O. F. PALMER.

MACHINE FOR MAKING METALLIC CONDUITS.

APPLICATION FILED FEB. 20, 1917.

1,334,787.

Patented Mar. 23, 1920.

3 SHEETS—SHEET 1.

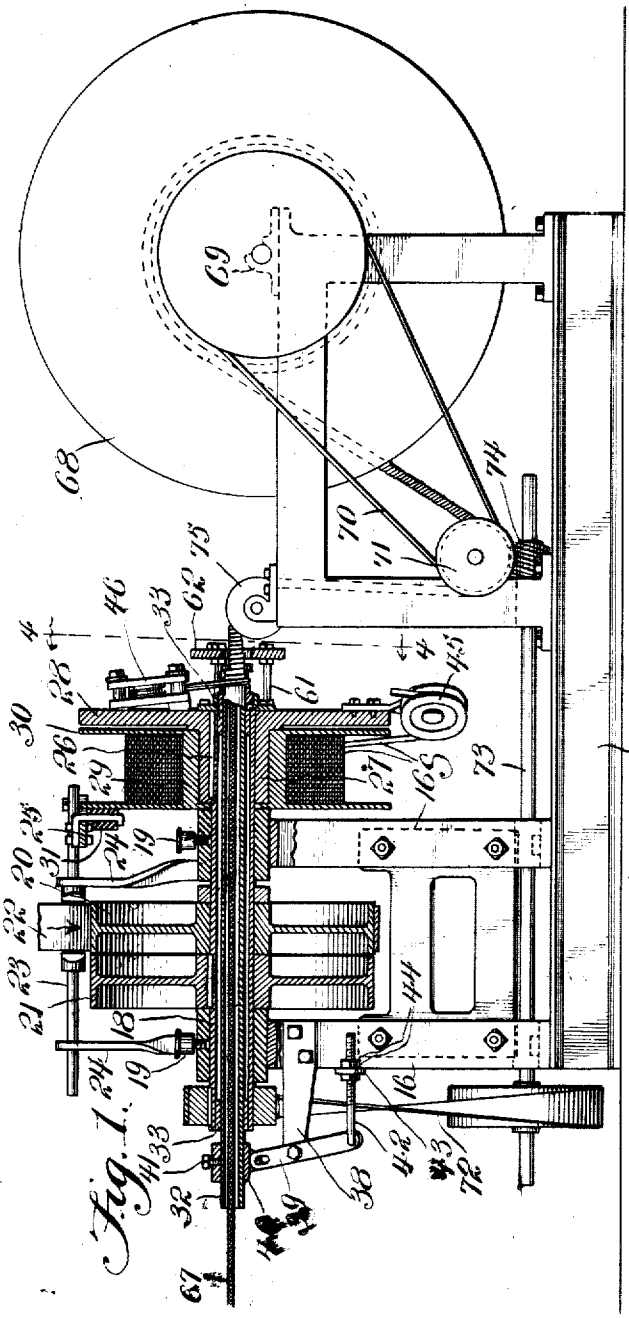


Fig. 1.

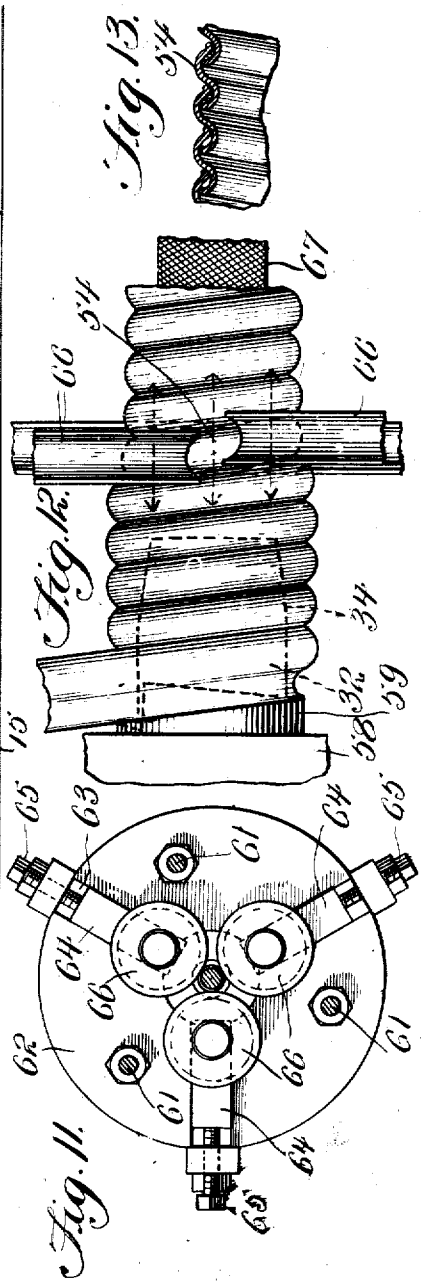


Fig. 12.

Fig. 11.

Fig. 13.

WITNESSES

J. L. Wright

E. E. Young.

INVENTOR

Otto F. Palmer

BY Victor J. Evans

ATTORNEY

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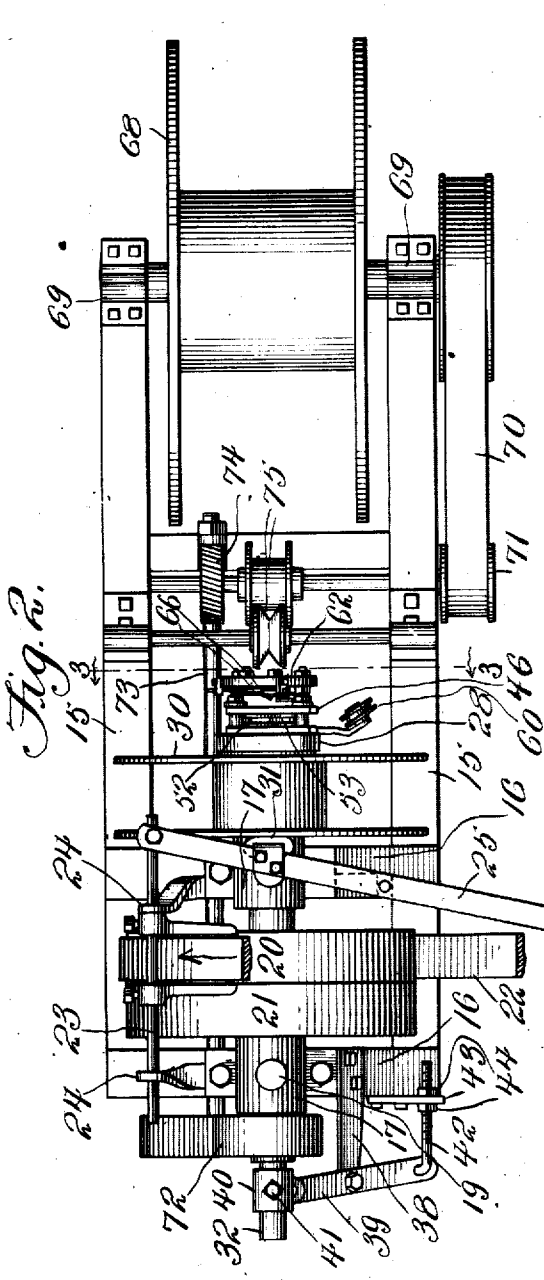


Fig. 2.

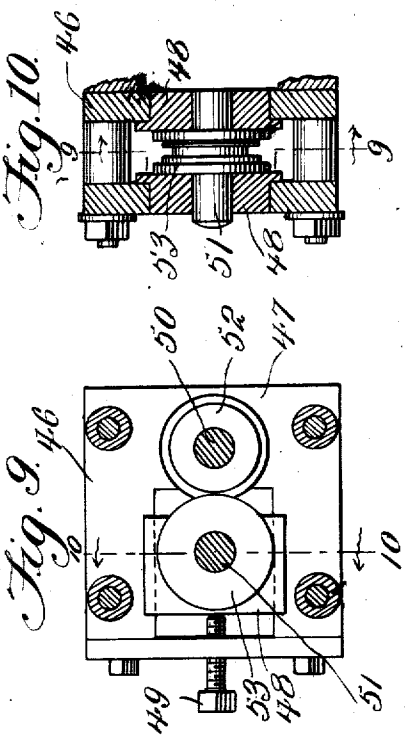


Fig. 9.

Fig. 10.

Fig. 8.

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3 SHEETS—SHEET 3.

Fig. 3.

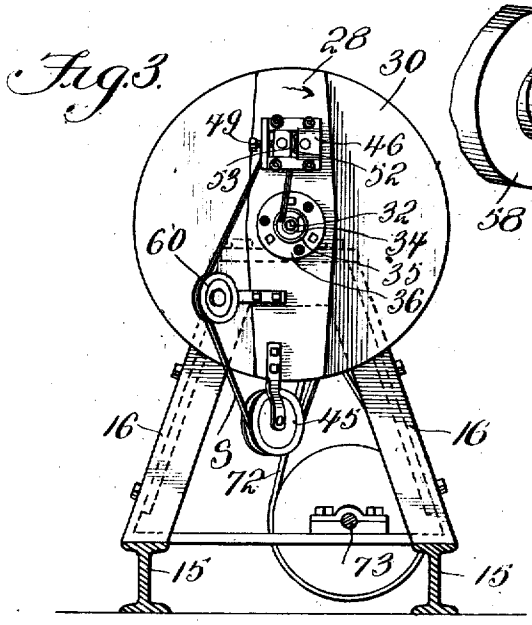


Fig. 6.

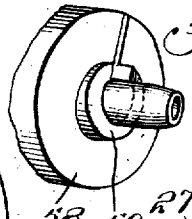


Fig. 5.

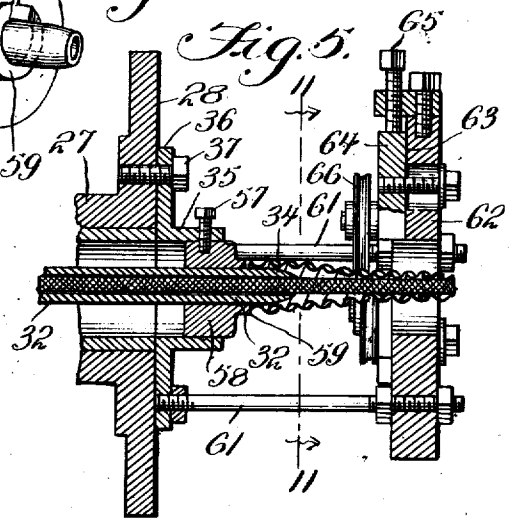


Fig. 4.

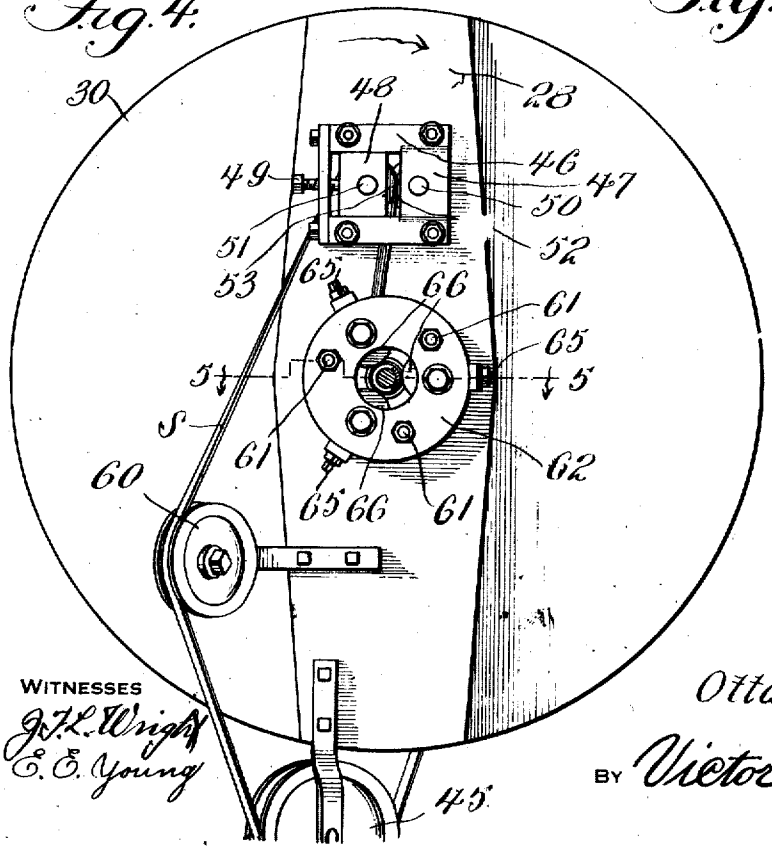
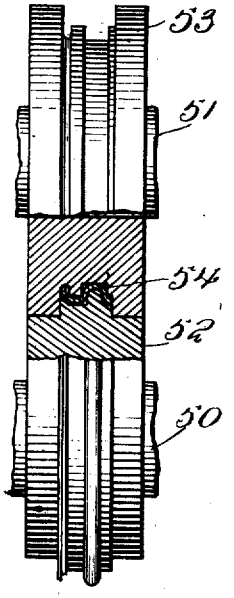


Fig. 7.



WITNESSES

J. L. Wright

E. E. Young

INVENTOR

Otto F. Palmer

BY Victor J. Evans

ATTORNEY

UNITED STATES PATENT OFFICE.

OTTO FRITIOF PALMER, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO V. C. GILPIN AND ONE-HALF TO J. C. McAULIFFE, BOTH OF BROOKLYN, NEW YORK.

MACHINE FOR MAKING METALLIC CONDUITS.

1,334,787. Specification of Letters Patent. Patented Mar. 23, 1920.

Application filed February 20, 1917. Serial No. 149,883.

To all whom it may concern:

Be it known that I, OTTO F. PALMER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Machines for Making Metallic Conduits of which the following is a specification.

This invention relates to machines for making metallic conduits for electric wires, cables and the like, the conduit being of a type which consists of a metallic strip which is suitably shaped and spirally coiled to produce a flexible tubular armor for the wires or cable contained therein.

One object of the invention is to produce a simple, improved and effective machine whereby a strip of metal may by a single operation be shaped or pressed to the desired contour and spirally coiled to produce a tubular structure of a flexible or bendable nature.

A further object of the invention is to produce a machine of the class described whereby the metallic strip may be coiled about the wire or cable, the product consisting of an armored electric conductor.

A further object of the invention is to produce a simple and improved construction whereby the metallic strip may be coiled more or less tightly as may be considered desirable or necessary.

Further objects of the invention are to simplify and improve the general construction and assemblage of the detailed parts of the machine.

With these and other ends in view which will readily appear as the nature of the invention is better understood, the same consists in the improved construction and novel arrangement and combination of parts which will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings has been illustrated a simple and preferred form of the invention, it being, however, understood that no limitation is necessarily made to the precise structural details therein exhibited, but that changes, alterations and modifications within the scope of the claims may be resorted to when desired.

In the drawings,

Figure 1 is a sectional elevation of a machine constructed in accordance with the invention.

Fig. 2 is a top plan view of the same.

Fig. 3 is a sectional view taken on the line 3—3 in Fig. 2.

Fig. 4 is a sectional view enlarged taken on the line 4—4 in Fig. 1.

Fig. 5 is a sectional detail view taken on the line 5—5 in Fig. 4.

Fig. 6 is a perspective detail view showing the tapered end of the tubular mandrel and the cam associated therewith.

Fig. 7 is a detail view in elevation, partly in section of the forming or shaping rolls.

Fig. 8 is a detail view in side elevation of the rolls and the frame wherein they are mounted.

Fig. 9 is a sectional view of said frame and rolls taken on the line 9—9 in Fig. 10.

Fig. 10 is a sectional detail view taken on the line 10—10 in Fig. 9.

Fig. 11 is a sectional detail view taken on the line 11—11 in Fig. 5.

Fig. 12 is a view in side elevation on a much enlarged scale of the tubular product as it issues from the machine, showing also portions of the compacting rolls.

Fig. 13 is a sectional detail view of a portion of the tubular product.

Corresponding parts in the several figures of the drawings are denoted by like characters of reference.

The base 15 of the improved machine supports uprights 16 having bearings 17 wherein a tubular shaft 18 is supported for rotation, the bearings being provided with lubricators 19. The tubular shaft 18 carries intermediate the uprights 16 a loose or idle band wheel 20 and a fixed band wheel 21, said band wheels being located closely adjacent to each other to receive power from any convenient source through the medium of a belt 22 which may be shifted from the loose to the fixed pulley for the purpose of interrupting the motion when desired. The belt shifter 23 which is guided on brackets 24 may be actuated by a shipping lever 25. Supported on the tubular shaft 18 adjacent to one end thereof and connected with said shaft by means of a key or spline 26 for rotation therewith is a hub 27 having a diametrical arm 28. Supported for rotation on the hub 27 is a reel or feed drum 29 having end disks or flanges 30 between which a quantity of material in the nature of a metallic strip is coiled to be operated upon by the machine. The bore of the reel or drum

29 snugly engages the hub 27 so that while free to rotate thereon there will still be a degree of frictional engagement between the two which will prevent the reel from spinning unduly around its axis which would result in prematurely uncoiling the material wound thereon. As a further precaution against the undue rotation of the feed drum or reel there is provided a brake shoe 31, the same being mounted on the shipping lever 25 in such a position that when the shipping lever is actuated to transfer the band 22 from the fixed pulley 21 to the idle pulley 20, the said brake shoe will frictionally engage one of the end disks 30 of the reel 29, thereby checking the tendency of said reel to continue rotation when the operation of the machine is interrupted. Extending longitudinally through the tubular shaft 18 is a tubular mandrel 32, the same being preferably spaced from the interior surface of the tubular shaft by means of bearing sleeves 33. The tubular mandrel 32 has a tapering or conical end portion 34 which normally projects beyond the face of the arm 28 of the hub 27, said arm being provided with a sleeve 35 having a flange 36 which is secured thereon by fastening members such as bolts 37, said sleeve being of a diameter exceeding that of the tubular mandrel 32 the tapering end portion of which projects through and beyond said sleeve. Fixed on one of the uprights 16 of the frame structure is a brake 38 on which is fulcrumed a lever 39 with one arm of which is pivotally connected a sleeve or collar 40 that surrounds the tubular mandrel and is connected therewith by a set screw 41. The tubular mandrel 32 is thereby held securely against rotation but in such a fashion that it may be moved longitudinally with respect to the bearing sleeves 33. To effect such adjustment of the tubular mandrel the other arm of the lever 39 is pivotally connected with one end of a threaded rod 42 the other end of which extends through an apertured lug 43 where it is held by means of adjusting nuts 44 by the manipulation of which the lever 39 may be rocked about the axis of its fulcrum, thereby effecting longitudinal movement of the tubular mandrel as will be readily understood.

Supported on the diametrical arm 28 of the hub 27 near one end thereof is a guide element consisting of a grooved pulley 45, and fixed on said diametrical arm intermediate the other end thereof and the axis of the hub is a frame structure 46 which has been illustrated in detail in Figs. 8, 9 and 10 by reference to which it will be seen that said frame structure has a stationary bearing 47 and a movable bearing 48 which latter may be actuated in the direction of the stationary bearing by means of a set screw 49. These bearings support spindles 50 and 51 of the stationary and the movable shaping rolls 52 and 53, said shaping rolls having grooved peripheral faces by the coaction of which a strip of metal forcibly drawn therebetween will be shaped to a sigmoidal cross sectional configuration as most clearly seen in Fig. 13 where the shaped strip is designated by 54, the crude strip coming from the roll 29 being designated by S. It is obvious that at the beginning of the operation the set screw 49 will be loosened to facilitate the insertion of the strip S between the rolls 52 and 53, the set screw being afterward tightened so as to insure the necessary degree of compression after which a pair of tongs may be utilized to draw the strip from between the rolls and to lay the same about the apertured end of the tubular mandrel where it may be held or fastened in any convenient manner until a proper start of the machine has been attained. These details, however, are obviously well known to workers in the art under which the present invention classifies.

Fixed in the sleeve 35 by means of a set screw 57 or in any other convenient manner is a cuff 58 which surrounds the protruding end portion of the tubular mandrel 32 and constitutes an auxiliary bearing for the same. Formed on the face of the cuff 58 is a spiral cam 59, best seen in Fig. 6, and the office of which is to push from the tubular mandrel the coiled fabric that is being laid about or formed upon said mandrel. As will be seen by reference to Fig. 5 the beveled or conical end portion of the tubular mandrel may be made to protrude beyond the cam member 59 sufficiently to permit several coils or whirls of the shaped strip 54 to be laid thereon before the outermost whirl is pushed from the mandrel by the action of the cam member. On the other hand, by retracting the tubular mandrel to some extent, it may be so adjusted as to permit only a single whirl or less than a single whirl to be laid thereon. The purpose of such adjustment of the tubular mandrel will presently be made apparent.

In addition to the grooved guide pulley 45, one or more additional guide members may be suitably mounted on the arm 28 for the purpose of guiding the strip S to the frame containing the shaping rolls. In Figs. 3 and 4 one such auxiliary guide element has been shown at 60. Mounted on the hub 27 and spaced therefrom by supporting rods or elements 61 is a frame 62, the same being shown as consisting of a disk having radial slots 63 in which bearing members 64 are slidably fitted, said bearing members being adjustable by set screws 65. The bearing members 64 support the compacting or compressing rolls 66 which are disposed circumferentially with respect to the tubu-

lar conduit issuing from the machine and in such a manner as to exert external pressure upon a sigmoidal strip 54, the relative arrangement of said compacting rolls being best seen in Figs. 11 and 12.

67 designates an insulated wire or cable which may be fed from any convenient source of supply through the tubular mandrel, so that the flexible tube formed or constructed by the machine will be laid about said cable which latter will then constitute a part of the finished product. The use of this feature of the invention is, however, optional since an electrical conductor of any kind may be inserted into the flexible tube after the formation thereof.

The finished product of the machine is wound on a reel 68 which is supported for rotation in a bearing 69, said reel being driven by a belt transmission 70 from a pulley 71 which receives motion from the tubular shaft 18 by means including a belt transmission 72, a countershaft 73 and a worm 74, it being, however, understood that any other convenient and well known driving means for the reel 68 may be substituted.

From the foregoing description, taken in connection with the drawings hereto annexed, the operation and advantages of this invention will be readily understood. When the machine is in operation, the strip S is guided from the reel 29 over the guide elements 45 and 60 to the shaping rolls, which are carried by the frame structure 46 mounted on the diametrical arm of the rotary hub 27. The shaped strip is laid or coiled in spiral form about the tubular mandrel and consequently also about the cable fed through said mandrel. If the tubular mandrel is projected to a considerable extent, the coils of the shaped strip will be laid about a portion of said mandrel which is of relatively large diameter whereas, if the mandrel is retracted, the coils will be formed about the tapered portion of said mandrel which is of relatively small diameter, the finished coils being pushed from the mandrel by the action of the cam element 59. The coils of the shaped strip are next subjected to the action of the compacting rolls whereby they are pressed together in close relation as clearly seen in Fig. 13, the finished product being wound on the reel 68 as it is being discharged from the machine. Guide elements, as indicated at 75, may be obviously provided to guide the finished product to the reel.

From the foregoing description it will be seen that mechanism has been provided for producing a helical metallic armor or conduit for cables, wires and the like, the successive elements of said armor or conduit, as formed by the continuous strip of material, being laid in overlapping, break joint relation, said mechanism embodying, essentially, feeding means consisting of supply and crimping elements, of which the latter describes an orbital path in reference to a mandrel having a graduated diameter, reduced toward its releasing terminal, means for progressively advancing the coils in a direction axially of the mandrel to displace the same successively therefrom, and means, preferably operating beyond the extremity of the mandrel for compressing and radially condensing the coils progressively, the shifting element by which the axial advance movement of the coils is effected, and which in the construction illustrated consists of a cam which occupies a fixed relation to the feeding means, serving as an axial condensing element to insure the proper relation of the successive coils or layers of the strip as they are laid on the mandrel, in addition to said function of advancing the formed coils to effect a disengagement of the latter from the terminal of the mandrel.

Having thus described the invention, what is claimed as new is:

1. A mechanism for the purpose described having a mandrel provided with a tapered graduated active surface and adapted for axial adjustment, means for securing said mandrel in adjusted positions, feeding means for a strip of coil forming material including a spool disposed axially with reference to said mandrel and a crimping element carried by the spool for describing an orbital path about the mandrel, a cam disposed concentrically with the mandrel and in a fixed position with relation to the said crimping element for progressively advancing the coils on the mandrel in a direction axially thereof, and radially compressing and condensing rolls in axial parallelism with the mandrel for progressive contact with the coils after leaving the mandrel.

2. A mechanism for the purpose described including a mandrel provided with a tapered graduated active surface, feeding means for a strip of coil-forming material including a spool disposed axially with reference to said mandrel and crimping means carried by the spool for describing an orbital path about the mandrel, a cam disposed concentrically with the mandrel and in a fixed position with relation to the said crimping means for progressively advancing the coils on the mandrel in a direction axially thereof and radially compressing and condensing rolls in axial parallelism with the mandrel for progressive contact with the coils after leaving the mandrel.

3. In an organized mechanism for the purpose described, the combination of a tubular mandrel provided with a tapered

end portion, a tubular shaft revoluble about said mandrel, a reel surrounding and revoluble with said tubular shaft, a hub surrounding the tubular shaft for rotation therewith and interposed between the shaft and the reel and having a diametrical portion in front of the reel, guide means on said diametrical portion, crimping means on the diametrical portion to describe an orbital path about the mandrel, and a cam fixed with respect to the tubular shaft and loosely surrounding the mandrel back of said end portion thereof to progressively advance the coils on the mandrel in a direction axially thereof.

4. In an organized mechanism for the purpose described, the combination of a tubular mandrel provided with a tapered end portion, a tubular shaft revoluble about said mandrel, a reel surrounding and revoluble with said tubular shaft, a hub surrounding the tubular shaft for rotation therewith and interposed between the shaft and the reel and having a diametrical portion in front of the reel, guide means on said diametrical portion, crimping means on the diametrical portion to describe an orbital path about the mandrel, a cam fixed with respect to the tubular shaft and loosely surrounding the mandrel back of said end portion thereof to progressively advance the coils on the mandrel in a direction axially thereof, and radially compressing and condensing means in axial parallelism with the mandrel for progressive contact with the coils after leaving the mandrel.

In testimony whereof I affix my signature.

OTTO FRITIOF PALMER.