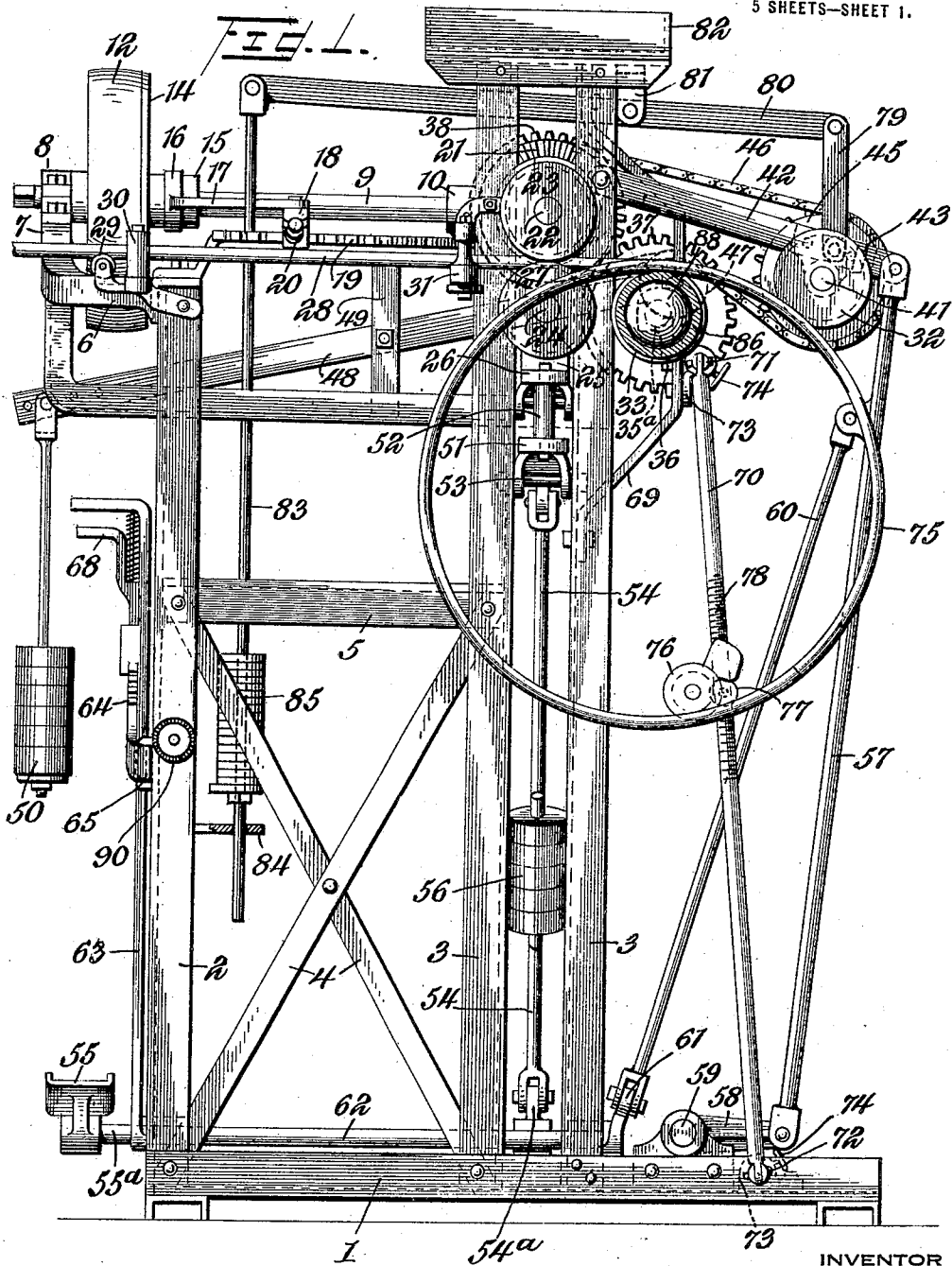


T. KARDONG.
SPIRAL MACHINE.
APPLICATION FILED APR. 20, 1920.

1,417,249.

Patented May 23, 1922.

5 SHEETS—SHEET 1.



WITNESSES

Howard D. Orr.
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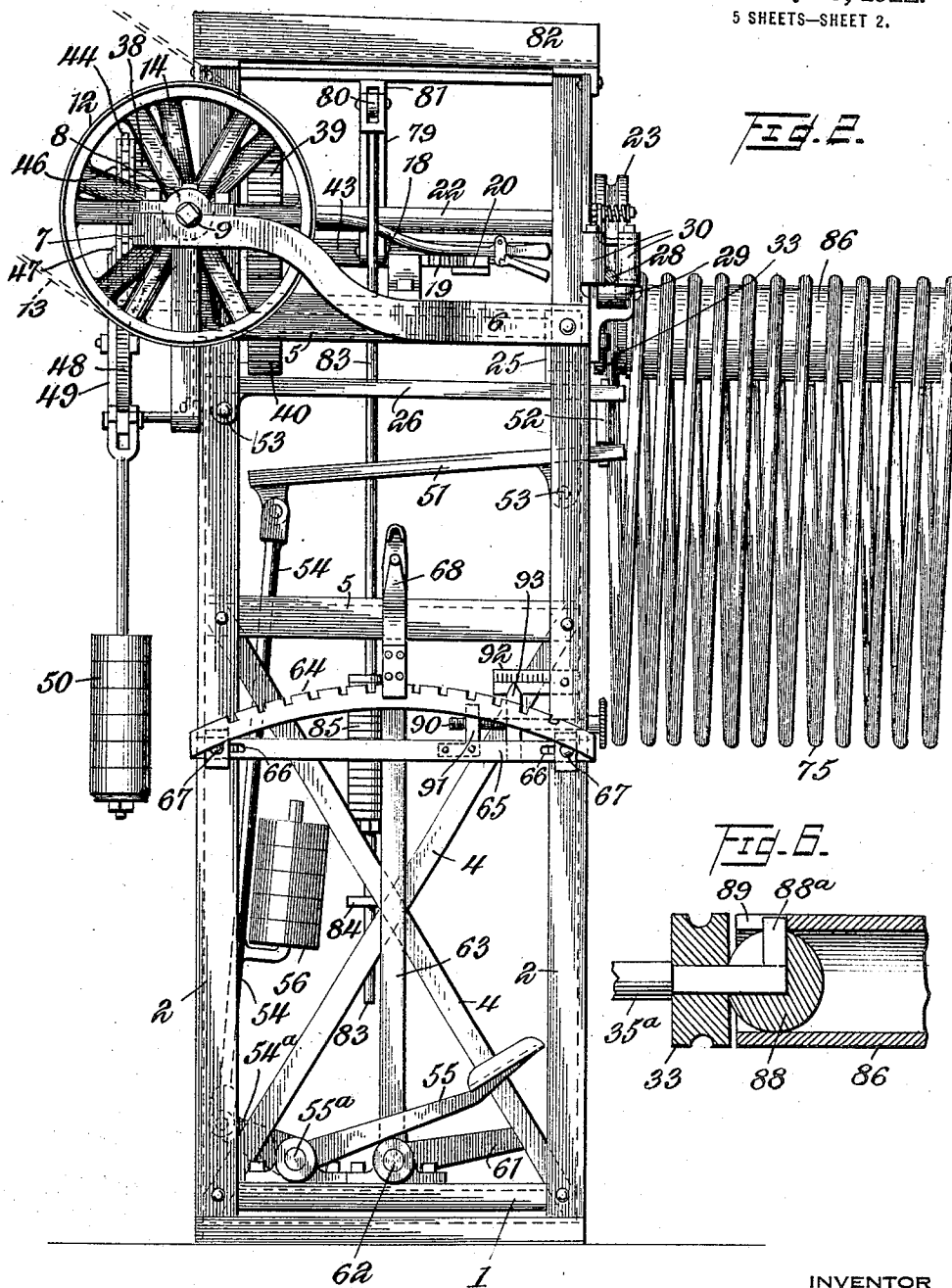
ATTORNEY

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5 SHEETS—SHEET 2.



WITNESSES

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5 SHEETS—SHEET 3.

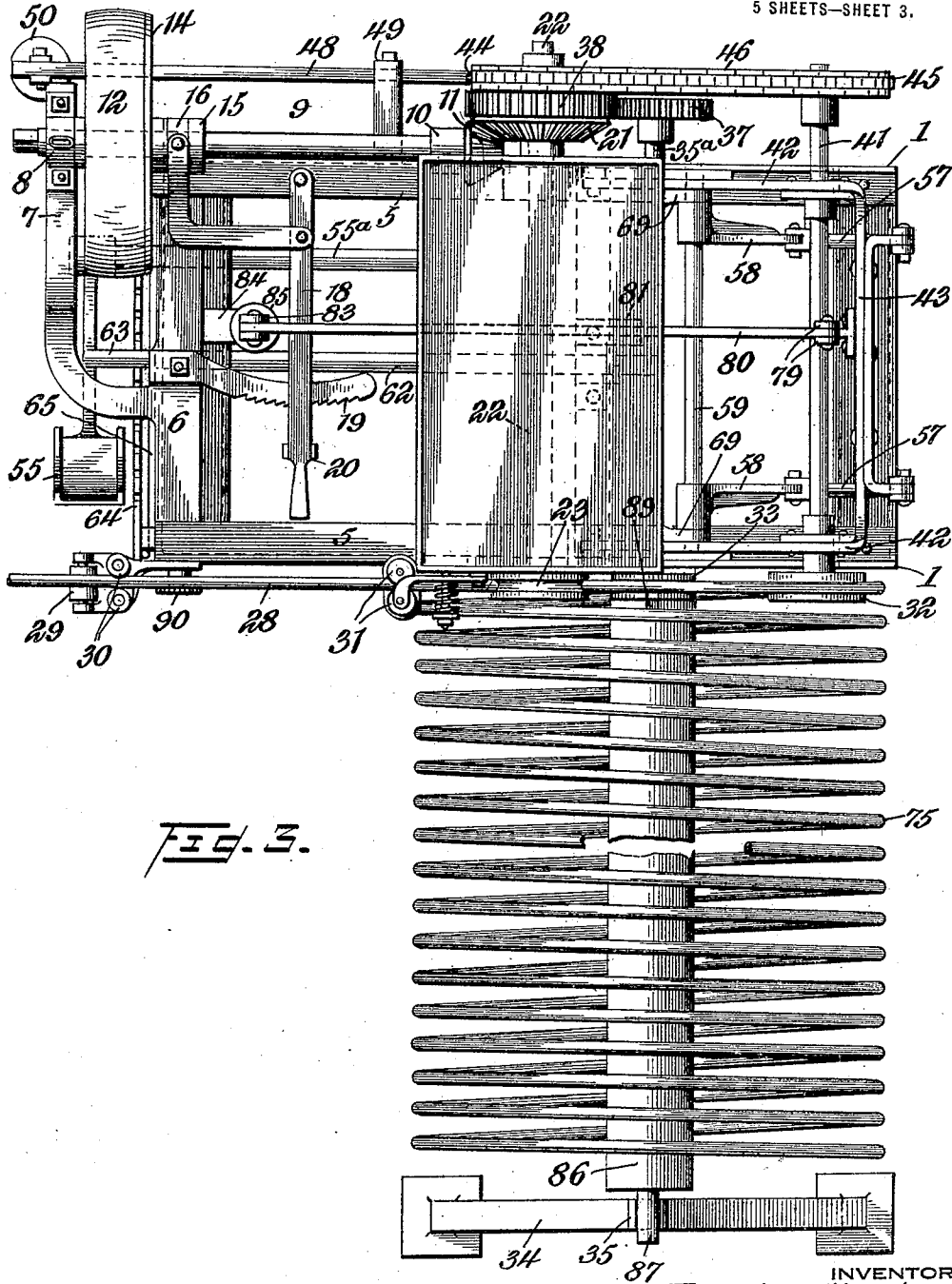


FIG. 3.

WITNESSES

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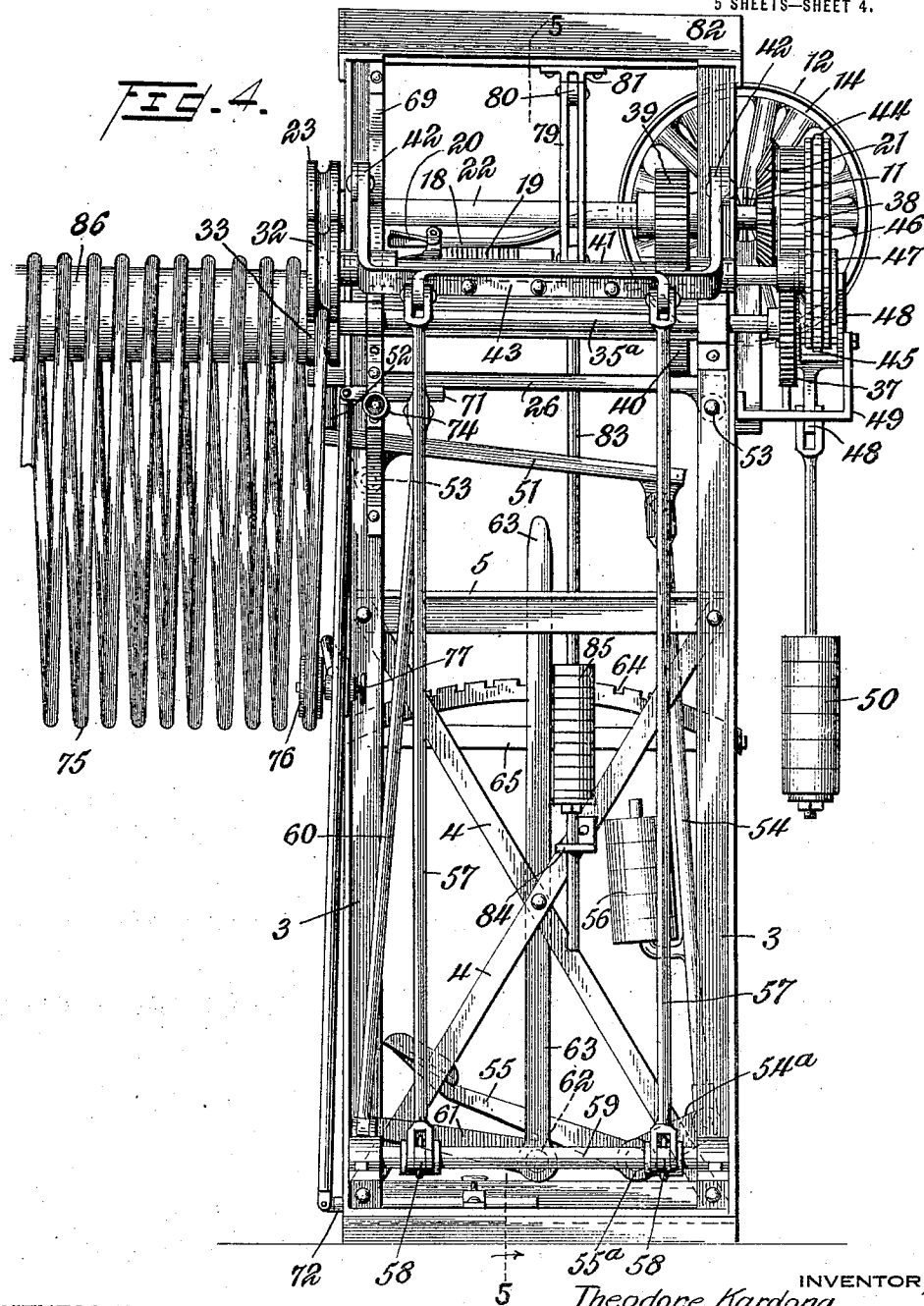
ATTORNEY

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Patented May 23, 1922.

5 SHEETS—SHEET 4.



WITNESSES

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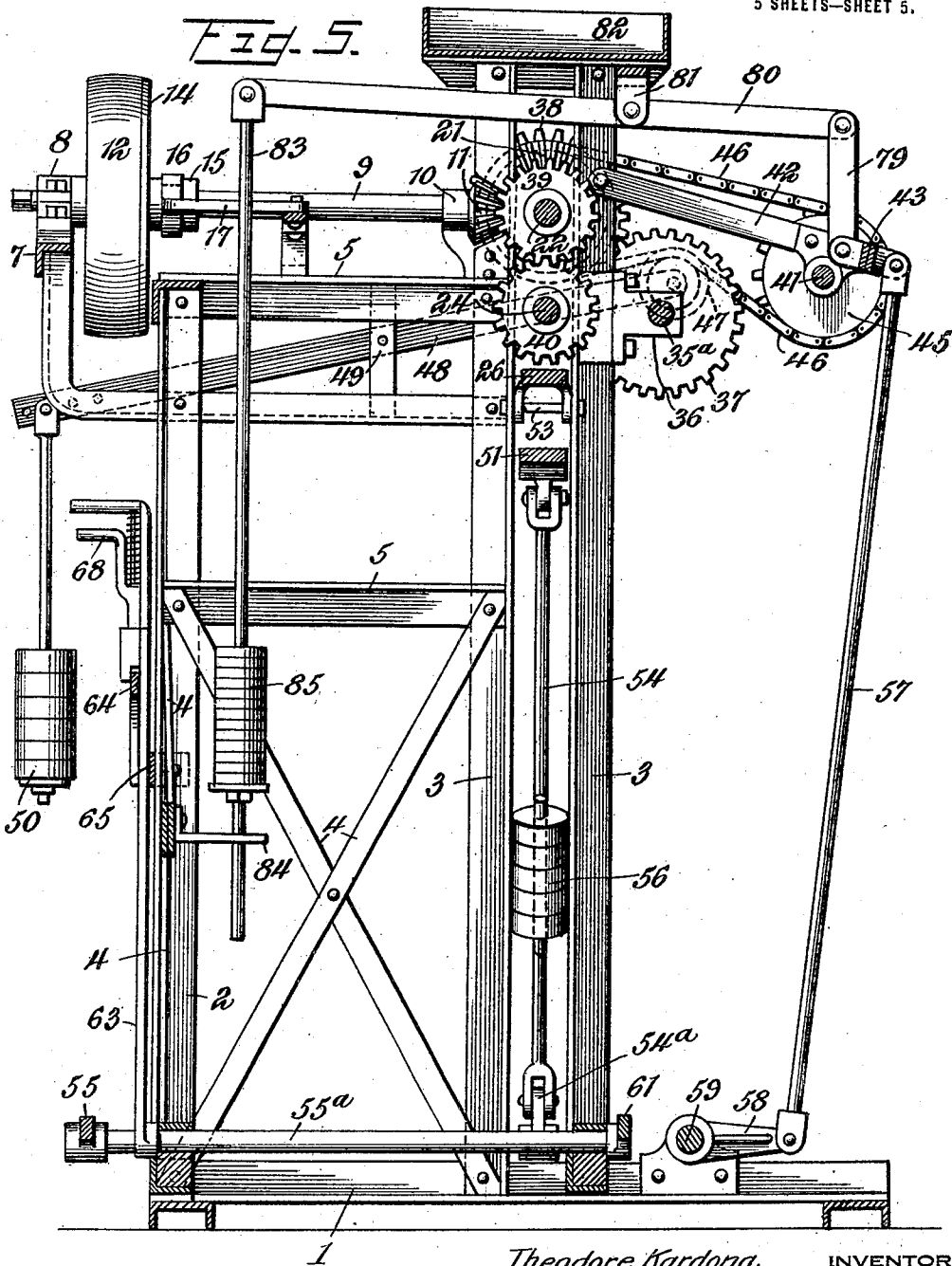
T. KARDONG.
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Patented May 23, 1922.

5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

THEODORE KARDONG, OF MINNEAPOLIS, MINNESOTA.

SPIRAL MACHINE.

1,417,249.

Specification of Letters Patent. Patented May 23, 1922.

Application filed April 20, 1920. Serial No. 375,298.

To all whom it may concern:

Be it known that I, THEODORE KARDONG, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented a new and useful Spiral Machine, of which the following is a specification.

This invention has reference to machines for bending steel stock in the form of bars, or rods or wires, to produce reinforcements for concrete work, and its object is to produce a machine which will form helices from round, square or deformed stock in any shape, namely, either in coiled bundles or straight stock, whether such bundles or straight stock be in good condition or bent from the effects of transit.

The invention comprises devices to act upon the stock in such manner that, irrespective of the condition in which the stock is fed into the machine, it will leave the device in the form of an extended helix with the turns of any diameter and spacing for which the machine may be set.

The invention includes feed rollers so arranged and driven that all the rollers are live rollers, that is, each roller is positively driven. The invention also includes control levers, a tension pitch guide, a pressure roller in which gravity or a spring is utilized for producing the pressure, and an arrangement for coupling or connecting a support for the finished helix.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not confined to any strict conformity with the showing in the drawings, but may be changed and modified so long as such changes and modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings,

Fig. 1 is an elevation of the helix-forming side of the machine with some parts in section.

Fig. 2 is an elevation of the machine as seen from the left hand side of Fig. 1.

Fig. 3 is a plan view of the machine.

Fig. 4 is an elevation of the machine as seen from the right hand side of Fig. 1.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is a longitudinal section of the driving end of the helix drum.

Referring to the drawings there is shown a main frame including a base 1, of suitable dimensions, on which uprights 2, 3, are erected, the uprights 3 being higher than the uprights 2 and are spaced so as to be relatively close together. The uprights are connected by brace bars 4 and crossbeams 5, whereby a rigid structure is obtained.

Connecting the upper ends of the shorter uprights 2 is a crossbeam 6 having a rising terminal portion 7, carrying a journal bearing 8 for one end of a power shaft 9 constituting the main power shaft of the machine. The other end of the shaft 9 is mounted in a journal bearing bracket 10, and on the end of the shaft 9 supported by the bracket 10 is a beveled pinion 11.

The shaft 9 near the journal bearing 8 has a pulley 12 mounted thereon receiving power from drive belt 13 indicated in dotted lines in Fig. 2 but omitted from the other figures of the drawing. The pulley 12 has associated therewith a clutch member 14, fast to the shaft 9, in such manner as to rotate therewith but so constructed that it may be moved into and out of clutching relation with the pulley 12.

In order to actuate the clutch member 14, there is provided a collar 15 fast to the clutch member 14, and slidable on the shaft 9, and surrounded by a ring 16 engaged by an arm 17 which, in the particular showing of the drawings is in the form of an angle link, connected at the end remote from the ring 16 to a hand lever 18, pivoted at one end to a part of the main frame and at the other end movable over a ratchet segment 19, and also fast to the main frame. The hand lever 18 carries a finger latch 20 engaging the teeth of the ratchet 19 to hold the clutch in or out of engagement with the pulley 12, so that an operator may couple up the machine to a source of power for operation or may disconnect it therefrom when it is desired that the machine be still.

The pinion 11 is in mesh with a beveled gear wheel 21 mounted on a shaft 22 extending transversely of the main frame to the opposite side thereof where it carries a circumferentially grooved upper roller 23. The shaft 22 which is alluded to in the claims as the second shaft is thus geared to the power shaft and extends between the uprights 3 and below it is another or third

shaft 24 also extending between the up-
rights 3, and mounted at its opposite ends
in bearings 25 carried by a lever 26 mov-
able between the posts 3, and hinged near
5 the side of the machine carrying the shaft
9 to permit the other end of the frame to
rise and fall. At the last named end of the
frame the shaft 24 carries a circumferen-
tially grooved lower roller 27 beneath and
10 coacting with the roller 23 as feed rollers so
as to pass a rod or wire 28 between them,
said wire coming from a suitable source of
supply and being directed to the two feed
rollers 23 and 27 by guide rollers 29, 30 and
15 31, toward another circumferentially grooved
roller 32, which may be located a distance
to one side of the longitudinal vertical
plane of the grooved peripheries of the
two rollers 23 and 27 said roller 32 being
20 referred to in the claims as the third roller.
By these means the rod or wire 28, fed by
the rollers 23 and 27, will ultimately reach
the third roller 32 and engaging under the
latter in its peripheral grooves will be bent
25 downwardly to assume a curved configura-
tion corresponding to the degree of out-of-
alignment of the third roller 32 with respect
to the adjacent portions of the upper and
lower rollers 23 and 27.

30 In the path of the wire or rod 28, after
leaving the rollers 23 and 27, and before
reaching the roller 32, is another peripher-
ally grooved roller 33 which is referred to in
the claims as the fourth roller, over which
35 the wire or strand 28 is caused to pass be-
fore reaching the third roller 32. The
fourth roller is located between the upper
and lower rollers and the third roller. The
strand 28 does not pass over the roller 32
40 but engages the latter on its under portion,
thereby deflecting the strand to an extent
causing it to assume a circular form, accord-
ing to the adjustment of the parts, whereby
a helical tendency is given to the wire or
45 strand.

At such distance from the side of the
main frame where the rollers 23, 27, 32 and
33 are located there is a standard or up-
right 34^a carrying a journal bearing 35 at
50 its upper end on a level with the axis of the
fourth roller 33. The roller 33 is mounted
on one end of a fifth shaft 35^a journaled
in brackets 36 fast to the uprights 3 of the
main frame. The other end of the shaft 35^a
55 carries a gear wheel 37 meshing with the
gear wheel 38 on the second shaft 22. The
two shafts 22 and 24 designated as the sec-
ond and third shafts carry meshing gear
wheels 39 and 40 whereby the shaft 22, driv-
60 en by the power shaft 9 through the pinion
11 and beveled gear wheel 21, causes the
shaft 24 and roller 27 to rotate with, but in
the opposite direction from, the shaft 22 and
roller 23.

65 The third roller 32 is carried by one end

of a fourth shaft 41 journaled in legs 42 of
a frame 43 rockably mounted on uprights
3 of the main frame so that the shaft 41,
together with the roller 32, may be raised
and lowered in the arc of a circle about the
70 axis of the frame 43; so that the relation of
the roller 32 to the rod or wire 28, as it
comes from the rollers 23, 27 and 33, may
be varied as desired.

The second shaft 22 carries a sprocket 75
wheel 44, and the fourth shaft 41 carries
a sprocket wheel 45, these two sprocket
wheels being connected by a sprocket chain
46 engaged intermediately by an idler 47
mounted on one end of a rock arm 48 and 80
carried between its ends by a pivot support
49 on the main frame, while the other end
of the rock arm 48 from the idler 47 is pro-
vided with a pendant weight 50 tending
to hold the idler 47 against the chain 46 to 85
keep it taut, therefore the idler acts as an
automatic belt tightener.

The end of the lever 26 carrying the roller
27 is, in turn, carried by another lever 51
through the intermediary of a spacer block 90
52, the lever 51 being pivoted at 53 to one
of the uprights of the main frame near
block 52. The other end of the lever 51,
constituting the longer end thereof, is con-
nected by a rod 54 and arm 54^a to a foot 95
lever 55 rockably mounted on a shaft 55^a in
the base portion of the main frame and pro-
vided with a weight 56 tending to lift the
roller 27 toward the roller 23, thus main-
taining a pressure on the work, represented 100
by the rod or wire 28, by gravity.

It is to be understood that the same result
may be accomplished by using a spring in
the place of the weight 58, the spring being
a well recognized equivalent of a weight in 105
such connection.

Whether a weight or a spring be em-
ployed, the pressure on the lower roller 27
is maintained at all times. The foot lever
serves the purpose of relieving the pressure 110
in order to introduce the stock between the
rollers. The roller 27 is movable toward or
away from roller 23 for the express purpose
of allowing an electric weld in the rod or
wire to pass through these rollers without 115
stopping the machine. As is well known
when a rod or wire is welded with an electric
welder, a knob is formed at the junction of
the two ends of the wire or rod, the diameter
of which knob is greater than the rod or 120
wire itself. When the knob passes between
the rollers, roller 27 moves downwardly to
allow the knob to pass, pressure being main-
tained at all times by the gravity weight or
spring. This construction provides a very 125
severe test for the weld. Any defect in the
weld would be quite sure to be detected.

Connected with the end of the frame 43,
and remote from the pivot supports thereof,
are links 57 descending to the basic portion 130

of the main frame and there connected to rock arms 58 fast to a rock shaft 59 near the ends thereof, the rock shaft extending across the base of the frame and thereby equalizing the movements of the links 57 and rock frame 43. Connected to one of the links 57 near its upper end is another link 60, in turn connected to an arm 61 on one end of rock shaft 62 journaled in the basic portion of the main frame. At the other end of the rock shaft 62 from the rock arm 61 there is a hand lever 63 at the same side of the main frame as the foot lever 55. The lever 63 rises alongside of the main frame to a convenient height and is movable across a notched arc 64, carried by a bar 65 with slots 66 near the ends through which bolts or screws 67 pass, holding the bar and the arc to the main frame with a degree of adjustability. The lever 63 is provided with a thumb latch 68 associated with the notched arc 64 whereby to hold the lever and parts controlled thereby in different adjusted positions. The lever 63 permits adjustment of the roller 32 to control the diameter of the coil into which a rod or wire 28 is formed. This is done by rocking the frame 43, carrying the shaft 41, with the roller 32 thereon to vary its position with reference to the straight line of travel of the rod or wire 28. The roller 32 is moved in the arc of a circle, and when lowered to its lowest position, the distance between its shaft 41 and the shaft 22 of roller 33, from which it receives its power, is shorter than when raised to its highest position, thereby causing a slack in the chain 46 which is taken care of by the chain tightener 47 controlled by weight 50.

Fast to the main frame is a bracket 69 which is attached to one end of a bar 70. The bracket 69 is located high up on the main frame near the roller 33, and the lower end of the bar 70 is attached to the basic portion 1 of the main frame. The two ends of the bar 70 are carried by slidable rods 71 and 72, respectively, in turn carried by brackets 73 to which the rods 71 and 72 are held by set screws 74. The rod, or staff, 70, extends across the formed helix indicated at 75, to which rod there is made fast an idle roller 76 by means of a set screw 77 permitting adjustment of the roller 76. To facilitate such adjustment the staff may be provided with graduations 78, thus guiding an operator in setting the roller 76 for different sizes of loops of the coil or helix 75. The roller 76 performs several important functions. It serves also as a combination pitch and guide roller. It guides each successive spiral or helix to a perfect repetition of the preceding spiral. When spirals or helices are formed from irregular stock, that is, a rod or wire which is kinked in any way or of uneven tensile strength, the four live rollers will not turn circles of even diameter

owing to the kinks or the uneven tensile strength of the wire or rod. The movement of the roller up and down permits it to be placed in its proper relation to the circle being formed. The roller is set with a slight tension against the stock, the tension being greater or less according to the size of the stock being used. This tension is the factor which causes each successive circle to be of the same diameter.

The two ends of the bar 70 are movable in a horizontal line in the same direction as the drum (see Figs. 1 and 4), each end independently of the other. This construction provides any pitch desired between the circles when the spiral is finished.

The frame 43 is hung by a link 79 from one end of a rock lever 80 pivotally supported by a bracket 81 on the underside of a tool box 82 mounted on the mast uprights 3. The other end of the lever 80 carries a link 83 with its lower end passing through a guide 84 on the main frame and supporting a weight 85 to serve as a counter weight for the frame 43.

The helix 75 as formed is projected along a drum 86 having a gudgeon 87 at one end adapted to be placed in the bearing 35, and at the other end formed to receive a ball 88 axially carried by the roller 33. The ball provides the necessary play or movement of the drum 86 to permit the placing of the gudgeon 87 into, and its removal from, the bearing 35. This universal joint enables the outer end of the drum to be moved from its bearing in any direction in order to permit the removal of the spiral or helix from the drum. The drum remains stationary at all times on the ball. In order to cause the drum 86 to turn with the roller 33 at the same speed the latter is formed with a lug 88^a and the drum 86 is formed with a recess 89 to receive the lug. The bearing 35 is open at the top to allow the gudgeon 87 to be inserted freely. The connection between the roller 33 and the drum permits the removal of the drum from the machine proper to be placed on the floor or stored without the removal of a single screw. It is sometimes necessary to remove the drum from the machine in order to use the space occupied by the drum when the machine is idle. The connection between the drum and the roller provides for a quick attachment and detachment of the drum in and out of position.

It is desirable that the notched arc, or rack, 64, have a fine adjustment. For this purpose there is provided a hand screw 90 carried by the main frame and passing through a nut 91 fast on the bar 65. To guide an operator in setting the rack 64 there is also provided a scale 92 fast on the main frame and the finger 93 fast on the bar 65. This provides for adjustments between the notches of the rack 64.

In operating the machine the parts are first set. The various counter weights may be of adjustable character so that the amount of weight may be varied as desired. This is valuable with respect to the pressing roller 27 in order to determine the degree of feeding pressure upon the rod, or wire, 28, constituting the stock from which the helix 75 is formed. The roller 32 is adjusted by the lever 63 to move the roller 32 initially out of the path of the stock 28, thus facilitating the threading of the stock into position. The rack bar 64 is adjusted by the hand wheel 90 to determine the position of the roller 32 with accuracy and avoid the necessity of accurate initial adjustments in the installation.

On starting the machine into operation the clutch 14 is coupled with the drive pulley 12, thus causing the power shaft 9 to actuate the meshed pinion 11 and gear 21, and thereby, in turn, actuating all the rollers 23, 27, 32 and 33. This actuation of the rollers is positive, the roller 23 being directly driven from the shaft 9 by the beveled gears and shaft 22, the roller 27 being directly driven by the meshing gears 39 and 40, acting on the shaft 24, the gear roller 33 being directly driven by the meshing gears 37 and 38 and the roller 32 being directly driven by the sprocket chain 46 driven by the sprocket wheels engaging it.

As the stock is driven forwardly by the rollers engaging it the forward end of the stock that ultimately engages the roller 32, and the latter, either at such time or previously, is depressed so as to change the course of the stock toward the bottom of the machine, positive movement of the roller 32 causing the stock to assume a curvature corresponding to the desired formation of the helix to be produced. This is further assured by the roller 76 causing the stock to thus assume an upward trend in spaced relation to the upright plane of the stock being fed toward the roller 32. In this manner the stock is given a screwlike progressive trend, depending upon the set of the machine. As the operation of the machine proceeds the helix being formed is fed along the drum 86 which serves to support the helix, and this operation may proceed until the outer end of the drum 86 is reached, whereupon the helix is cut, after stopping the machine, and the drum 86 is lifted from its bearing 35 so that the helix may be bodily removed by cutting from the machine. Then the drum is replaced and the machine is again started to continue the formation of the helix as long as desired. The ready removability of the drum permits helices of any desired length, up to the capacity of the machine, to be formed and removed at any time.

It will be noted that the spiral or helix is removed from the drum at the end which is

remote from the machine. This is an advantage because when several spirals or helices are rolled out on the drum at one time, and when cut to the proper length, a fraction of a spiral or helix may still be left on the drum, the unfinished portion remaining in the rollers. In the reverse construction, where the spiral or helix is removed from the drum at the machine end, great difficulty would be encountered in removing the end of the spiral or helix supporting drum from its bearing, owing to the fraction of the spiral remaining on that end.

An important feature of this machine is its capability to make a helix or spiral of small diameter. The rollers on this machine are $4\frac{1}{2}$ inches in diameter which form a spiral or helix $5\frac{1}{2}$ or 6 inches in diameter, according to the grade of stock used. So far as I am aware, no other machine can make a spiral or helix so small in diameter as this machine.

What is claimed is:

1. In a machine for producing helices, the combination of an upper roller, a lower roller, a third roller located to one side of the longitudinal vertical plane of the peripheries of the upper and lower rollers, a fourth roller located between the upper and lower rollers and the third roller, and means for positively driving all four rollers from the power shaft of the machine.

2. In a machine for producing helices, the combination of an upper roller, a lower roller, a third roller located to one side of the longitudinal vertical plane of the peripheries of said upper and lower rollers, a fourth roller located between the upper and lower rollers and the third roller, means for passing the metal to be bent between the upper and lower rollers, then over the fourth roller and under the third roller, means for moving the third roller in the arc of a circle, and means for positively driving all four rollers from the power shaft of the machine.

3. In a machine for producing helices, the combination of an upper roller, a lower roller, a third roller located to one side of the longitudinal vertical plane of the peripheries of said upper and lower rollers, a fourth roller located between the upper and lower rollers and the third roller, means for passing the metal to be bent between the upper and lower rollers, then over the fourth roller and under the third roller, means for moving the third roller in the arc of a circle, and means for positively driving all four rollers from the power shaft of the machine, the upper and lower rollers being rotated in opposite directions, the lower roller being the pressure roller and having means for holding it in engagement with the upper roller.

4. In a machine for producing helices, the combination of an upper roller, a lower roller, a third roller located to one side of

the longitudinal vertical plane of the peripheries of the upper and lower rollers, a fourth roller located between the upper and lower rollers and the third roller, a drum on which the helix is wound coupled to the fourth roller, and rotated at the same speed, and means for positively driving all four rollers from the power shaft of the machine.

5. In a machine for producing helices, the combination of an upper roller, a lower roller, a third roller located to one side of the longitudinal vertical plane of the peripheries of the upper and lower rollers, a fourth roller located between the upper and lower rollers and the third roller, means for positively driving all four rollers from the power shaft of the machine, and an idle roller arranged below the other rollers in a relatively fixed position and serving as a guide roller.

6. In a machine for producing helices, the combination of an upper roller, a lower roller, a third roller located to one side of the longitudinal vertical plane of the peripheries of the upper and lower rollers, a fourth roller located between the upper and lower rollers and the third roller, means for positively driving all four rollers from the power shaft of the machine, and an idle roller arranged below the other rollers in a relatively fixed position and serving as a guide roller, said roller being adjustable in the direction of the diameter of the helices being formed and set with a tension against the stock from which the helices are formed.

7. In a machine for producing helices, the combination of an upper roller, a lower roller, a third roller located to one side of the longitudinal vertical plane of the peripheries of said upper and lower rollers, a fourth roller located between the upper and lower rollers and the third roller, means for passing the metal to be bent between the upper and lower rollers, then over the fourth roller and under the third roller, means for moving the third roller in the arc of a circle, means for positively driving all four rollers from the power shaft of the machine, an idle roller located below the other rollers, a support for the idle roller, said idle roller having means for adjusting the same along the support, and means for moving the ends of the support independently of each other.

8. In a machine for producing helices, the combination of an upper roller, a lower roller, a third roller located to one side of the longitudinal vertical plane of the peripheries of said upper and lower rollers, a fourth roller located between the upper and lower rollers and the third roller, means for passing the metal to be bent between the upper and lower rollers, then over the fourth roller and under the third roller, means for moving the third roller in the arc of a circle, a drum on which the helix is wound connected to the fourth roller to revolve

therewith, an idle roller cooperating with the four rollers and located below the same, said idle roller serving as a pitch and guide roller, and means for positively driving all four rollers from the power shaft of the machine.

9. In a machine for producing helices, a pair of feed rollers for the wire or rods, a roller in the path of the advancing wire or rod to change the direction of travel thereof from a straight course to a helical course, an axially extended drum between the direction changing roller and the feed rollers to receive and support the helix being formed, means for positively driving said rollers from the power shaft of the machine, and an idle roller and support therefor independent of the first named rollers and drum and serving as a combination pitch and guide roller.

10. In a machine for producing helices, a pair of feed rollers for the wire or rods, a roller in the path of the advancing wire or rod to change the direction of travel thereof from a straight course to a helical course, an axially extended drum between the direction changing roller and the feed rollers to receive and support the helix being formed, and a roller and support therefor independent of the first named rollers and drum, the last named roller having associated therewith means for adjustment of the roller in the direction of the diameter of the helix.

11. In a machine for producing helices, feeding rollers, a direction changing roller and a supporting roller for the coils of a formed helix, all positively driven, another roller for engaging a coil of the forming helix and serving as a guide therefor, the last named roller being an idler roller, and a carrier for the last named roller extending across the helix and adjustable on a horizontal line in the direction of the drum.

12. In a machine for producing helices, rollers for forming a strand or wire into a helix, and a supporting drum for the forming helix including a roller for the wire or rod constituting the helix, the roller carrying the drum being positively driven and the drum being connected to the roller by a universal joint.

13. In a machine for producing helices, associated rollers arranged to feed and bend a strand or wire into helical form, and a drum separate from, and axially connected to and supported at one end by one of the rollers for receiving the helix being formed, the connection being a universal joint, and at the other end having a journal support, whereby the drum with the formed helix thereon may be bodily moved from its journal support to permit the removal of the helix from the end of the drum remote from the machine.

14. In a machine for producing wire or

rod helices, rollers for engaging the wire or rod to bend it into helical form, one of the rollers having a ball continuation with a lateral extension, and a drum formed at one end with a recess to receive the ball and a slot to receive the lateral continuation, whereby the drum is locked to the ball to rotate with the roller, and a journal support for the other end of the drum from which it may be separated, whereby the drum may be moved from its journal support to permit the removal of the helix.

15. In a machine for producing wire or rod helices, a pair of positively driven feed rollers for the wire, a direction changing roller in position to be engaged by the wire delivered from the feed rollers, another roller intermediate of the feed rollers and the second named roller, positively acting driving means for all and individual to the rollers, and a supporting drum for the helix as formed having means for connecting it to the intermediate roller to be driven thereby, and a journal support for the end of the drum remote from the machine, the drum being movable away from said support.

16. In a machine for producing wire or rod helices, helix forming rollers with one roller mounted to move toward and from the path of the wire or rod from which the helix is formed to determine the curvature and consequent size of the helix, and means for moving said roller comprising a pivoted frame carrying the roller, equalizing rods connected to the frame, and lever and link sections for actuating the frame to adjust the roller as desired.

17. In a machine for producing wire or rod helices, helix forming rollers with one roller mounted to move toward and from the path of the wire or rod from which the helix is formed to determine the curvature and consequent size of the helix, and means for moving said roller comprising a pivoted frame carrying the roller, equalizing rods connected to the frame, and lever and link connections for actuating the frame to adjust the roller as desired, said frame having one-way constraining means yieldable to the adjustment of the roller.

18. In a machine for producing wire or rod helices, helix forming rollers with one of the rollers provided with a support whereby the relation of the roller to others of the rollers may be changed, and means for effecting the changed relation comprising a rack lever connected to the roller, and a rack segment for the lever to hold it in different positions of adjustment, said rack being adjustable in chord relation to the axis of the rack lever to provide for micrometric adjustments.

19. In a machine for producing wire or rod helices, a group of helix forming rollers

with one of the rollers movable to vary the size of the helix being formed, and means for effecting the adjustment of the roller, comprising a rack lever connected to and controlling the adjustable roller, a rack over which the rack lever is movable and provided with means for holding the rack lever in different positions of adjustment with relation to the rack, and a support for the rack having micrometric means for moving the rack in chord relation to the axis of the rack lever whereby small adjustments of the rack, less than the distance between two teeth of the rack, may be made.

20. In a machine for forming helices, the combination with feeding rollers, a direction changing roller, and a supporting roller, all positively driven from the power shaft of the machine, an idle roller for engaging under tension a coil of the forming helix and serving as a guide therefor, and means for adjusting said roller to accord with the helix being formed.

21. In a machine for producing helices, the combination of a plurality of rollers for forming the helix, one of the rollers being mounted to move toward or from the path of the wire or rod from which the helix is made to determine the curvature and consequent size of the helix, and means for moving said roller comprising a pivoted frame carrying the roller, a hand lever connected to the frame for moving the same, and means for adjusting the throw of the lever.

22. In a machine for producing helices, the combination of a plurality of rollers for forming the helix, one of the rollers being mounted to move toward or from the path of the wire or rod from which the helix is made to determine the curvature and consequent size of the helix, and means for moving said roller comprising a pivoted frame carrying the roller, a hand lever connected to the frame for moving the same, and means for adjusting the throw of the lever, and micrometer means for providing a finer adjustment for the last-mentioned means.

23. In a machine for providing helices, the combination with the frame, of a power shaft mounted therein, a second shaft geared to the power shaft, a roller mounted on said second shaft, a third shaft geared to the second shaft, a roller on the third shaft, a fourth shaft geared to the second shaft, a roller on the fourth shaft, a fifth shaft geared to the second shaft, and a roller on the fifth shaft.

24. In a machine for producing helices, the combination with a frame, of a power shaft, a main shaft geared to the power shaft, a roller on the main shaft, three other shafts all geared to the main shaft, an individual roller for each shaft, one of the shafts and

its roller being mounted to move in the arc of a circle, and means for effecting such movement.

25. In a machine for producing helices, the combination with a frame, of a power shaft, a main shaft, a roller on the main shaft, two other shafts geared to the main shaft, a roller on each shaft, a movably mounted frame, a shaft therein, sprocket and chain gearing connecting the last mentioned shaft to the main shaft, and means for moving said frame in the arc of a circle.

26. In a machine for producing helices, helix forming rollers with two of the rollers associated to constitute feed rollers for the rod or wire, said feed rollers being super-

posed with the lower roller movable toward and from the other, a lever carrying the lower roller, another lever connected to the first-mentioned lever and arranged at an angle thereto, a rod connected to the last-mentioned lever, a foot lever connected to the rod, and means independently of the foot lever and acting against the lever supporting the lower roller for lifting the lower roller toward the upper roller so as to maintain a pressure on the rod or wire at all times.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

THEODORE KARDONG.