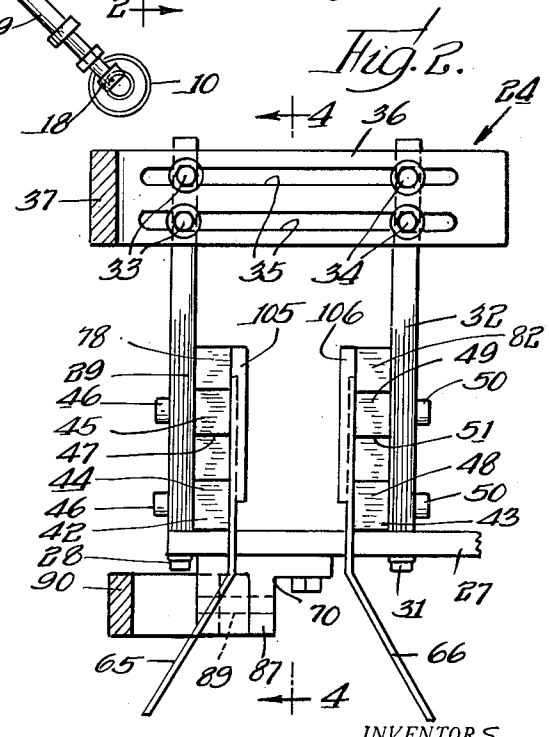

Fig. 2.

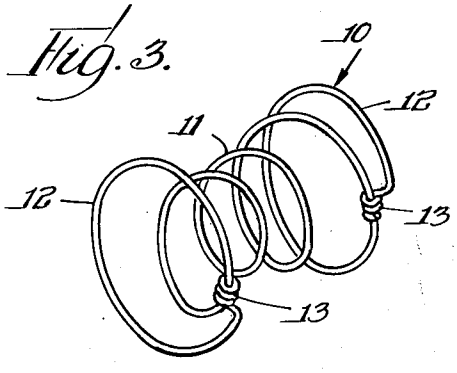

Fig. 3.

INVENTORS.
Martin J. Nelson
Thaddeus S. Celnar

By: Wallenstein & Spangenberg Attys.

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Filed Oct. 6, 1954 4 Sheets-Sheet 2

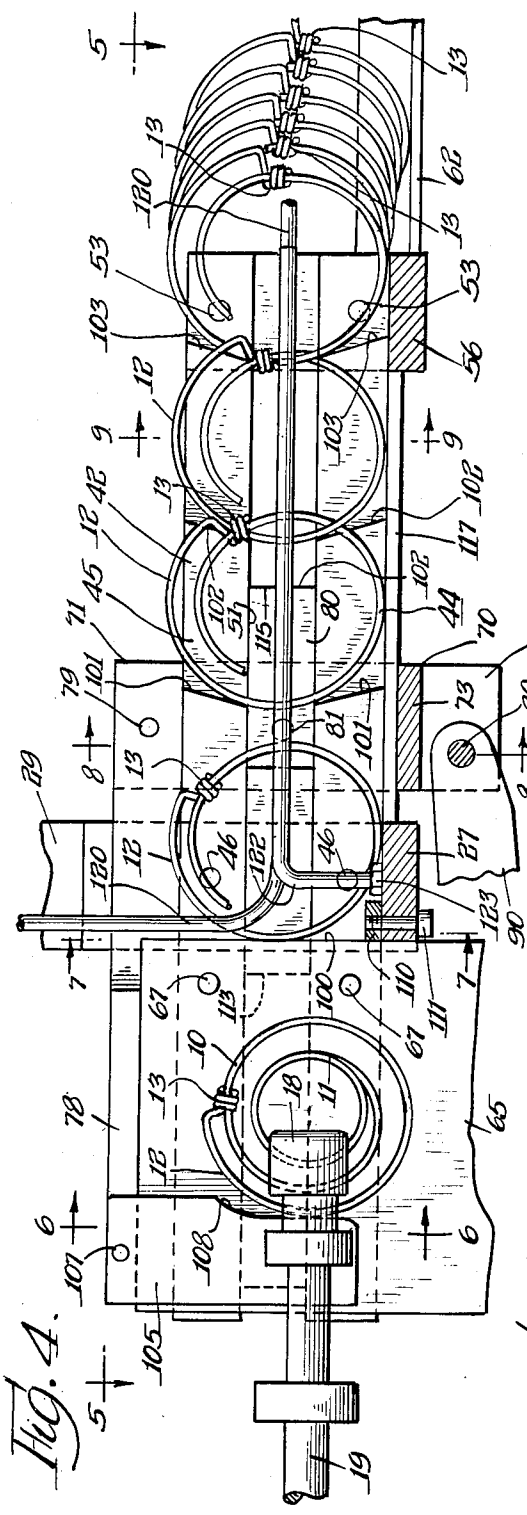

Fig. 4.

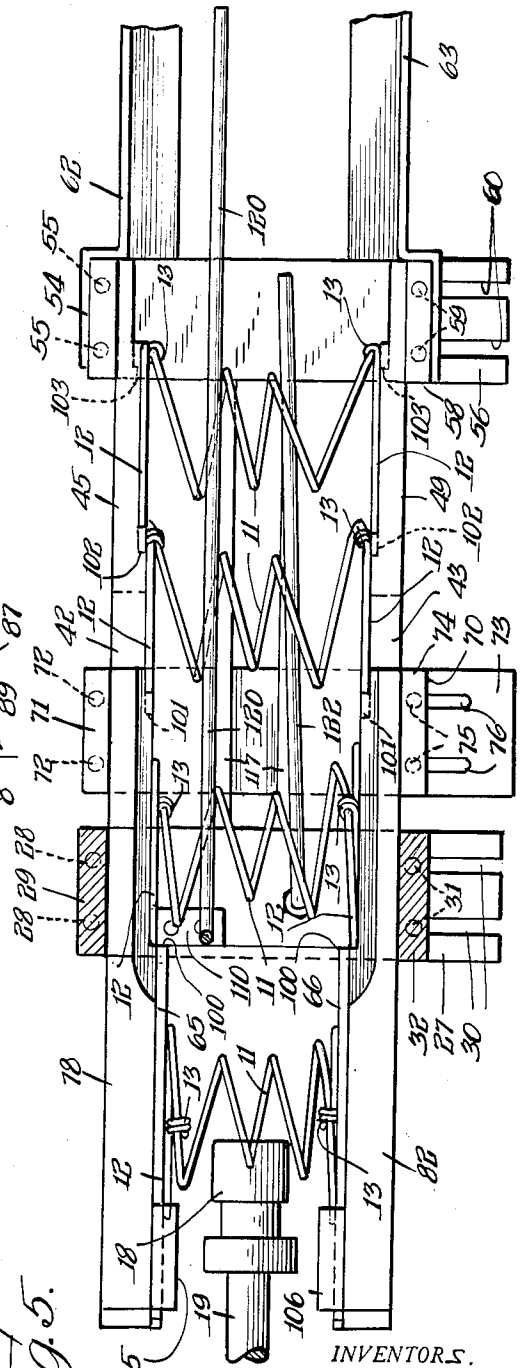

Fig. 5.

INVENTORS.
Martin J. Nelson
Thaddeus S. Cetnar
By: Wallenstein & Spangenberg
Attys

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STACKER MECHANISM FOR COIL SPRINGS

Filed Oct. 6, 1954 4 Sheets-Sheet 3

Fig. 7.

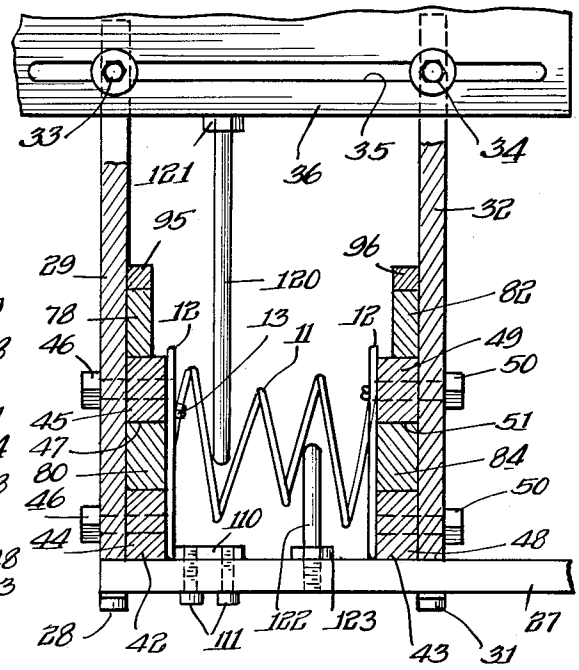
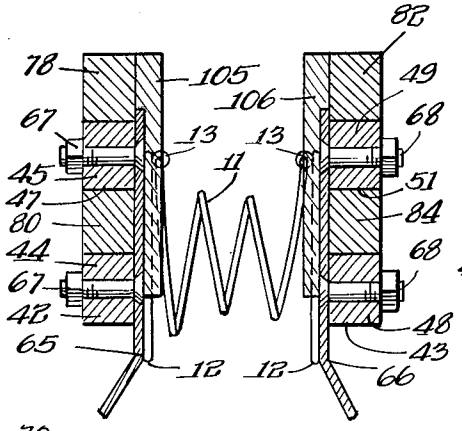


Fig. 6.



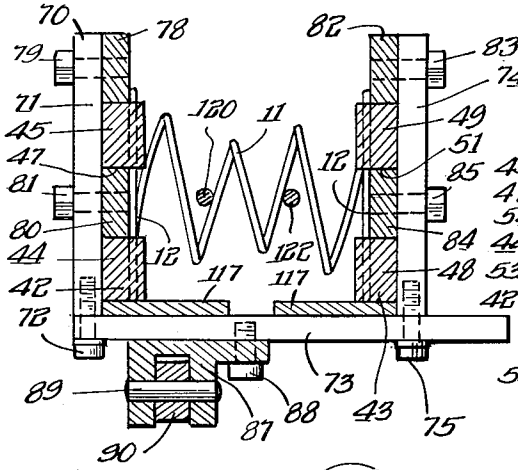
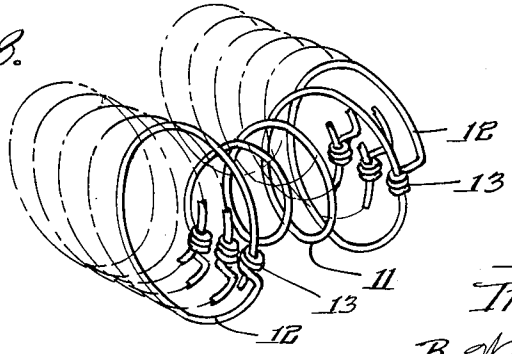


Fig. 8.



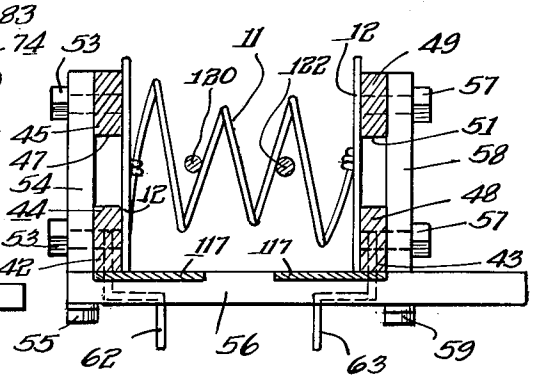


Fig. 9

Fig. 10.

INVENTORS.
Martin J. Nelson
Thaddeus S. Cetnar
By: Wallenstein & Spangenberg
Attys.

Sept. 20, 1955 M. J. NELSON ET AL 2,718,315

STACKER MECHANISM FOR COIL SPRINGS

Filed Oct. 6, 1954 4 Sheets-Sheet 4

Fig. 11.

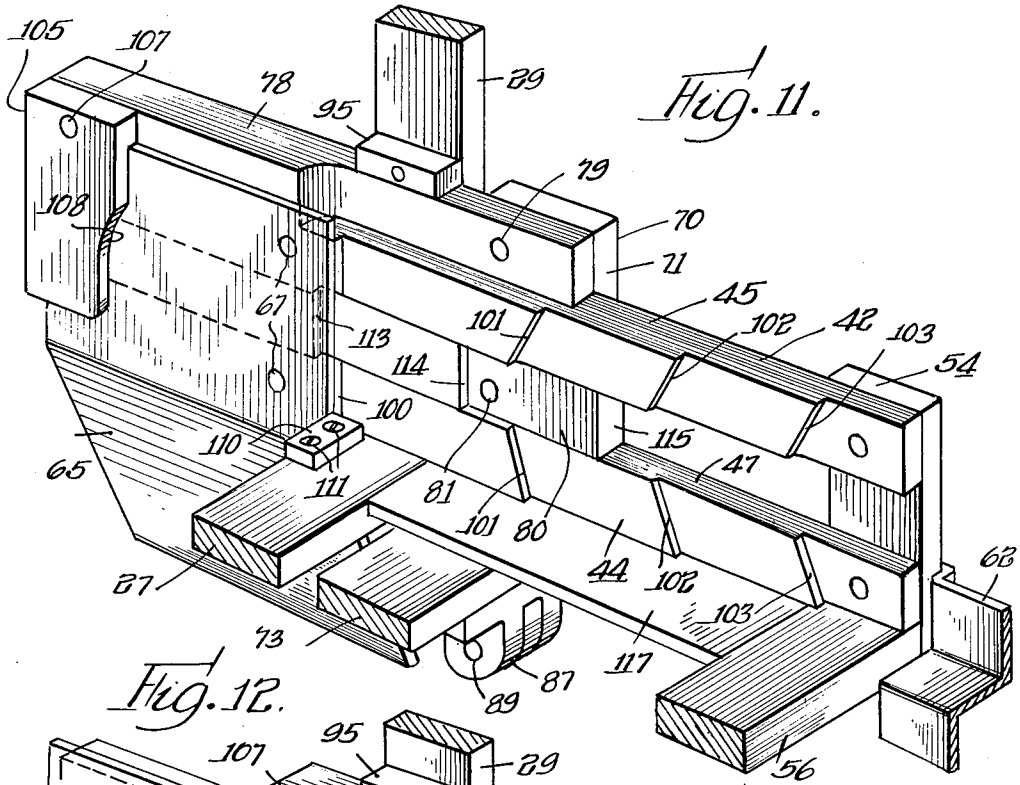
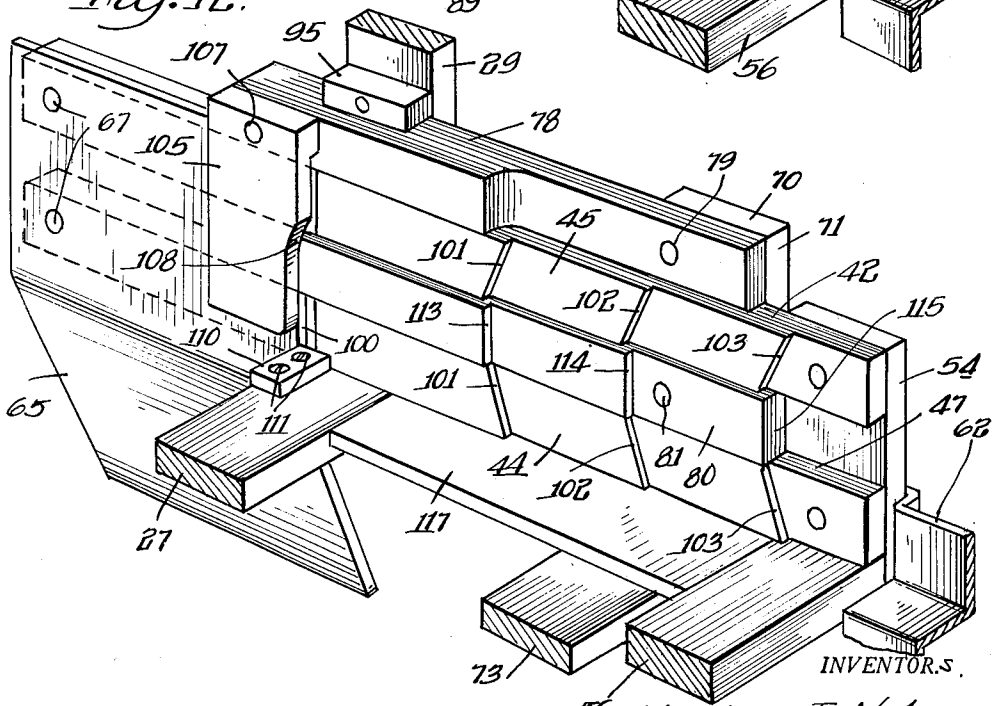


Fig. 12.



INVENTORS.
Martin J. Nelson
Thaddeus S. Cetnar
By Wallenstein & Spangenberg Attys.

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2,718,315

STACKER MECHANISM FOR COIL SPRINGS

Martin J. Nelson, Chicago, and Thaddeus S. Cetnar, Lombard, Ill., assignors to Wunderlich Spring Machinery Company, a corporation of Illinois

Application October 6, 1954, Serial No. 460,538

19 Claims. (Cl. 214—6)

This invention relates to stacker mechanisms for coil spring producing machines and is an improvement over that disclosed in Calvin G. Corser Patent No. 2,498,850, issued February 28, 1950, and over that disclosed in copending application of Martin J. Nelson and Edward Turecki, Serial No. 303,377, filed August 8, 1952. The stacker mechanism of this invention, while generally applicable to various types of coil spring producing machines, is particularly adaptable for use with the coil spring producing machine disclosed in William E. Wunderlich Patent No. 2,604,202, issued July 22, 1952.

Coil spring producing machines, such, for example, as the one disclosed in the aforementioned William E. Wunderlich patent, usually include a coiling mechanism, a pair of knotting mechanisms, a stacker mechanism, and a transfer mechanism for transferring and advancing the coil springs from the coiling mechanism through the knotter mechanisms to the stacker mechanism. The stacker mechanism receives the knotted coil springs from the transfer mechanism and stacks the same in conveniently handled bundles. In so stacking, each coil spring is telescopically received or nested in each previously stacked coil spring. Considerable difficulty has been encountered in such stacker mechanisms in accurately nesting the coil springs in a stack and in advancing the stacked coil springs into and along the stacking channel.

It is desirable to stack the springs in such a manner that the knotted portions of the springs are at the forward part of the springs as they are advanced and telescopically received or nested in the stack of springs. This greatly facilitates the stacking. When the stacker mechanism is mounted on the coil spring producing machine at the three o'clock position, as illustrated in said William E. Wunderlich patent, the coil springs are not presented to the stacker mechanism with their knots forwardly positioned and, accordingly, considerable difficulty was encountered with the stacker mechanism of that patent in properly stacking the knotted coil springs. To obviate that difficulty the stacker mechanism of said Calvin G. Corser patent was devised, wherein the stacker mechanism thereof, also located at the three o'clock position, was provided with a pair of rotary discs for forwardly rotating the coil springs as they are presented to the stack of springs in the stacker mechanism. However, considerable difficulty was there encountered in accurately removing the coil springs from between the pair of rotary discs and advancing them into the stack of springs.

Another manner of presenting the coil springs, with their knots substantially forwardly facing, to the stack of springs is disclosed in said aforementioned copending application wherein the stacking mechanism is located at the four-thirty o'clock position on the coil spring producing machine so that rotation of the coil springs is not necessary. When, however, in such an arrangement, an annealing mechanism, located at the six o'clock position on the coil spring producing machine, is utilized for aligning the knots in the individual coil springs prior to

stacking the same, which is not disclosed in the aforementioned Calvin G. Corser patent, sufficient time is not provided, between the six o'clock and four-thirty o'clock positions, to allow adequate cooling of the coil springs before stacking the same. Thus, when annealing before stacking is utilized, it is desirable to stack the coil springs at the three o'clock position, where forward rotation of the annealed coil springs is also desirable for accurate stacking.

The principal object of this invention is to provide an improved stacker mechanism for coil springs, which accurately nests coil springs in uniform stacks, wherein the coil springs are forwardly rotated in a simple and foolproof manner as they are advanced through the stacker mechanism to present the same, knots forwardly, into the stack of springs, wherein the coil springs are progressively advanced in controlled stages through the stacker mechanism to assure accurate and uniform nesting and stacking of the coil springs, wherein adjustments may be readily made for accommodating coil springs of different diameters and different lengths, which is simple and straight forward in construction and foolproof in operation, and which may be inexpensively manufactured and serviced. The stacker mechanism of this invention differs generally from the stacker mechanism of the aforementioned Calvin G. Corser patent in the manner in which the coil springs are rotated and from the stacker mechanisms of said Calvin G. Corser patent and of said aforementioned copending application in the manner in which the coil springs and the stack of springs are advanced, the coil springs being advanced and nested in accurately controlled stages.

Further objects of this invention reside in the details of construction of the stacker mechanism and in the cooperative relationships between the component parts thereof.

Other objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawings, in which:

Fig. 1 is an illustration of a coil spring producing machine with the stacker mechanism of this invention applied thereto;

Fig. 2 is a front elevational view of the stacker mechanism taken substantially along the line **2—2** of Fig. 1;

Fig. 3 is a perspective view of a coil spring which is adapted to be nested in stacks by the stacker mechanism of this invention;

Fig. 4 is a vertical sectional view through the stacker mechanism taken substantially along the line **4—4** of Fig. 2;

Fig. 5 is a top plan view of the stacker mechanism illustrated in Figs. 2 and 4 and taken substantially along the line **5—5** of Fig. 4;

Figs. 6, 7, 8 and 9 are vertical sectional views through the stacker mechanism taken substantially along the lines **6—6**, **7—7**, **8—8** and **9—9**, respectively;

Fig. 10 is a perspective view of a stack of coil springs which have been stacked by the stacker mechanism of this invention;

Fig. 11 is a sectional view in perspective of the stacker mechanism of this invention with the carriage in the retracted position;

Fig. 12 is a sectional view in perspective similar to Fig. 11 but showing the carriage in advanced position.

Referring first to Fig. 3, a coil spring to be stacked by the stacking mechanism is generally designated at **10**. It includes a plurality of inner convolutions or turns **11** and a pair of end turns **12**. The ends turns **12** terminate in knots **13**. The coil spring may be plain, as illustrated, or the end turns thereof may be crimped or offset, if so desired. As will be noted, the knots **13** are in substantial alignment, this being brought about by the annealing of

the coil spring. The stacker mechanism of this invention nests or stacks the coil springs 10 into a bundle or stack of coil springs as indicated in Fig. 10 wherein the knots 13 of the coil springs are forwardly arranged and lie adjacent to each other.

Any suitable machine may be utilized for the purpose of fabricating the coil springs 10 and for purposes of illustration in this application Fig. 1 discloses a coil spring producing machine generally designated at 15, which may be of the type disclosed in the aforementioned William E. Wunderlich patent. The machine 15 includes a base or standard 16 and a coiling mechanism 17 supported thereby for coiling wire into the double end coil spring 10. When the coil spring is thus formed, it is grasped by fingers 18 carried by radial arms 19 of a transfer mechanism 20, which is intermittently rotated in a counterclockwise direction as illustrated in Fig. 1. The coil springs 10 thus formed and grasped by the fingers 18 are advanced from a twelve o'clock position to a knotting mechanism 21 located at a nine o'clock position wherein one end of the coil spring 10 is knotted as at 13 and, if desired, crimped into an offset. The coil springs 10 are then advanced to a second knotting mechanism 22 located at a seven-thirty o'clock position where the other end of the coil spring is knotted and may also be crimped into an offset, if so desired. The knotted coil spring 10 is then advanced by the transfer mechanism 20 to a heat treating mechanism 23 which may take the form disclosed in Patent No. 2,678,989 issued May 18, 1954. Before the coil springs are heat treated or annealed by the heat treating mechanism 23 the knots 13 thereof are not in alignment but after heat treating they come into alignment with each other as illustrated in Fig. 3, this heat treating taking place at the six o'clock position. After the coil springs 10 are heat treated, they are advanced by the transfer mechanism to the stacker mechanism of this invention, generally designated at 24, wherein the coil springs are stacked in nested form. The stacker mechanism 24 is located at the three o'clock position. When the coil springs 10 are presented to the stacker mechanism at this three o'clock position their knots 13 are upwardly arranged as illustrated in Fig. 4. Since the coil spring producing machine illustrated in Fig. 1 is fully disclosed in the aforementioned William E. Wunderlich patent, a further description thereof is not considered necessary.

The stacker mechanism 24 of this invention includes a base member 27 to one end of which is secured by bolts 28 a bracket 29. The other end of the base member 27 is provided with slots 30 for receiving bolts 31 for adjustably securing thereto a bracket 32. The brackets 29 and 32 are secured by screws 33 and 34 to a transverse bracket 36 provided with slots 35. Thus, the bracket 29 may be adjustably positioned on the bracket 36 and the bracket 32 may be adjustably positioned with respect to the bracket 29, the base member 27 and brackets 29, 32 and 36 being rigidly secured together in proper adjusted position. The bracket 36 is provided with an arm 37 which is secured by slots and bolts 38 to a bracket 39 which in turn is carried by a support 40 secured to the coil spring making machine.

The brackets 29 and 32 carry side plate members 42 and 43, respectively, these side plate members being spaced apart a desired amount and extending lengthwise of the stacker mechanism. The side plate member 42 includes a pair of bars 44 and 45 which are secured to the bracket 29 by screws 46. These bars 44 and 45 are spaced apart to form a longitudinally extending slot 47 therebetween. In a like manner the side plate member 43 is formed from a pair of spaced apart bars 48 and 49 which are secured to the bracket member 32 by screws 50, the spacing between the bars 48 and 49 forming a longitudinally extending slot 51. The bars 44 and 45 of the side plate member 42 are also secured by screws 53 to a bracket 54 which in turn is secured by screws 55 to a cross member 56. In a like manner the bars 48 and 49 of the side plate member 43 are secured by screws 57 to a bracket 58 which in turn is adjustably secured by screws 59 and slots 60 to the cross member 56. In this way, both ends of the side plate members 42 and 43 are securely fastened together in an adjustable manner so as to provide a rigid assembly. A pair of guides 62 and 63 are suitably secured to the brackets 54 and 58 to form channels for supporting and conveying the stacked coil springs which are stacked by the stacker mechanism of this invention.

A pair of plates 65 and 66 are secured by screws 67 and 68 to the forward ends of the bars 44 and 45 of the side plate member 42 and the forward ends of the bars 48 and 49 of the side plate member 43. These plates 65 and 66 are mounted on the inside of the side plate members 42 and 43 and their lower ends diverge as illustrated in Figs. 2 and 6. As the coil springs 10 are advanced by the transfer mechanism 20 to the three o'clock position the coil springs are carried between the plates 65 and 66 and due to the diverging character of these plates, each coil spring is lodged under considerable compression between these plates. The coil spring is then released by the transfer mechanism between the plates 65 and 66. Since the coil springs are compressed between the plates 65 and 66 they are firmly held in place therebetween even though the transfer mechanism releases them at this point.

A carriage 70 is slidably mounted on the side plate members 42 and 43 for longitudinal movement between a retracted position illustrated in Figs. 4, 5 and 11 and an advanced position illustrated in Fig. 12. This carriage 70 includes a bracket 71 which is secured by screws 72 to a bracket 73. It also includes a bracket 74 which is adjustably secured by screws 75 and slots 76 to the bracket 73. The brackets 71 and 74 straddle the side plate members 42 and 43. A bar 78 is secured by a screw 79 to the bracket 71 and this bar 78 slides upon the top of the bar 45. A second bar 80 is secured to the bracket 71 by a screw 81, this second bar 80 sliding in the slot 47 formed in the side plate member 42 by the spaced apart bars 44 and 45. In a like manner a bar 82 is secured to the bracket 74 by a screw 83, this bar 82 riding on top of the bar 49. A bar 84 is also secured to the bracket 74 by a screw 85, this bar 84 sliding in the slot 51 in the side plate member 43 formed by the spaced apart bars 48 and 49. A member 87 is secured to the bracket 73 by screws 88 and this member 87 is provided with a pivot pin 89 to which is secured one end of an adjustable link 90, 91. The other end of the adjustable link 90, 91, as shown in Fig. 1, is pivoted at 92 to an oscillating arm 93 operated in timed relation with the transfer mechanism 20. Thus, each time that the transfer mechanism 20 is intermittently advanced the carriage 70 of the transfer mechanism 24 is advanced and retracted. A pair of blocks 95 and 96 are secured to the brackets 29 and 32 to assist in the guiding of the carriage in its longitudinal movement.

The side plate members 42 and 43 and their diverging plates 65 and 66 form a first narrow channel portion for receiving coil springs under compression from the transfer mechanism, this first channel portion being coextensive with the plates 65 and 66. The plates 65 and 66 and hence the side plate members 42 and 43 terminate in a first step 100 to mark the end of the first narrow channel portion and to mark the beginning of a second wider channel portion which receives with less compression coil springs from the first channel portion. The side plate members 42 and 43 are provided with further steps 101, 102 and 103 for demarking further subsequent wider channel portions. The second channel portion is located between the steps 100 and 101, the third channel portion is located between the steps 101 and 102, the fourth channel portion is located between the steps 102 and 103 and the fifth channel portion is located beyond the step 103. Each of these channel portions become successively wider so that when the springs reach the fifth

channel portion beyond the step **103** there is substantially no compression of the springs at that point and the springs which are nested ride freely in the channel guides **62** and **63**. It is here noted that the first and second channel portions are at least as long as the diameters of the coil springs while the third and fourth channel portions are shorter than the diameters of the springs. By reason of this arrangement telescoping or nesting of the coil springs takes place in the fourth and fifth channel portions.

A pair of arms **105** and **106** are secured by screws **107** to the forward ends of the bars **78** and **82** of the carriage **70**. These arms **105** and **106** extend downwardly over the diverging side plates **65** and **66**. When the carriage is retracted, the arms **105** and **106** are in the positions illustrated in Figs. 4 and 11 and when the carriage is advanced, they are moved to the position illustrated in Fig. 12. The arms **105** and **106** are provided with curved coil spring engaging surfaces **108** for engaging the end turns **12** of the coil spring **10** to advance the coil spring from the first channel portion over the first step **100** into the second channel portion upon advancing of the carriage **70**. A shoulder **110** is secured to the base member **27** by means of screws **111**. This shoulder **110** is in the path of movement of an end turn **12** of the coil spring as it is being moved from the first channel portion to the second channel portion. During this movement the end turn of the coil spring is confined between the shoulder **110**, adjacent the step **100**, and the spring engaging surface **108** on the arm **105**. This confining of the coil spring causes it to roll over the shoulder **110** for rotating the coil forwardly as it is advanced by the arms **105** and **106**. As seen in Fig. 4, the coil spring in the second channel portion has been rotated forwardly by this action. Preferably, the forward rotation of the coil spring is only partially completed at this particular point, further forward rotation taking place as the coil springs are progressively advanced through the remaining portion of the stacker mechanism.

As will be seen more clearly in Figs. 4, 11 and 12 the bars **80** and **84** are stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders **113**, **114** and **115** arranged therealong. These shoulders **113**, **114** and **115** lie within the confines of the slots **47** and **51** in the side plate members **42** and **43** at the first, second and third channel portions thereof when the carriage **70** is retracted. When, however, the carriage **70** is advanced these shoulders **113**, **114** and **115** protrude into the progressively wider second, third and fourth channel portions for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions, respectively. This occurs during each advancing movement of the carriage **70**. In other words, the shoulder **113** is arranged behind the step **100**, the shoulder **114** is arranged behind the step **101** and the shoulder **115** is arranged behind the step **102** when the carriage is retracted. When, however, the carriage is advanced the shoulder **113** is advanced adjacent to the step **101**, the shoulder **114** is advanced adjacent the step **102** and the shoulder **115** is advanced adjacent the step **103**. Thus, in the stacker mechanism the coil springs are moved from the first channel portion to the second channel portion by the arm **105** and **106**, from the second channel portion to the third channel portion by the shoulder **113**, from the third channel portion to the fourth channel portion by the shoulder **114** and from the fourth channel portion to the fifth channel portion by the shoulder **115**. By this arrangement the coil springs are advanced through the stacker mechanism in controlled progressive fashion. Since the third and fourth channel portions are shorter than the diameter of the coil springs, the coil springs are telescoped or nested in the fourth and fifth channel portions, as illustrated in Fig. 4. The steps **102** and **103** in the side plate members assure proper nesting and the steps **100**, **101**, **102** and **103** prevent the coil springs from backing up when the carriage **70** is retracted. The coil springs are closely nested or stacked in the fifth channel portion and are forced forwardly by the shoulders **115** on the bars along the channel guide **62** where they are freely supported. To prevent the coil springs from falling downwardly in the stacker mechanism the bottom of the stacker mechanism is provided with a pair of longitudinally extending guide members **117**.

A rod **120**, secured by nuts **121** to the bracket **36**, extends longitudinally along the stacker mechanism between the side plate members thereof. This rod **120** engages the inner convolutions **11** of the coil springs from the top side and operates to guide the coil springs and maintain them against the guide members **117** as they are advanced through the stacker mechanism. A second rod **122** is secured to the base member **27** by nuts **123** and this rod **122** also extends longitudinally along the stacker mechanism between the side plates thereof. This rod **122** also engages the inner convolutions **11** of the coil springs but from the under side. As shown more clearly in Fig. 5, this rod **122** slants inwardly a slight amount. As the coil springs are advanced along the stacker mechanism this rod **122**, in engaging the inner convolutions **11** of the coil springs, causes the coil springs to rotate forwardly as they are so advanced, this additional forward rotation being illustrated in Fig. 4. Thus, when the coil springs reach the fifth channel portion of the stacker mechanism the knots **13** thereof are completely forwardly arranged so that best stacking efficiency is obtained.

In the stacker mechanism of this invention the coil springs are progressively advanced in steps therethrough and this advancing of the coil springs is accurately controlled at all times. By reason of the shoulder **110** adjacent the first step **100** and the rod **122** the coil springs **10** are also progressively rotated in a forward direction as they are advanced through the stacker mechanism so that the knots **13** of the coil springs are forwardly arranged when they are stacked. Of course, if rotation of the coil springs is not desired these latter features of this invention may be omitted. The stacking of the coil springs is brought about through several controlled steps rather than by a single step so that the stacking is more accurately controlled. The position of the stacker mechanism **24** with respect to the transfer mechanism **20** is adjustable so that coil springs of various diameters may be readily stacked. The stacker mechanism is also completely adjustable as to width for accommodating coil springs of different lengths. The stacker mechanism is simple in construction and foolproof in operation inasmuch as it utilizes a minimum number of moving parts.

While for purposes of illustration, one form of this invention has been disclosed other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and, therefore, this invention is to be limited only by the scope of the appended claims.

We claim as our invention:

1. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a carriage movable longitudinally along the side plate members between retracted and advanced positions, a pair of arms on the inside of the side plate members and carried by the carriage and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms having coil spring engaging surfaces for engaging the end turns of the coil springs received in the first channel portion and advancing them past the step into the second channel portion as the carriage is advanced, and a stationary shoulder located adjacent the

step in the side plate members and engaged by the end turns of the coil springs as they are advanced by the arms for confining the same during such advancement between the shoulder and the engaging surfaces of the arms to cause the coil springs to rotate forwardly as they are advanced from the first channel portion to the second channel portion.

2. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the next succeeding channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage.

3. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding chanel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the next succeeding channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage, at least some of said subsequent channel portions being shorter than the diameter of the coil springs so that the coil springs are nested and stacked as they are progressively advanced through said channel portions.

4. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying chanel, each side plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the second channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each advancing movement of the carriage.

5. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the second channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each

advancing movement of the carriage, the third and fourth channel portions being shorter than the diameter of the coil springs so that the coil springs are nested in the fourth channel portion and closely stacked in the fifth channel portion.

6. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the next succeeding channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage, and means including a rod extending longitudinally between the side plate members along the subsequent channel portions for engaging the inner convolutions of the coil springs for guiding the same as they are progressively advanced along said subsequent channel portions.

7. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the next succeeding channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage, and means including a pair of rods extending longitudinally between the side plate members along the subsequent channel portions for engaging the inner convolutions of the coil springs from above and below for guiding and forwardly rotating the coil springs as they are progressively advanced along said subsequent channel portions.

8. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the second channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each advancing movement of the carriage, and means including a rod extending longitudinally between the side plate members along the second, third, fourth and fifth channel portions for engaging the inner convolutions of the coil springs for guiding the same as they are progressively advanced along said channel portions.

9. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the second channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate

members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each advancing movement of the carriage, and means including a pair of rods extending longitudinally between the side plate members along the second, third, fourth and fifth channel portions for engaging the inner convolutions of the coil springs from above and below for guiding and forwardly rotating the same as they are progressively advanced along said channel portions.

10. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the next succeeding channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage, at least some of said subsequent channel portions being shorter than the diameter of the coil springs so that the coil springs are nested and stacked as they are progressively advanced through said channel portions, and means including a rod extending longitudinally between the side plate members along the subsequent channel portions for engaging the inner convolutions of the coil springs for guiding the same as they are progressively advanced along said subsequent channel portions.

11. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the next succeeding channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage, at least some of said subsequent channel portions being shorter than the diameter of the coil springs so that the coil springs are nested and stacked as they are progressively advanced through said channel portions, and means including a pair of rods extending longitudinally between the side plate members along the subsequent channel portions for engaging the inner convolutions of the coil springs from above and below for guiding and forwardly rotating the coil springs as they are progressively advanced along said subsequent channel portions.

12. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the second channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each advancing movement of the carriage, the third and fourth channel portions being shorter than the diameter of the coil springs so that the coil springs are nested in the fourth channel portion and closely stacked in the fifth channel portion, and means including a rod extending longitudinally between the side plate members along the second, third, fourth and fifth channel portions for engaging the inner convolutions of the coil springs for guiding the same as they are progressively advanced along said channel portions.

13. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side

plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms carried by the carriage on the inside of the side plate members and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms engaging the end turns of the coil springs received in the first channel portion and advancing them into the second channel portion as the carriage is advanced, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each advancing movement of the carriage, the third and fourth channel portions being shorter than the diameter of the coil springs so that the coil springs are nested in the fourth channel portion and closely stacked in the fifth channel portion, and means including a pair of rods extending longitudinally between the side plate members along the second, third, fourth and fifth channel portions for engaging the inner convolutions of the coil springs from above and below for guiding and forwardly rotating the same as they are progressively advanced along said channel portions.

14. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms on the inside of the side plate members and carried by the carriage and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms having coil spring engaging surfaces for engaging the end turns of the coil springs received in the first channel portion and advancing them past the first step into the next succeeding channel portion as the carriage is advanced, a stationary shoulder located adjacent the first step in the side plate members and engaged by the end turns of the coil springs as they are advanced by the arms for confining the same during such advancement between the shoulder and the engaging surfaces of the arms to cause the coil springs to rotate forwardly as they are advanced from the first channel portion to said next succeeding channel portion, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage.

15. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms on the inside of the side plate members and carried by the carriage and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms having coil spring engaging surfaces for engaging the end turns of the coil springs received in the first channel portion and advancing them past the step into the second channel portion as the carriage is advanced, a stationary shoulder located adjacent the first step in the side plate members and engaged by the end turns of the coil springs as they are advanced by the arms for confining the same during such advancement between the shoulder and the engaging surfaces of the arms to cause the coil springs to rotate forwardly as they are advanced from the first channel portion to the second channel portion, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each advancing movement of the carriage.

16. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms on the inside of the side plate members and carried by the carriage and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms having coil spring engaging surfaces for engaging the end turns of the

coil springs received in the first channel portion and advancing them past the first step into the next succeeding channel portion as the carriage is advanced, a stationary shoulder located adjacent the first step in the side plate members and engaged by the end turns of the coil springs as they are advanced by the arms for confining the same during such advancement between the shoulder and the engaging surfaces of the arms to cause the coil springs to rotate forwardly as they are advanced from the first channel portion to said next succeeding channel portion, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage, at least some of said subsequent channel portions being shorter than the diameter of the coil springs so that the coil springs are nested and stacked as they are progressively advanced through said channel portions.

17. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms on the inside of the side plate members and carried by the carriage and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms having coil spring engaging surfaces for engaging the end turns of the coil springs received in the first channel portion and advancing them past the steps into the second channel portion as the carriage is advanced, a stationary shoulder located adjacent the first step in the side plate members and engaged by the end turns of the coil springs as they are advanced by the arms for confining the same during such advancement between the shoulder and the engaging surfaces of the arms to cause the coil springs to rotate forwardly as they are advanced from the first channel portion to the second channel portion, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each advancing movement of the carriage, the third and fourth channel portions being shorter than the diameter of the coil springs so that the coil springs are nested in the fourth channel portion and closely stacked in the fifth channel portion.

18. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a plurality of steps spaced therealong to form a first narrow channel portion for receiving coil springs under compression and a plurality of subsequent progressively wider channel portions for progressively receiving with less compression coil springs from the next preceding channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms on the inside of the side plate members and carried by the carriage and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms having coil spring engaging surfaces for engaging the end turns of the coil springs received in the first channel portion and advancing them past the first step into the next succeeding channel portion as the carriage is advanced, a stationary shoulder located adjacent the first step in the side plate members and engaged by the end turns of the coil springs as they are advanced by the arms for confining the same during such advancement between the shoulder and the engaging surfaces of the arms to cause the coil springs to rotate forwardly as they are advanced from the first channel portion to said next succeeding channel portion, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of inwardly facing shoulders arranged therealong, said shoulders lying within the confines of the slots in the side plate members at the channel portions thereof when the carriage is retracted and protruding into the subsequent wider channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to progressively advance the coil springs to the next succeeding channel portions during each advancing movement of the carriage, and means including a pair of rods extending longitudinally between the side plate members along the subsequent channel portions for engaging the inner convolutions of the coil springs from above and below for guiding and forwardly rotating the coil springs as they are progressively advanced along said subsequent channel portions.

19. A stacker mechanism for coil springs comprising, a pair of stationary elongated spaced apart side plate members forming a coil spring carrying channel, each side plate member having a first step to form a first narrow channel portion for receiving coil springs under compression and a second wider channel portion for receiving with less compression coil springs from the first channel portion, a second step to form a third wider channel portion for receiving with less compression coil springs from the second channel portion, a third step to form a fourth wider channel portion for receiving with less compression coil springs from the third channel portion and a fourth step to form a fifth wider channel portion for receiving with no compression coil springs from the fourth channel portion, each side plate member also having a slot extending longitudinally therealong, a carriage movable longitudinally along the side plate members between retracted and advanced positions and including a bar longitudinally slidable in each slot of the side plate members, a pair of arms on the inside of the side plate members and carried by the carriage and movable along the first channel portion as the carriage is advanced and retracted, said pair of arms having coil spring engaging surfaces for engaging the end turns of the coil springs received in the first channel portion and advancing them past the step into the second channel portion as the carriage is advanced, a stationary shoulder located adjacent the first step in the side plate members and engaged by

the end turns of the coil springs as they are advanced by the arms for confining the same during such advancement between the shoulder and the engaging surfaces of the arms to cause the coil springs to rotate forwardly as they are advanced from the first channel portion to the second channel portion, each of said bars of said carriage being stepped in relation to the steps of the side plate members forming the channel portions therebetween by means of three inwardly facing shoulders arranged therealong, said first, second and third shoulders lying within the confines of the slots in the side plate members at the first, second and third channel portions thereof when the carriage is retracted, said first, second and third shoulders protruding into the progressively wider second, third and fourth channel portions as the carriage is advanced for engaging the end turns of the coil springs therein to advance the coil springs into the progressively wider third, fourth and fifth channel portions respectively during each advancing movement of the carriage, the third and fourth channel portions being shorter than the diameter of the coil springs so that the coil springs are nested in the fourth channel portion and closely stacked in the fifth channel portion, and means including a pair of rods extending longitudinally between the side plate members along the second, third, fourth and fifth channel portions for engaging the inner convolutions of the coil springs from above and below for guiding and forwardly rotating the same as they are progressively advanced along said channel portions.

No references cited.