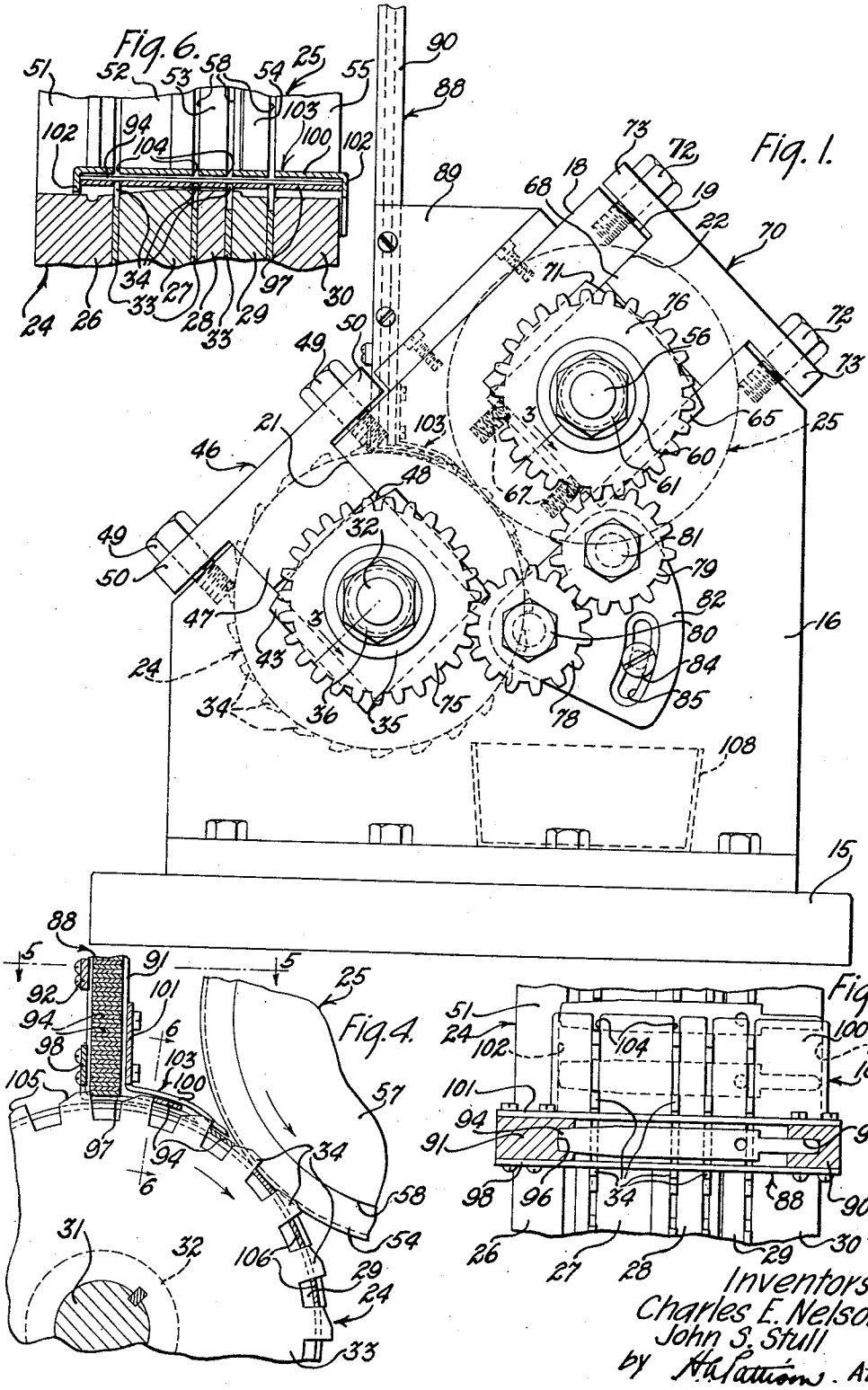
Nov. 24, 1931. C. E. NELSON ET AL 1,833,616

MATERIAL FORMING APPARATUS

Filed June 9, 1927 2 Sheets-Sheet 1



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Fig. 7.

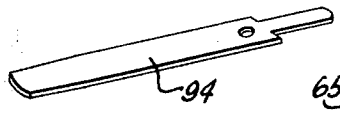


Fig. 8.

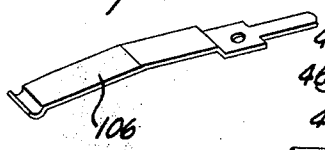


Fig. 2.

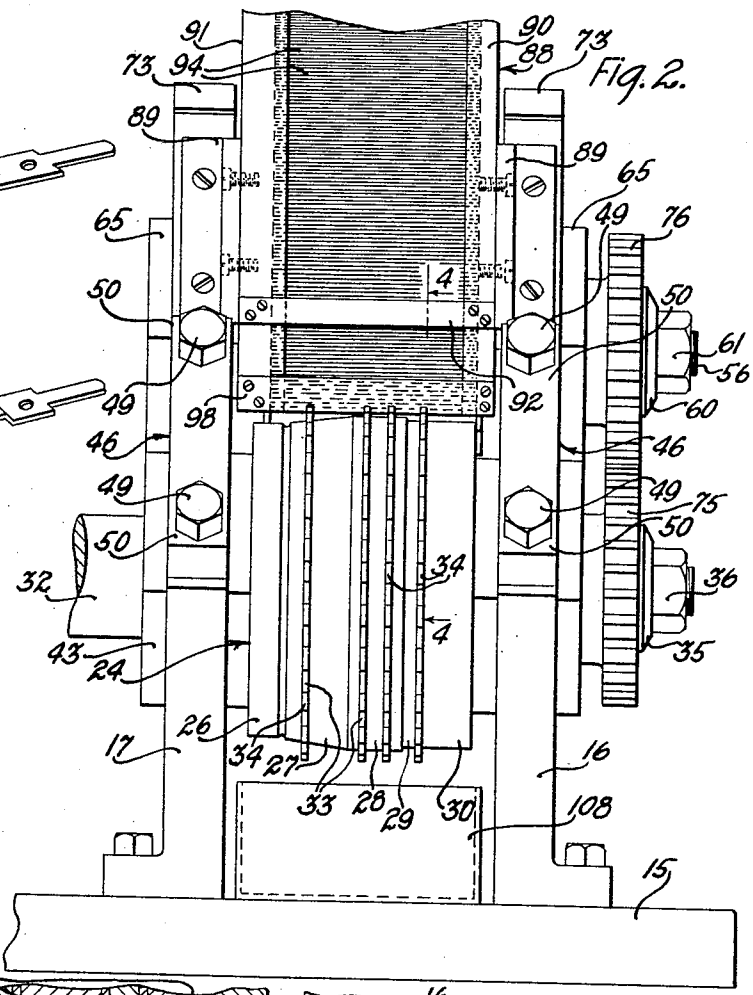
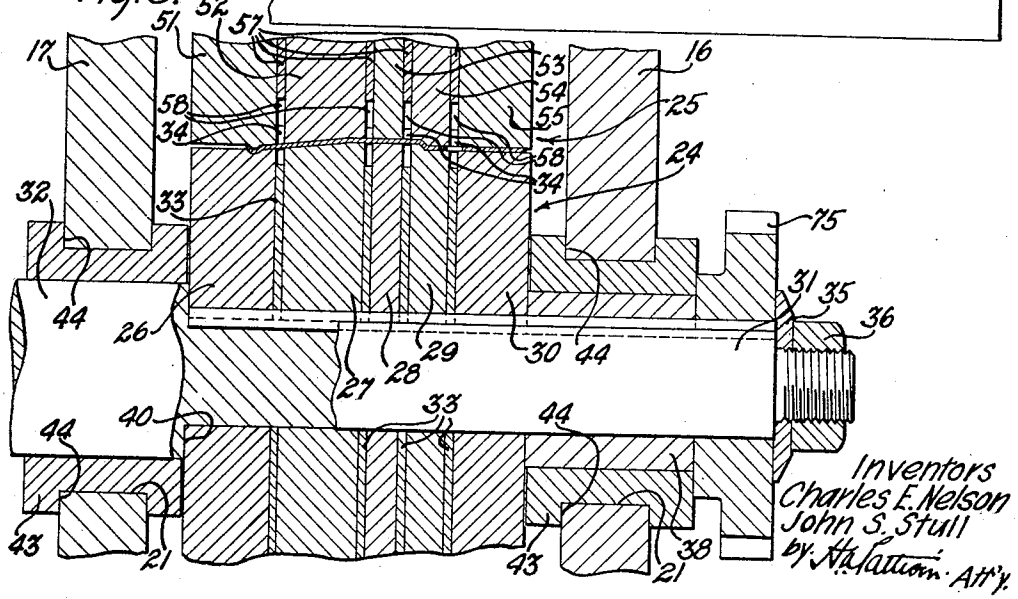


Fig. 3.



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UNITED STATES PATENT OFFICE

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MATERIAL FORMING APPARATUS

Application filed June 9, 1927. Serial No. 197,651.

This invention relates to improvements in material forming apparatus, and more particularly to improvements in apparatus for forming articles from metal blanks.

The principal object of the invention is the provision of an improved apparatus of simple and inexpensive construction for efficiently and expeditiously forming metal blanks into articles of various predetermined shapes.

In accordance with the general features of the invention there is provided in one embodiment thereof a pair of cooperating positively driven forming rolls between which the blanks are successively advanced from a magazine by peripheral teeth or projections of annular disks disposed between individual sections of one of the rolls and passing between individual sections of the other roll. Means is provided for guiding the blanks against displacement as they are advanced from the magazine to the position wherein they are operatively engaged by the forming rolls. The peripheral surfaces of the individual sections of the forming rolls are designed so as to cooperate in forming the blanks advanced therebetween into articles of the desired shape.

Other features and advantages of the invention will become apparent from the following detailed description of one embodiment thereof, reference being had to the accompanying drawings, wherein

Fig. 1 is a side elevational view of an apparatus embodying the features of the invention;

Fig. 2 is a front elevation thereof;

Fig. 3 is an enlarged fragmentary section taken on line 3—3 of Fig. 1;

Fig. 4 is an enlarged fragmentary section taken on line 4—4 of Fig. 2;

Figs. 5 and 6 are fragmentary detailed sections of the magazine and guide chute taken on lines 5—5 and 6—6, respectively, of Fig. 4;

Fig. 7 is a perspective view of a blank previous to the forming operation, and

Fig. 8 is a perspective view of an article which has been formed by the improved apparatus.

The term "forming" as used in the specification and the claims is to be understood to include any operation wherein the surface contour or formation of the material is changed, such as shaping, bending, stamping, knurling, etc.

Referring now to the drawings in detail and particularly to Figs. 1 and 2 thereof, the reference numeral 15 indicates a supporting base to which are secured a pair of spaced vertical side frame members 16 and 17. As shown in Fig. 1, the upper portion of each of the frame members 16 and 17 tapers to a point so as to form a right angle portion, the side edges 18 and 19 of which are disposed at an angle of 45° to the horizontal. Extending inwardly from each of the side edges 18 and 19 and at right angles thereto are rectangular slots 21 and 22, respectively, within which are mounted the journals for the forming rolls as will be hereinafter described.

The forming rolls are designated generally in the drawings by the reference numerals 24 and 25. The roll 24 is composed of a plurality of individual annular sections 26, 27, 28, 29 and 30 which are keyed or otherwise removably secured to a reduced portion 31 of a horizontally disposed shaft 32 (Fig. 3). Disposed between these individual roll sections and also keyed to the shaft 32 are a plurality of disks 33, each of which is provided with a plurality of equidistantly spaced peripheral teeth or projections 34 (Fig. 3) extending beyond the peripheral surface of the forming roll 24. By means of a retaining washer 35 and a nut 36 threaded upon the end of the reduced portion 31 of the shaft 32, the individual sections of the roll 24 and the toothed disks 34 interposed therebetween are rigidly clamped together between a bushing 38 secured to the shaft 32 and a shoulder 40 formed by the reduced portion of the shaft.

The shaft 32 is rotatably supported in journals 43—43, the opposite sides of which are slotted as indicated at 44 (Fig. 3) by means of which they are removably mounted in the slots 21 of the vertical frame members 16 and 17. The journals 43 are rigidly held in position against the bottom of the slots 21 by means of T-shaped clamping blocks 46—46

(Fig. 1) having depending portions 47—47 which extend into the slots and are caused to bear under pressure against curved upper surfaces 48—48 of the journals 43 by means of screws 49—49 extending through suitable apertures formed in overhanging portions 50—50 of the clamping blocks and engaging threaded apertures in the frame members 16 and 17.

The forming roll 25 is composed of a plurality of individual annular sections 51, 52, 53, 54 and 55 (Fig. 3) which are in alignment with the annular sections 26, 27, 28, 29 and 30, respectively, of the roll 24. The individual sections of the roll 25 are separated by annular spacing disks 57—57 which are of lesser diameter than the roll sections, thus providing annular spaces 58—58 for accommodating the peripheral projections 34 of the spacing disks 33. The sections 51 to 55, inclusive, of the roll 25 and the spacing disks 57 are keyed to a horizontally disposed shaft 56 (Fig. 1) and are rigidly clamped together by means of a retaining washer 60 and a nut 61 in a manner similar to that described in connection with the individual sections of the roll 24. The shaft 56 is rotatably carried in journals 65—65 removably mounted in the slots 22 of the frame members 16 and 17. Each of the journals 65 rests upon a pair of helical compression springs 67—67 mounted within suitable apertures formed in the bottom of the slots 22 (Fig. 1). Depending portions 68 of T-shaped clamping blocks 70—70 extend into the slots 22 and are caused to bear under pressure against curved upper surfaces 71—71 of the journals 65 by means of screws 72—72 extending through suitable apertures in overhanging portions 73—73 of the clamping blocks and engaging threaded apertures in the frame members 16 and 17. By reason of the construction just described, the space between rolls 24 and 25 may be adjusted merely by turning screws 72, the springs 67 serving to keep portions 73 pressed against the heads of the screws regardless of whether or not there is a blank between the rolls.

The rolls 24 and 25 are driven at the same speed in the direction indicated by the arrows in Fig. 4. The roll 24 may be driven by any suitable source of power (not shown) connected to the shaft 32 and the roll 25 is driven from the shaft 32 by means of suitable gearing which will presently be described. Secured to the shaft 32 is a gear 75 and secured to the shaft 56 is a similar gear 76 (Fig. 1). Meshing with the gear 75 is a pinion 78 which meshes with a similar pinion 79 which, in turn, meshes with the gear 76. The pinion 78 is rotatably carried upon a pin or stud 80 secured to the frame member 16 and the pinion 79 is rotatably carried upon a pin or stud 81 secured to a bracket 82, the bracket 82 being pivotally supported upon the stud 80. By means of an adjusting screw 84 engaging an elongated slot 85 of the bracket 82 and threaded in the frame member 16, the position of the pinion 79 with respect to the gear 76 may be adjusted in accordance with the position of the roll 25.

Disposed above the roll 24 is a vertical magazine 88 which is removably supported by means of brackets 89—89 (Figs. 1 and 2) secured to the vertical frame members 16 and 17. The magazine 88 comprises a pair of spaced vertical side members 90 and 91 interconnected by horizontal cross pieces, one of which is indicated at 92 (Fig. 2). It is obvious that the particular construction of the magazine depends upon the shape or type of blank to be formed. In the present embodiment of the invention, the magazine is designed to contain a plurality of contact spring blanks 94 of the type shown in Fig. 7. The blanks are positioned in the magazine in a vertical column as shown in Figs. 2 and 4. Vertical grooves 95 and 96 (Fig. 5) formed in the inner sides of the vertical members 90 and 91 of the magazine serve to guide the blanks as they gravitate towards the bottom or discharge end of the magazine. The lowermost blank in the magazine rests upon a plate 97 having an integral vertical portion 98 by means of which it is secured to the lower end of the magazine as shown in Fig. 4.

It will be observed by referring to Fig. 4 that an arcuate portion of the plate 97 is disposed in close proximity to the peripheral surface of the roll 24. Positioned above the plate 97 and spaced therefrom just sufficiently to permit the passage of a blank therebetween is an arcuate shaped plate 100 having an integral vertical portion 101 by means of which it is secured to the vertical side members 90 and 91 of the magazine. The plate 100 is provided with depending side portions 102—102 which are spaced apart just sufficiently to accommodate a blank positioned lengthwise therebetween, as shown in Figs. 5 and 6. The plates 97 and 100 cooperate to provide a guide chute 103 or confined passage for the blanks as they are advanced from the bottom of the magazine to the position wherein they are engaged between the forming rolls. The plates 97 and 100 are provided with a plurality of spaced slots or openings 104—104 (Figs. 5 and 6) through which the peripheral teeth 34 of the disks 33 pass during the rotation thereof.

It will be noted by referring to Fig. 4 that the lowermost blank in the magazine is positioned so that it is engaged by the forward edges of the peripheral teeth 34 of the disks 33. It will also be apparent that successive teeth 34 are spaced apart just sufficiently to accommodate a blank therebetween. By reason of this construction and arrangement of the parts, it is obvious that as the blanks gravitate to the bottom of the magazine they are individually and succes-

sively engaged by the peripheral teeth 34 of the rotating disks 33 by which they are advanced and guided through the guide chute 103 to the position wherein they are gripped between the forming rolls 24 and 25. As soon as a blank has been completely moved from its position at the bottom of the magazine the blank positioned immediately thereabove drops into its place. Sufficient time is provided for this action to take place by reason of the rearward edges of the teeth 34 being tapered off as indicated at 105 (Fig. 4).

Although the forming rolls as illustrated in the present embodiment of the invention are preferably composed of a plurality of individual sections, it is to be understood that either or both of the rolls may comprise a single unit. The peripheral surfaces of the forming rolls are designed so as to form the blanks advanced therebetween into articles of the desired predetermined shape. In the present embodiment of the invention the peripheral surfaces of the individual sections of the forming rolls are provided with a series of cooperating annular ridges and depressions designed to form metal blanks into electrical contact springs of the shape indicated at 106 in Fig. 8.

It is believed that the novel features of the invention will be clearly understood from the following brief description of the operation of the above described apparatus. A supply of blanks 94 is placed in the magazine 88 and the forming rolls 24 and 25 are rotated in the direction indicated by the arrows (Fig. 4) in the manner hereinbefore described. The teeth or peripheral projections 34 of the rotating disk 33 successively engage individual blanks as they gravitate to the bottom of the magazine and advance them through the guide chute 103 and between the peripheral surfaces of the forming rolls by which they are formed into articles of the desired predetermined shape. The guide chute 103 and the peripheral projections 34 cooperate to confine the blanks to a predetermined path as they are advanced from the bottom of the magazine. After passing between the forming rolls the formed articles drop into a removable pan or receptacle 108 (Figs. 1 and 2).

It should be understood that the magazine 88 may be readily and conveniently replaced by magazines constructed to accommodate blanks of various sizes and shapes. Also the forming rolls or one or more of the individual sections thereof may be readily removed and replaced by rolls and individual sections of various constructions designed to form blanks into articles of various predetermined shapes.

Electrical contact springs of the type illustrated in Fig. 8 and other similar articles have in some instances been formed heretofore by punch press operations, which method sometimes tends to change the molecular structure of the metal, thus often necessitating an annealing operation in order to obtain the desired characteristics. Furthermore, it has been found that the tension or other physical characteristics of punch pressed contact springs sometimes varies to such an extent that it has been necessary in some instances to accurately test the individual springs in order to insure that they possess the required physical characteristics. However, it has been found that the physical characteristics of material formed in accordance with the present invention are not materially affected thereby and therefore the annealing and testing operations may be eliminated. This obviously results in a large saving in the cost of production.

Although the invention has been herein illustrated and described in connection with a preferred embodiment thereof, it is to be understood that the novel features of the invention are capable of various other applications within the scope of the appended claims.

What is claimed is:

1. In an article forming apparatus, a magazine for containing a supply of articles, a guide chute extending from the discharge end of said magazine, and a pair of rolls having cooperating peripheral forming surfaces for engaging opposite sides of an article, one of the rolls having a plurality of spaced elements permanently projecting beyond the periphery thereof for receiving articles from the magazine and advancing them through the guide chute and between the peripheral surfaces of the rolls.

2. In an article forming apparatus, a magazine for containing a supply of articles arranged in a column, a pair of positively driven rolls having cooperating peripheral forming surfaces for engaging opposite surfaces of an article, a guide chute communicating with an opening in the lower end of the magazine for guiding an article from the magazine to the engaging surfaces of the forming rolls, and a member permanently projecting from the surface of one of the rolls for advancing an article from the magazine through the guide chute.

3. In an article forming apparatus, a pair of cooperating forming rolls, each roll comprising a plurality of spaced individual sections, and a member disposed between adjacent sections of one of the rolls and passing between adjacent sections of the other roll for advancing articles between the peripheral surfaces of the rolls.

4. In an article forming apparatus, a pair of cooperating driven forming rolls, each roll comprising a plurality of spaced individual sections, and a plurality of disks disposed between adjacent sections of one of the rolls, said disks having a plurality of

spaced peripheral teeth extending beyond the peripheral surface of the roll and passing between adjacent sections of the other roll for guiding and advancing articles between the rolls.

5. In an article forming apparatus, a magazine for containing a supply of articles arranged therein in a vertical column, a pair of cooperating driven forming rolls, each roll comprising a plurality of individual sections, a plurality of disks disposed between adjacent sections of one of the rolls, each disk having a plurality of spaced peripheral teeth extending beyond the peripheral surfaces of the adjacent roll sections and passing between adjacent sections of the opposite roll for successively receiving articles from the magazine and advancing them between the forming rolls, and means for guiding the articles as they are advanced by the peripheral teeth of said disks.

6. In an article forming apparatus, a pair of cooperating forming rolls, a magazine for containing a supply of articles, a guide chute extending from the discharge end of the magazine to the engaging surfaces of the forming rolls, and means carried by one of the forming rolls and permanently projecting beyond the periphery thereof for advancing an article from the magazine through the chute and between the rolls.

7. In a material forming apparatus, a plurality of cooperating forming rolls arranged to peripherally engage the material, and a plurality of radial elements projecting permanently in spaced relationship circumferentially of the forming rolls for advancing the material between the rolls.

8. In a material forming apparatus, a pair of cooperating rotatable forming members having complementary forming surfaces shaped as surfaces of rotation with their radii varying irregularly from one end of the members to the other, and non-forming means carried by one of the forming members intermediate the ends thereof and permanently projecting beyond the forming surface of the forming member for advancing the material between the forming surfaces.

9. In a material forming apparatus, a pair of rotatable forming members having complementary circumferentially extending projections and depressions, and non-forming means carried by one of the forming members intermediate the ends thereof and permanently projecting beyond the periphery of the forming member for advancing the material therebetween.

10. In a material forming apparatus, a pair of rotatable forming members having complementary circumferentially extending projections and depressions, and having horizontal axes lying in a common inclined plane, a magazine extending substantially vertically above one of the forming members, and non-forming means carried by one of the forming members intermediate the ends thereof and permanently projecting beyond the periphery of the forming member for advancing material from the magazine to a position between the forming members.

11. In an article forming apparatus, a pair of cooperating forming rolls, a non-forming member carried by one of the rolls and permanently projecting beyond its periphery for engaging an elongated article at a point intermediate its ends and advancing the article sidewise between the rolls, the other roll being provided with a recess to receive said member, and means for supplying articles to said member.

12. In an article forming apparatus, forming means comprising a roll and a member cooperating with the roll to form articles into predetermined shapes, and means separate from the forming means and comprising a plurality of elements spaced circumferentially of the roll and permanently projecting beyond its periphery for advancing articles between the roll and said member.

13. In an apparatus for forming elongated articles, a pair of cooperating forming rolls adapted to impart a predetermined shape to an article passed therebetween, one of said rolls comprising a plurality of co-axial sections, and means carried between adjacent sections of said roll for positively advancing and guiding an article between the rolls.

14. In an apparatus for forming elongated articles, a pair of cooperating multi-section forming rolls adapted to impart a predetermined shape to an article passed therebetween, the sections of each roll being in axial alignment, and a plurality of spaced advancing members carried between adjacent sections of one of the rolls for advancing and guiding an article between the rolls.

15. In an apparatus for forming elongated articles, a pair of cooperating multi-section forming rolls adapted to impart a predetermined shape to an article passed therebetween, the sections of each roll being in axial alignment and a plurality of advancing members spaced from each other longitudinally of the rolls and carried between adjacent sections of one of the rolls for advancing an article between the rolls.

In witness whereof, we hereunto subscribe our names this 26th day of May A. D., 1927.

CHARLES EDWIN NELSON.
JOHN STANLEY STULL.