F. H. RICHARDS.

COILING MECHANISM.

APPLICATION FILED JULY 6, 1909.

958,767.

Patented May 24, 1910.

5 SHEETS—SHEET 1.

FIG. 1.

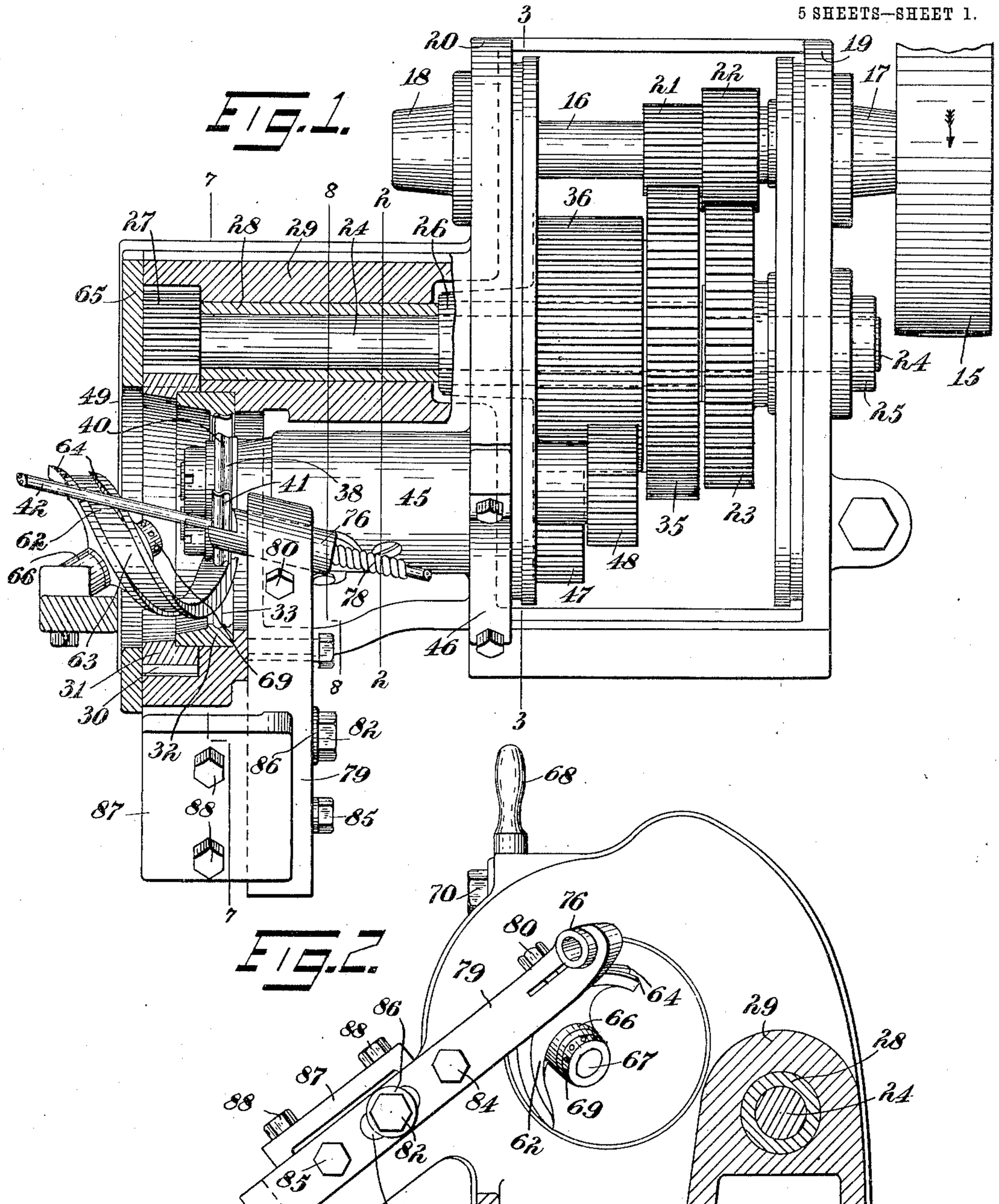


FIG. 2.

Witnesses:

S. Thomas

H. D. Penney

Inventor:

F. H. Richards.

F. H. RICHARDS.

COILING MECHANISM.

APPLICATION FILED JULY 6, 1909.

958,767.

Patented May 24, 1910.

5 SHEETS—SHEET 2.

FIG. 3.

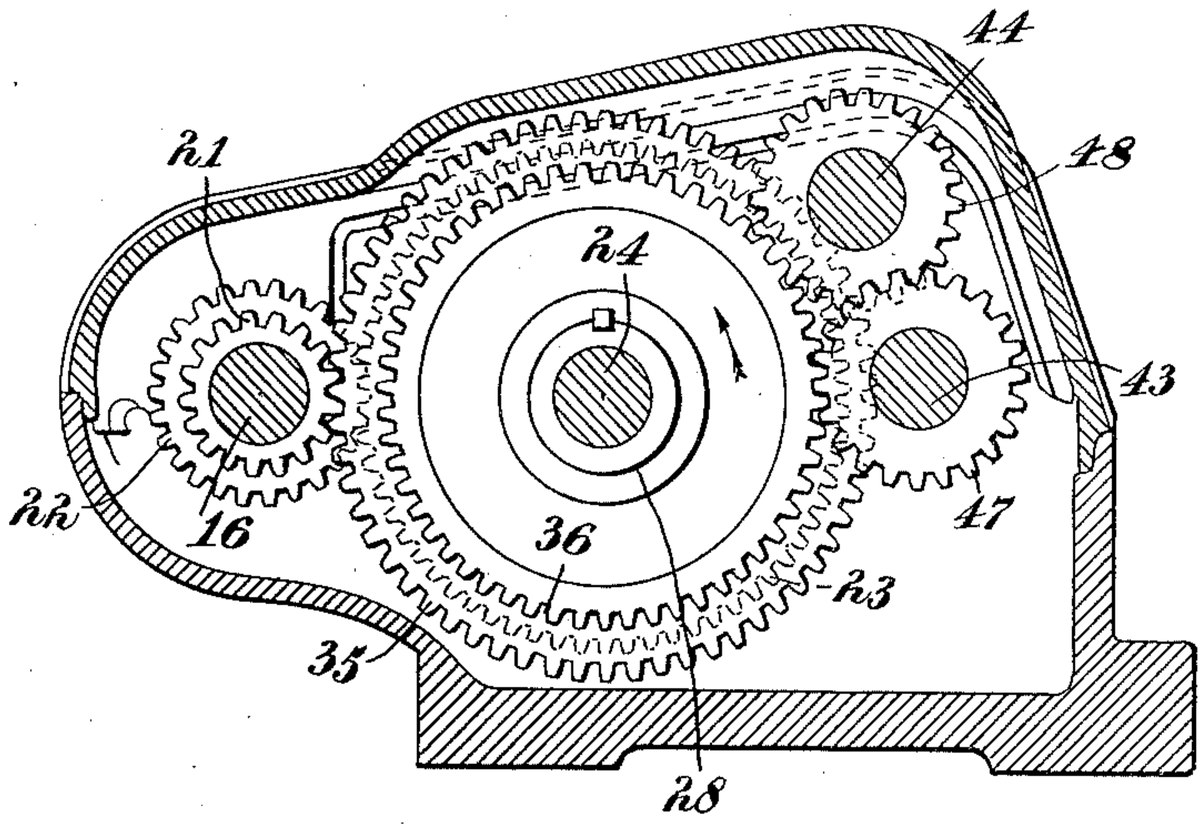
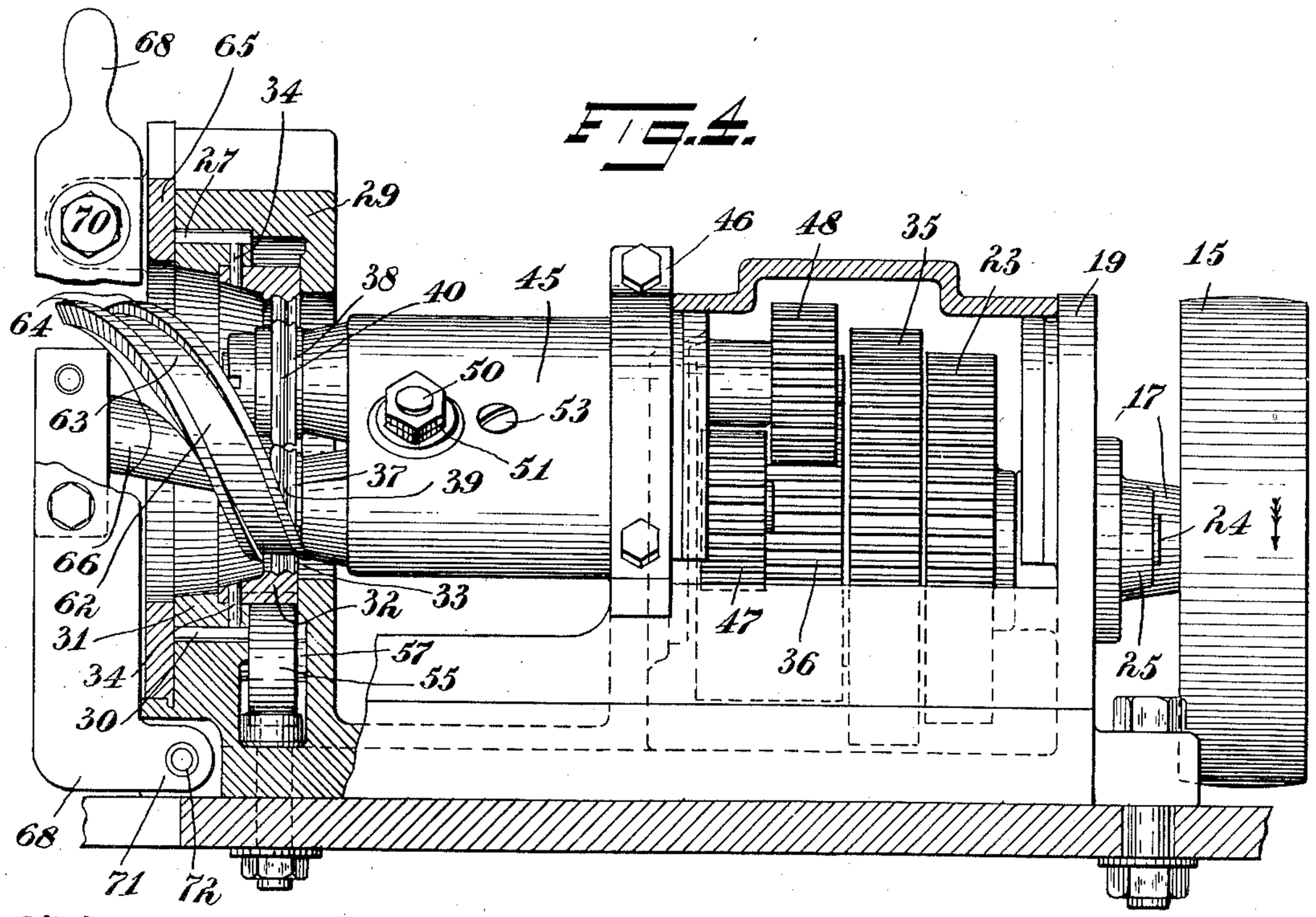


FIG. 4.



Witnesses:

S. Seaman.

H. D. Penney

Inventor:

F. H. Richards.

F. H. RICHARDS.

COILING MECHANISM.

APPLICATION FILED JULY 6, 1909.

958,767.

Patented May 24, 1910.

5 SHEETS—SHEET 3.

FIG. 5.

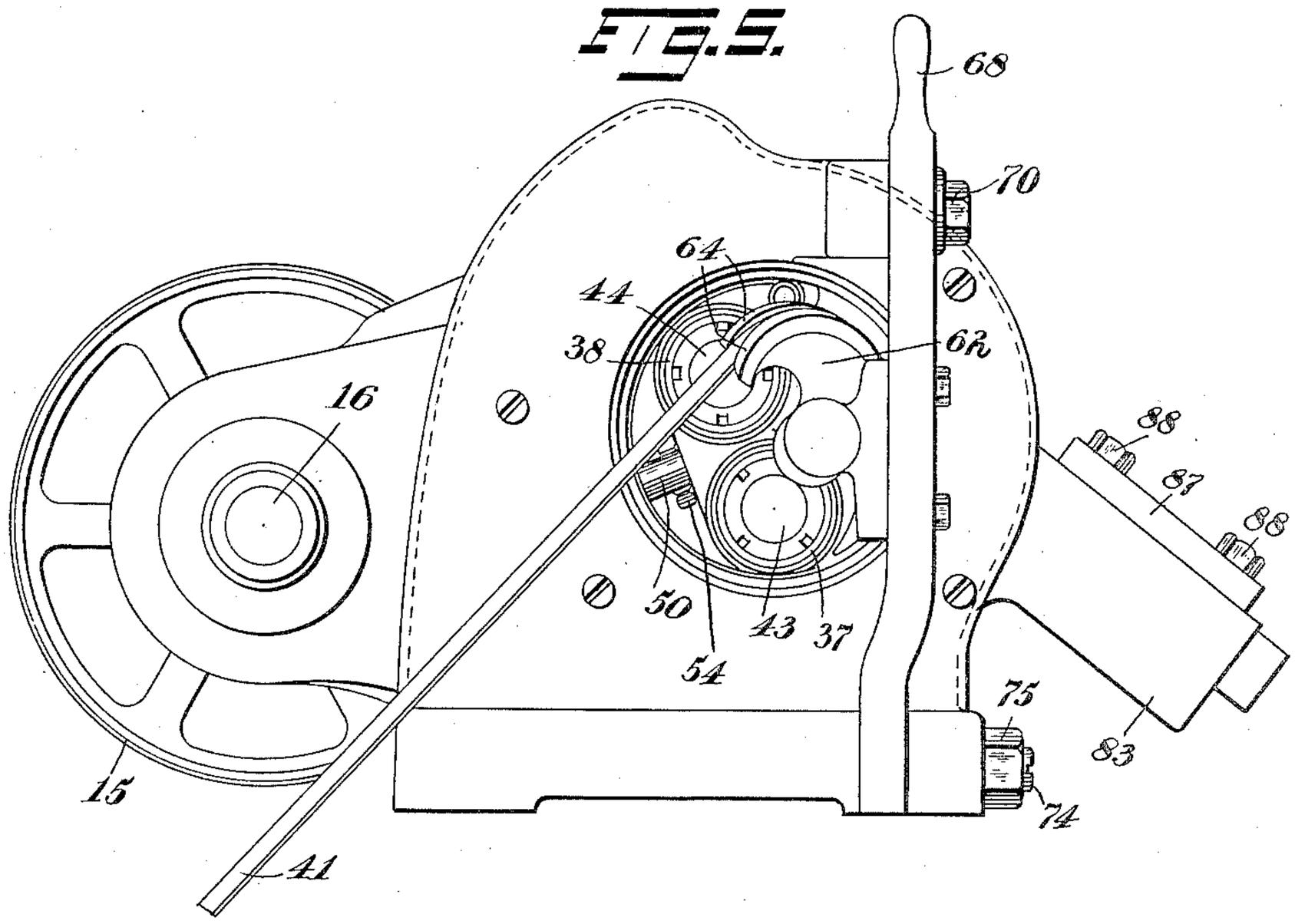
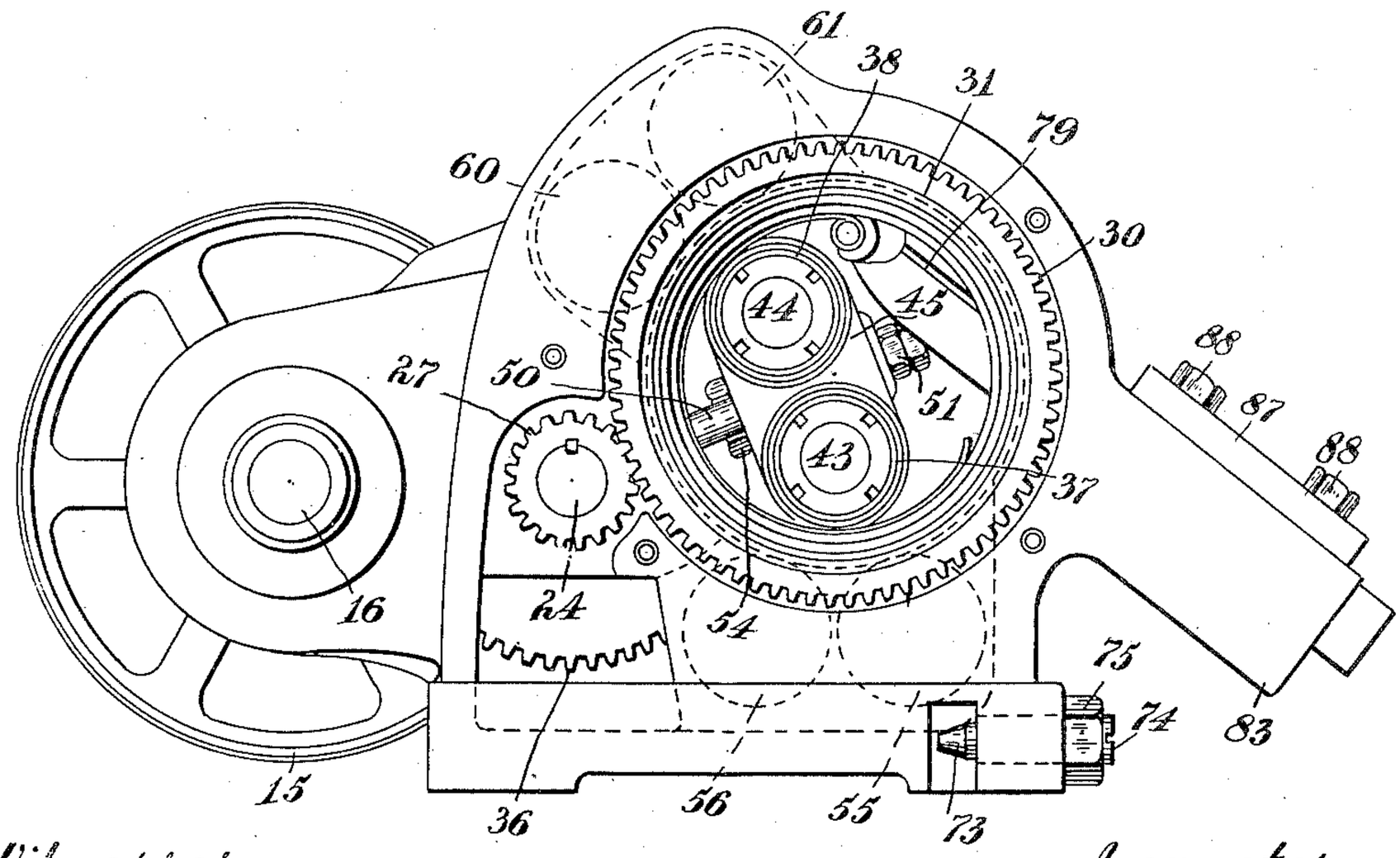


FIG. 6.



Witnesses:
S. Newman
H. D. Penney

Inventor:
F. H. Richards.

F. H. RICHARDS.

COILING MECHANISM.

APPLICATION FILED JULY 6, 1909.

958,767.

Patented May 24, 1910.

5 SHEETS—SHEET 4.

FIG. 7.

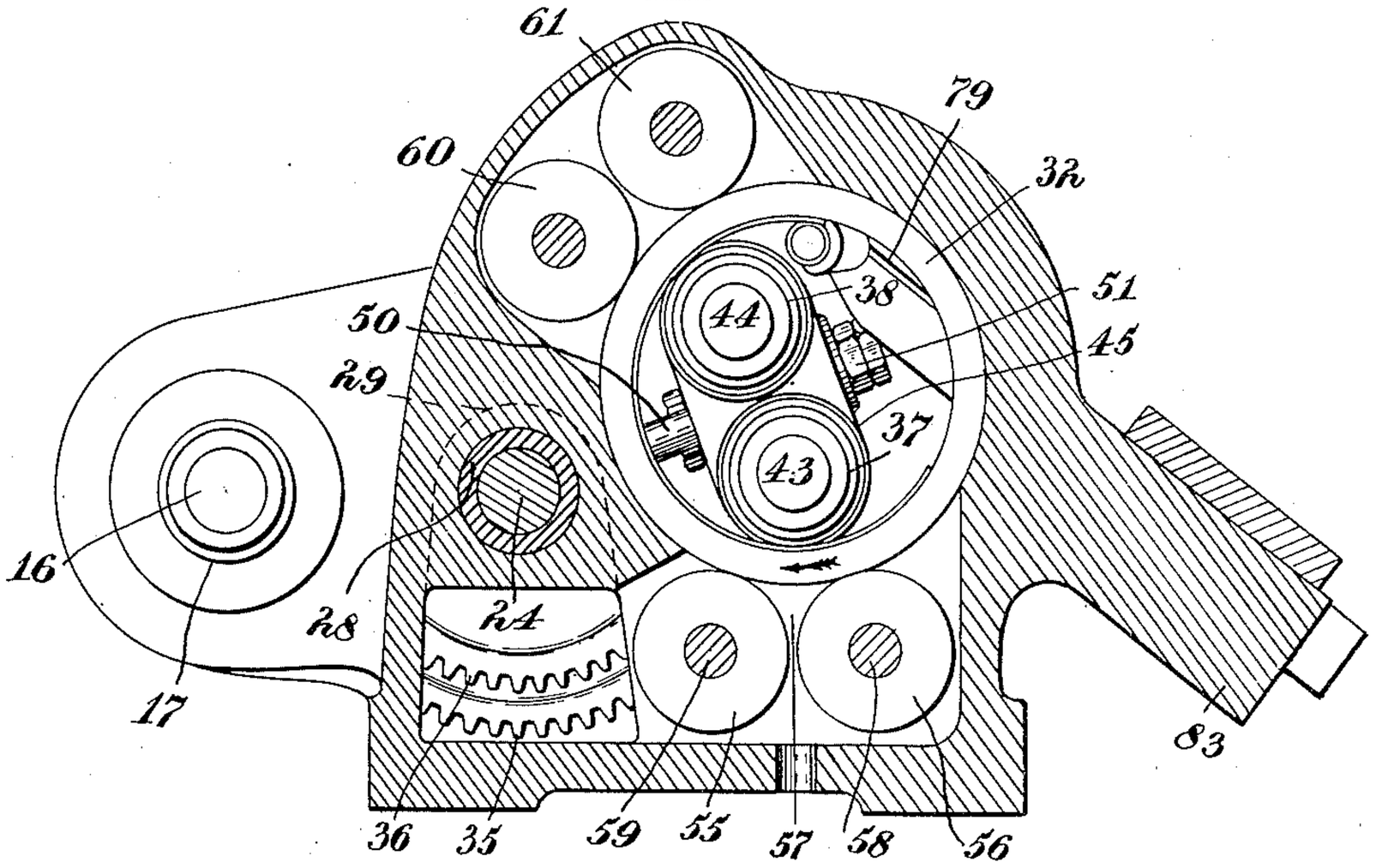
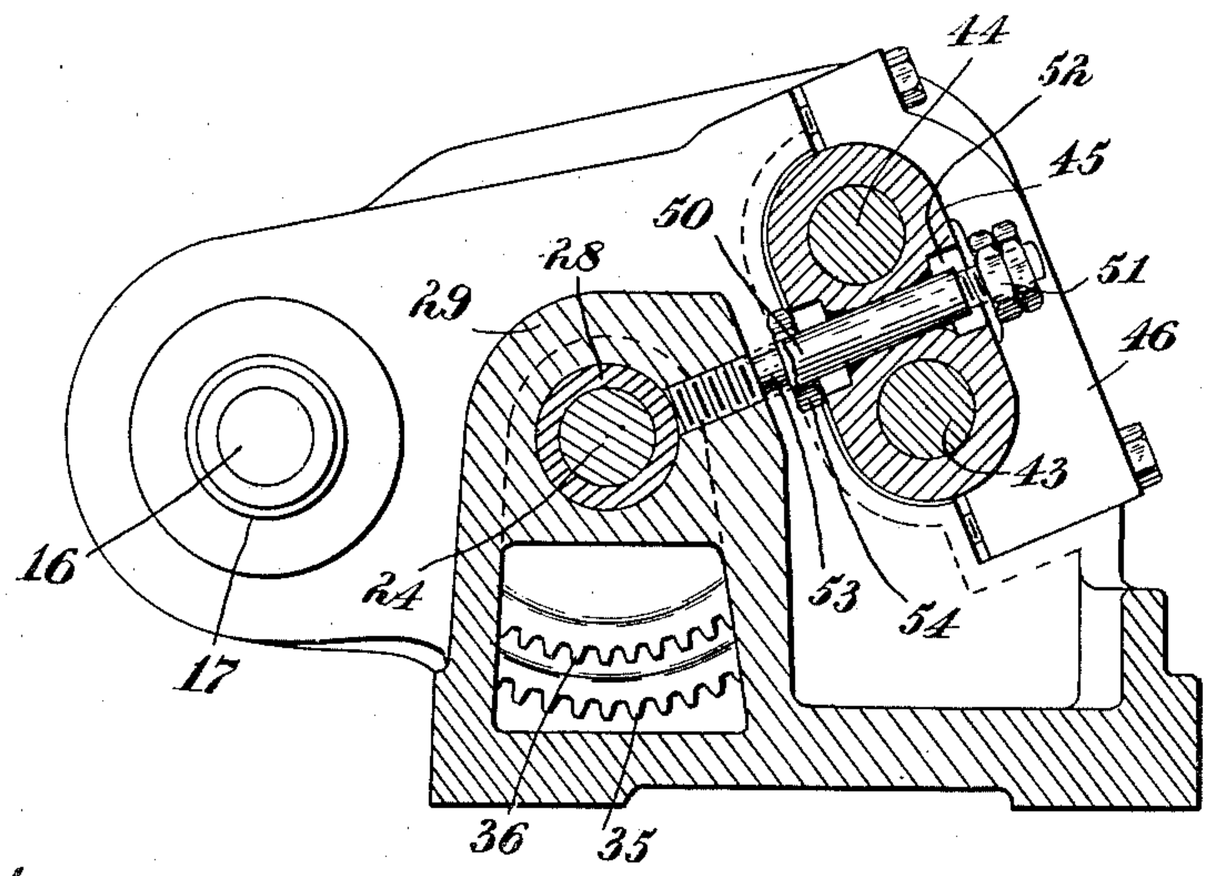


FIG. 8.



Witnesses:

S. Seaman

H. D. Penney

Inventor:

F. H. Richards.

F. H. RICHARDS.

COILING MECHANISM.

APPLICATION FILED JULY 6, 1909.

958,767.

Patented May 24, 1910.

5 SHEETS—SHEET 5.

FIG. 9.

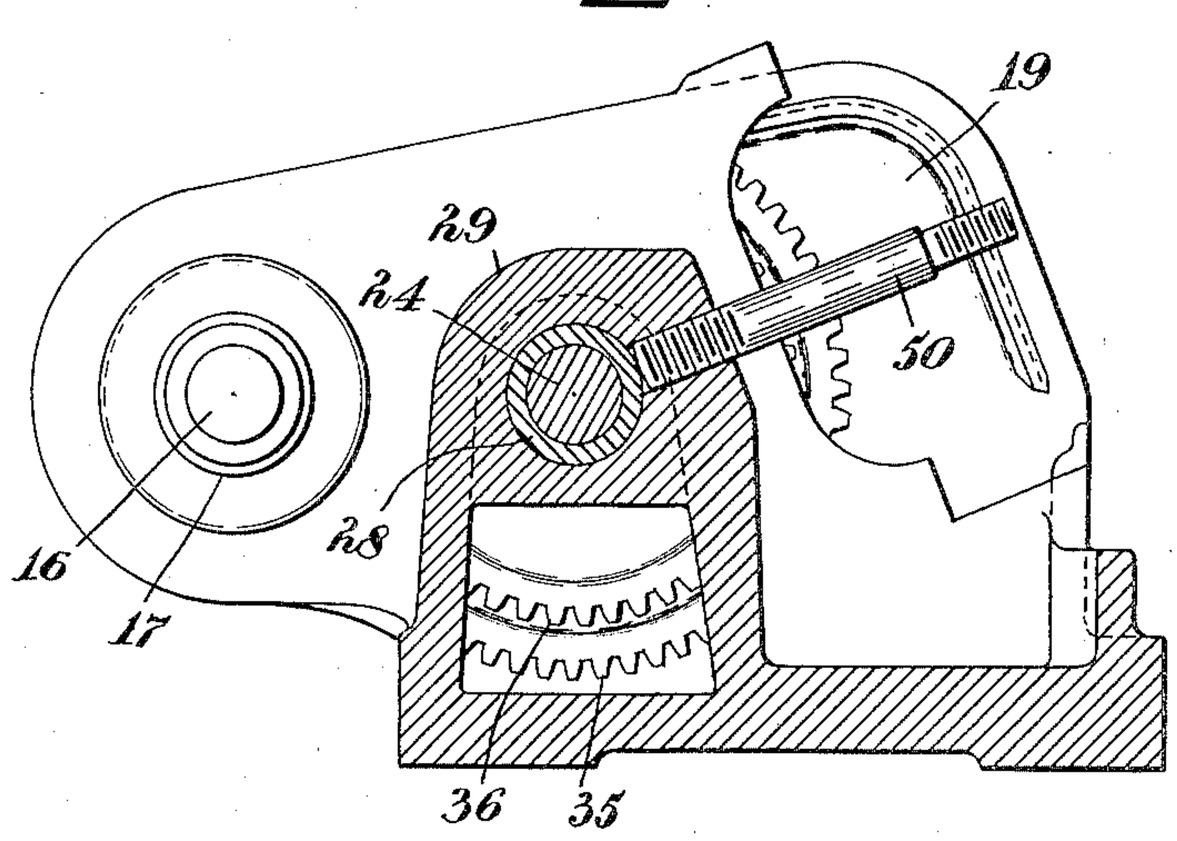


FIG. 12.

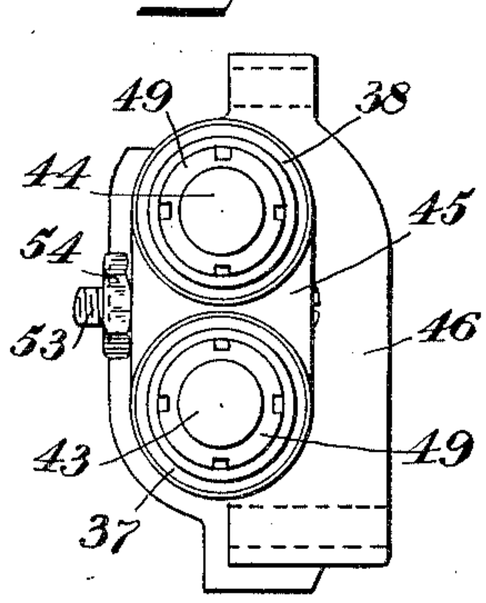


FIG. 10.

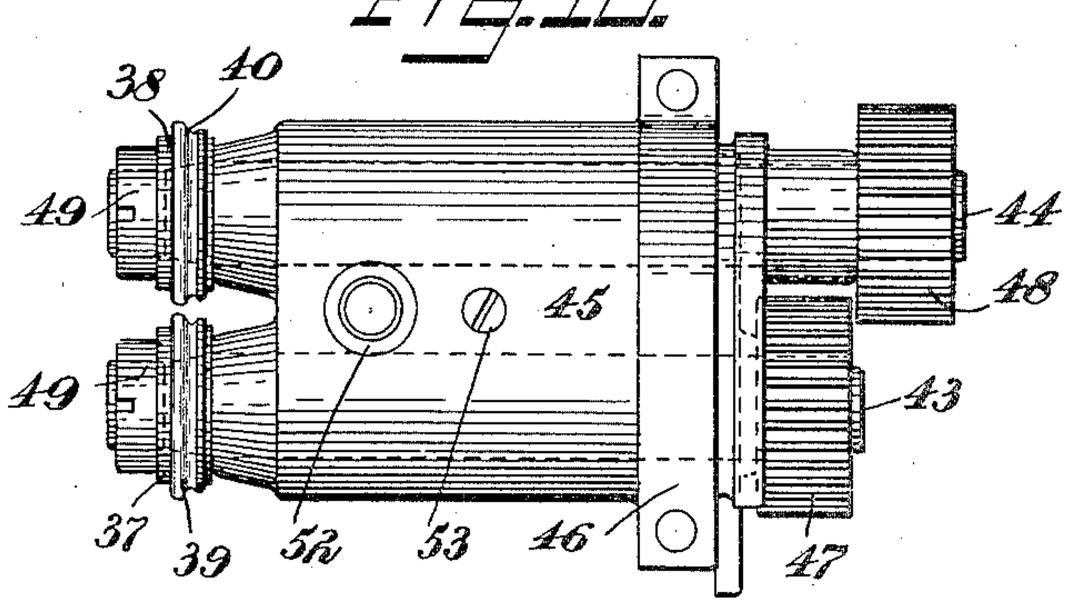


FIG. 13.

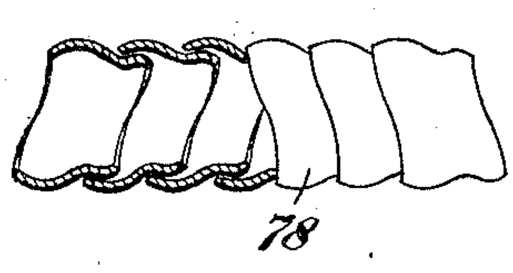


FIG. 11.

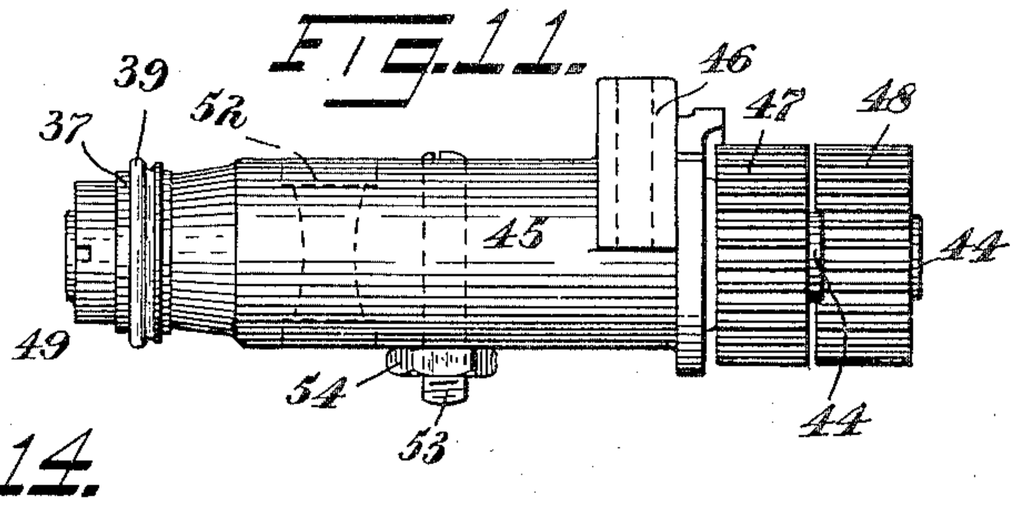
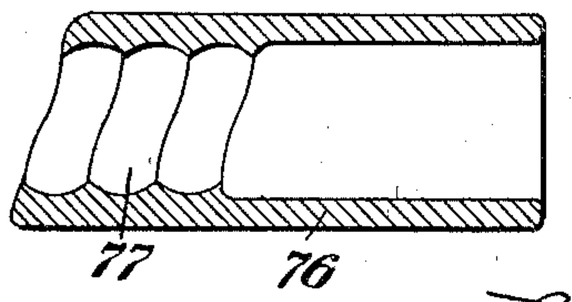


FIG. 14.



Witnesses:

S. Newman

H. D. Penney

Inventor:

F. H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO EDWARD D. SPEER, OF NEW YORK, N. Y.

COILING MECHANISM.

958,767. Specification of Letters Patent. **Patented May 24, 1910.**

Application filed July 6, 1909. Serial No. 505,952.

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing in Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Coiling Mechanism, of which the following is a specification.

This invention relates to coiling mechanism and has for an object to provide coiling mechanism embodying improved stock forming and feed rolls capable of forming the stock and delivering the formed stock directly from the working pass between a pair of forming rolls into coiling mechanism and effecting the coiling by virtue of the forwarding movement of the bite of the forming rolls.

In my application Serial No. 105,273, for rolling mechanism filed April 30, 1902, I have disclosed and claimed mechanism comprising a pair of rolls one located interiorly of the other and provided with coöperative die faces for re-forming or changing the cross sectional configuration of a stock bar.

In my application Serial No. 502,205, for coiling and feed mechanism, filed the 15th day of June, 1909, I have disclosed and claimed a feed mechanism comprising an internal face roll in combination with an external face roll for feeding directly to a coiling device.

The present invention relates to mechanism for making efficient a combination of these two inventions, namely the stock forming rotary dies for feeding directly to a coiling die the stock which is fed forward and formed at the working pass between such rotary dies. A pair of feed rolls which will engage the stock and drive this forward into a coiling die must ordinarily have the stock engaging faces so formed as to produce an inappreciable amount of distortion or disfiguration of the stock which is being fed forward. In the present invention, however, the feeding rolls are also forming dies and give a formation to the stock which is being fed forward by them and this fact is taken advantage of and the rolls will have a greater driving or forwarding action upon the stock than will rolls which are designed with a view to preventing the disfiguration of the stock. The forwarding action from the working pass of a pair of forming rolls before being engaged by any other surface than that of the forming rolls is to immediately pass it into the coiling die and the forwarding movement from the working pass is employed for driving the stock through the forming die.

This invention is particularly useful in placing an armor upon an insulated wire, and when such armor is given a proper configuration by the forming rolls it will be flexible.

In the drawings accompanying and forming a part of this specification a practicable embodiment of a form of my invention is illustrated wherein—

Figure 1 is a top plan view partly in horizontal section. Fig. 2 is a section taken on about the plane indicated by the line 2—2 in Fig. 1, looking toward the left, the internal rolls, however, being omitted in this view. Fig. 3 is a section taken on about the plane indicated by the line 3—3 in Fig. 1 looking toward the right. Fig. 4 is a side elevation partly shown in vertical central section. Fig. 5 is an end view of the machine looking at this from the left hand end of Fig. 1. Fig. 6 is a view similar to Fig. 5 showing the end plate and the stock guiding mechanism removed. Fig. 7 is a section taken on about the plane indicated by the line 7—7 in Fig. 1 looking toward the right. Fig. 8 is a view taken on a plane at about the line 8—8 in Fig. 1 also looking toward the right. Fig. 9 is a view similar to Fig. 8 but omitting the bearing or carrying member for the inner rolls. Fig. 10 is a top view of the inner rolls, their carrier mechanism and driving pinions. Fig. 11 is a side view; and Fig. 12 an end view of the parts shown in Fig. 10. Fig. 13 is a portion of the product of the machine partly shown in elevation and partly shown in longitudinal section; and Fig. 14 is a longitudinal sectional view of the coiling die.

The power for driving the mechanism of the present illustration is shown as a pulley 15 fast upon a shaft 16 which shaft is supported in journals 17 and 18 carried by the

respective ends 19 and 20 of the machine frame, which ends with the base of the frame constitute a gear box. The shaft 16 has fast upon it pinions 21 and 22. The pinions 21 and 22 are respectively for driving the inner and the outer forming and feed rolls. The pinion 22 is in mesh with a gear wheel 23 which is fast upon a shaft 24, such shaft being supported in bearings 25 and 26 carried by the end members 19 and 20 respectively. The shaft 24 carries a pinion 27, in the present instance located at some distance from the bearing 26. Between the pinion 27 and the bearing 26 the shaft 24 is surrounded by a bushing 28 of some anti-friction material, which bushing is supported by a bearing portion 29 of the bed of the machine frame. The pinion 27 is for driving the outer roll and is in mesh with gear teeth 30 upon the outer perimeter of a ring 31. The ring 31 is rabbeted and carries the outer roll 32 which constitutes the outer member of the rolls and has upon it a circular internal die face 33. The roll 32 and ring 31 will be fastened together by some suitable means, as for instance by pins 34. The ring 33 is provided upon its outer periphery with a bearing face which is partly supported by the machine frame and partly by two pairs of anti-friction rollers, which rollers in function will presently be described.

There is loosely mounted upon the shaft 24 a pair of gear wheels 35 and 36 which gear wheels are fast together. The gear wheel 35 is in mesh with the pinion 21 and the gear wheel 36 is for the purpose of driving the inner forming and feed rolls 37 and 38. The rolls 37 and 38 have faces 39 and 40 upon their perimeters which are complemental to and coöperative with the die face 33 for engaging, forming, and feeding forward the stock, as for instance a strip 41, of material which is to be coiled around insulated wire 42. The inner rolls 37 and 38 are mounted upon shafts 43 and 44 respectively, which shafts are provided with bearings in a carrier member 45. The carrier member is held in position at its end farthest from the rolls by means of a clamping member 46, and suitable set screws. The rolls are at one side of the clamping member 46 and the shafts 43 and 44, where these project from the other side of the clamping member, are provided with pinions 47 and 48 respectively which mesh with the gear wheel 36. In the present illustration the distance between centers of the pinions 47 and 48 is such that they cannot be placed in the same plane, consequently they are arranged in parallel planes and slightly overlapping, the gear wheel 36 being made broad enough to accommodate these pinions when so constructed and located. Suitable set nuts 49 are shown for holding the rollers 37 and 38 in position upon the shafts.

The gearing herein illustrated is of such relative proportions that the surface speed of the die 33 and the die faces 39 and 40 will be the same and move in the same direction, and each of these faces will be positively driven by a direct connection to the main source of power.

Means are shown for effecting the desired amount of pressure with which the inner rolls will be forced against the stock and against the outer roll. A pin 50 is shown as carried or mounted in the portion 29 of the frame. The pin 50 is shown as screw threaded at its carrier end and as abutting the bushing 28 for holding this in position. This is merely a means of making the pin do a double duty, for its main object is to carry a pair of set nuts 51 at its free end for bearing upon the end of the carrier 45 farthest from its clamp 46 and pressing the die faces 39 and 40 of the rolls 37 and 38 against the die face 33 of the outer roll 32. The pin 50 passes through an opening 52 in the carrier member 45 and this opening is made sufficiently large and of such an internal configuration as to permit of the required movements of adjustment. In some instances it will be desirable to prevent or limit the inward movement of the die faces of the inner members toward the die face of the outer member, and for this purpose an adjustable abutment or stop 53 will be provided, which is in the form of a screw passing through the carrier 45 and provided with a set nut 54.

The carriage 45 is constructed and adapted for ready removal from the machine, and upon its removal it will take with it the inner rolls. It will be noticed that the rolls are carried at one end of this carriage and the pinions therefor are carried at the other end and that the pinions are at the end which is secured to the machine frame, the rolls being at the farther or free end. There will be sufficient yieldability in the carriage 45 and the pin 50 to permit the rolls 37 and 39 which are at the extreme end of the carriage from the fastening device 46 to be properly adjusted and to accommodate themselves to irregularities in their work.

Reference was heretofore made to anti-friction rollers for engaging the outer perimeter or bearing face of the roll 32. The roll 32 is supported on each side of the radial line passing through the center of the arc of contact of the inner and the outer rolls by a pair of antifriction rollers. The rollers 55 and 56 are in position to receive the working thrust of the roll 37 against the roll 32. These antifriction rollers are set rather closely together and the line drawn from the center of the roll 32 will pass

through the center of the roll 37 and between the anti-friction rollers 55 and 56. This line for convenience is illustrated and is given the reference character 57. These anti-friction rollers being located as they are will receive the working thrust and being located not in the line of the thrust but on each side of the same will have distributed between them and between their journals 58 and 59 the strain and the friction. Another pair of rolls 60 and 61 will be similarly positioned in respect of the roll 38 for the purpose of supporting the roll 32 against the working thrust of the roll 38. The outer surfaces of one or more of the inner rolls will, when the nature of the material requires and will permit, be suitably formed or roughened for increasing the bite and the friction between the material and such roll or rolls. The roll faces or die faces 33, 39 and 40 are at a considerable distance from the driving gears to afford ample space between these two parts of the mechanism in which to lead off and dispose of the product of the machine.

The stock, in the form of a steel ribbon, when the machine is used for armoring insulated wire, will be supplied to the machine from some suitable source and will be passed over a guide 62 which guide has a flat face 63 for receiving the flat face of the stock and side guides 64 for engaging the edges of the stock. The development of the guide face 63 is cylindrical and the guide faces 64—64 and 63 are disposed in a spiral of about one-half a convolution, and of steep pitch. These guide faces may be cut on a screw cutting lathe. The guide face 62 will change the direction of the path of movement of the stock without exerting any edgewise distortion or strain upon it and will convey the stock to the working pass in a straight path and in a line normal to the line of movement of the roll surfaces, so that the stock will be fed through the end plate 65 of the machine, past the ring 31 and the securing portion of the roll 32 and be presented to the working pass between the face 39 of the roll 37 and the face 33 of the roll 32 in a direction coinciding with the path of movement of such faces at such working pass. The material will be engaged at such working pass and will be crimped or pressed into the desired formation and will be passed on to the working pass between the face 40 of the roll 38 and the face 33 of the roll 32 where the forming of the stock will be finished or completed. By referring to Fig. 13 a form which the stock will be given when it is desired to make an overlapping flexible armor is illustrated.

The guide member 62 is shown as provided with a hub 66 which is mounted upon a stub shaft 67 carried by a lever 68. The guide member 62 after having been adjusted to its proper position upon the stub shaft will be held in that position by means of a set nut 69. This will give a certain amount of rotary adjustment, and movement toward and from the working pass may be effected by this means. The lever 68 is for the purpose of giving adjustment of the stock relative to the plane of the face 33. The lever is shown as pivoted at 70, and has an inturned end or toe 71 which is provided with a conical opening 72 which will be engaged by a conical end 73 of a screw 74. There is a set nut 75 to lock the conical end 73 in its position after it has served to move the lever upon its pivot 70.

It is well known that in rolling mills a pair of rolls which form the stock will pass the stock forward with considerable force, the bite at the working pass of such forming rolls being very strong. In the present instance this naturally strong forwarding action from between a pair of forming rolls is taken advantage of for passing the formed material directly, and without engagement with any other surfaces than those which have engaged it for its formation, into a coiling device and utilizing such strong forwarding movement for forcing the stock through the coiling device. In the present illustration a solid coiling die is employed. The die is illustrated in longitudinal section in Fig. 14 and bears the reference character 76, it being a solid die and having at one end 77 a configuration to give the proper conformational outlines to the coil 78 which it is to produce. One side of the die is open, see Fig. 1, for receiving the stock as this passes from between the engaging faces 40 and 33. By reference to Fig. 6 it will be seen that the coiling die is located a short distance from the working pass of these rolls, and it will also be seen that the stock is not engaged by any surface after passing from between such working pass until it enters the die.

The die in the present instance is shown as having a cylindrical exterior which is seated in a socket in a supporting member 79 and will be clamped in its proper longitudinal and rotary position of adjustment by means of a set screw 80. The supporting member 79 is provided with a longitudinally disposed bolt slot 81 for receiving a bolt 82 which enters an extension 83 of the machine frame. This bolt and slot will permit the member 79 to be adjusted longitudinally for bringing the coiling die nearer to or farther from the working face 33 of the roll 32. The die may be given its proper inclination, that is as respects the longitudinal axis, by a pair of adjusting screws 84—85 which have

screw threaded connection with the member 79 and abut at their ends against the machine frame and will move the member 79 upon the pivot afforded by the head and washer 86 of the bolt 82. For the purpose of rigidly supporting the member 79 in its position of adjustment a plate 87 is mounted upon the extension 83 and will, by means of set screws 88, clamp the member 79 against a suitably formed ledge upon the extension 83.

The operation of the machine is substantially as follows: The stock guide 62 will be given its proper angular adjustment upon its shaft 67 for bringing the stock 42 which is fed over the surfaces 63 and between the guides 64—64 into the plane of the die face 33 of the external roll 32. The stop face 53 will be adjusted for limiting the pressure between the rolls 37—38 and the roll 32, and the set nuts 51 will be adjusted for holding the rolls 37—38 to their work and stop member 53 against its seat. The coiling die 76 will be adjusted in its carrying member 79 longitudinally for bringing it to the proper position relative to the plane of the face 33 and will be adjusted angularly for bringing its open side to the proper position for engaging the material as this comes from between the rolls 38—32 at their working pass. The member 79 will be adjusted longitudinally and rotarily also for bringing the die into its proper position, and the various set nuts will be clamped in position. The gearing will, by means of the driving pulley, rotate the die faces 33 and 39 and 40, at the same surface speed in the same direction which will draw the strip of stock between the rolls 37 and 32 and give it its general configuration. The pressure between the rolls 37 and 32 may be stronger than that between the rolls 38 and 32, which latter rolls by their engagement give the finishing conformation to the stock and pass this on into the coiling die and coil it around the insulated wire 42 which passes through the die opening. The die face 33 engages that side of the stock which will be on the outside of the coil, and the roll faces 36 and 40 engage the side of the stock which will be on the inner side of the coil.

Having described my invention I claim:

1. The combination with a coiling die, of a rotary member having an internal circumferentially formed die face, a rotary member having an external circularly formed die face mounted within and eccentric to said internal die face, said die faces being in rolling working engagement one with the other throughout a considerable arc of each and effective to pass work between them and in the direction of their rotation and into the said coiling die.

2. The combination with a coiling die, of a rotatable member having a compressive inner face, a rotatable member arranged eccentrically of the first mentioned rotatable member and having a compressive peripheral surface located within said inner face and coöperative therewith in forming a working pass adjacent to said coiling die.

3. The combination with an internally faced roll, of a roll mounted within and cooperative with the internally faced roll for forming a working pass for forming the stock and forcing the same forward, means for rotating the said rolls at the same surface speed, a circumferentially closed coiling die having an open sided portion located adjacent to the working pass of said rolls and in position to receive the stock as this is formed and fed forward by the rolls.

4. The combination with a rotary member having an internal circularly formed die face, of a pair of rotary members mounted within and each eccentric to the said internal die face and each having an external circularly formed die face upon it, a carriage supporting said pair of rotary members, means for adjusting the die faces thereof toward the said internal die face, and a pair of anti-friction rollers engaging the outer circumference of said first mentioned rotary member for receiving the thrust of each of said pair of members.

5. The combination with a ring provided on its inner periphery with a circumferential die face and on its outer periphery with a plain bearing face, a carriage, a pair of rolls carried by said carriage and each provided upon its outer periphery with a circumferential die face, said die faces being adapted to coöperate with the die face upon the inner circumference of said ring, and a pair of rolls for engaging the bearing face of said ring at each side of a radial line drawn from the center of said ring through the center of the arc of contact between the die faces of the ring and the inner roll.

6. The combination with a coiling die, of a pair of rolls located one within the other and supported one eccentrically to the other, said rolls being provided with stock feeding and forming faces and forming a working pass at their position of nearest approach one to the other, and adjacent to said coiling die for receiving stock forming the same and passing the stock into the coiling die by the forwarding forming bite of the said forming rolls.

7. The combination with a rotary member having an internally circularly formed die face, of a pair of rotary members mounted within the internal die face and each having an external circularly formed die face upon it, a carriage supporting the pair of rotary

members each in eccentric relation to said internal die face means for adjusting the carriage for adjusting the engagement of the die faces of said members with the said internal die face, said carriage so supporting and locating said pair of members relative to the said internal die face that one of said external die faces will be in closer relation to the said internal die face than will be the other of said external die faces.

8. The combination with a rotary member having an internal circularly formed die face, of a pair of rotary members mounted within the internal die face and each having an external circularly formed die face upon it, a carriage supporting the pair of rotary members each in eccentric relation to said internal die face, means for adjusting the carriage for adjusting the engagement of the die faces of said members with the said internal die face, and means for adjustably limiting such carriage adjustment.

9. The combination with a rotary member having an internal circularly formed die face, of a pair of rotary members mounted within the internal die face and each having an external circularly formed die face upon it, a carriage supporting at one end the pair of rotary members each in eccentric relation to said internal die face, means constructed and adapted for supporting the carriage at the other end for disassemblage from the machine, means for adjusting the carriage for adjusting the engagement of the die faces of said members with the said internal die face, said carriage so supporting and locating said pair of members relative to the said internal die face that one of said external die faces will be in closer relation to the said internal die face than will be the other of said external die faces, and means for adjustably limiting such carriage adjustment.

10. The combination with a rotary member having an internal circularly formed die face and externally having gear teeth, of a pair of rolls mounted within the internal die face and each having an external circularly formed die face upon it, a carriage provided with a pair of parallel bearings, shafts in said bearings respectively supporting at their ends the said rolls, and a pinion mounted at the other end of each shaft, said pinions being of greater radius than is their distance between centers and being disposed in parallel planes, means constructed and adapted for supporting the carriage at the pinion carrying end for disassemblage from the machine, means for adjusting the roll carrying end of the carriage for adjusting the engagement of the die faces of said rolls toward the said internal die face, said carriage so supporting and locating said rolls relative to the said internal die face that one of said external die faces will be in closer relation to the said internal die face than will be the other of said external die faces, means for adjustably limiting such carriage adjustment, a gear wheel in engagement with said pinions, a shaft carrying said gear wheel and a driving gear wheel on the shaft, a shaft carrying said pinion, and a driving gear wheel on the shaft, a power shaft and a pinion on the power shaft for each of said driving wheels.

11. In a machine of the character described, the combination with a framework embodying end members, a power wheel shaft, bearings for the power wheel shaft carried by the said end members, a pair of pinions fast upon said shaft, a driving shaft, bearings for said driving shaft carried by the said end members and said driving shaft extending outwardly beyond one of said bearings, the frame being provided with a member having an auxiliary bearing for said extending portion of the shaft, and a bushing surrounding said extending portion of the shaft, a pinion mounted upon said extending portion, a gear wheel fast upon said shaft between the end members and in engagement with one of said power shaft pinions, an annular member provided externally with gear teeth in mesh with the pinion on said driving shaft, an annular member provided with an internal circularly formed die face, means for removably connecting said die face carrying member and said gear teeth carrying member, means for guiding and supporting said members for rotation upon a common axis, a pair of rolls provided with die faces complemental to the die face on said annular member, a carriage provided with a pair of parallel bearings, shafts in said bearings each supporting at one end one of the said rolls, a pinion mounted upon the other end of each of said shafts, said pinions being of greater radius than is their distance between centers and being disposed in parallel planes, means constructed and adapted for supporting the carriage at the pinion carrying end for disassemblage from the machine for mounting the rolls internally of said circular formed die face, means for adjusting the roll carrying end of the carriage for adjusting the working pass between the die faces of said rolls and said internal die face, a gear wheel mounted free upon said driving shaft and of sufficient width for engaging both of said pinions and in engagement therewith when the carriage is in position, a gear wheel fast with said gear wheel and meshing with one of the pair of pinions upon the power shaft, an adjustable spirally dis-

posed guiding face for guiding strip material to the working pass between the first of said rolls and the internal die face from the side farthest away from the gearing, a coiling die for receiving the stock from the working pass of the second of said rolls and the internal die face, means for adjustably supporting said coiling die at a position between said internal die face and the gearing, said coiling die being constructed and adapted for passing the material away from the machine in a path disposed upon a line at an angle to the axial line of said annular members.

12. The combination with an internal roll and an external roll located within and forming a working pass with the external roll, of a stock guide located with its delivery portion within the external roll and provided with a spiral face of cylindrical development for the flat face of the stock, and guide faces for the edges of the stock, and means for shifting said guide for effecting the adjustment of said spiral face relative to the working pass.

Signed at Nos. 9–15 Murray St., New York, N. Y., this 30th day of June, 1909.

FRANCIS H. RICHARDS.

Witnesses:
HENRY E. GREENWOOD,
FRED. J. DOLE.