A. W. GILLESPIE.

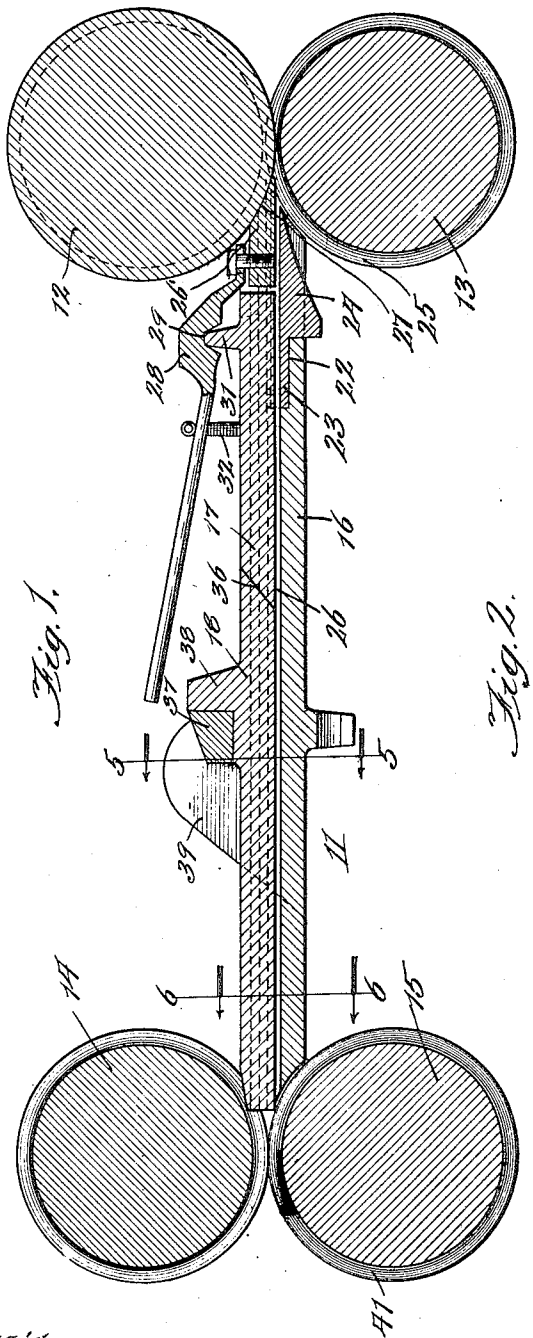
METHOD OF AND APPARATUS FOR FORMING METAL TUBES.

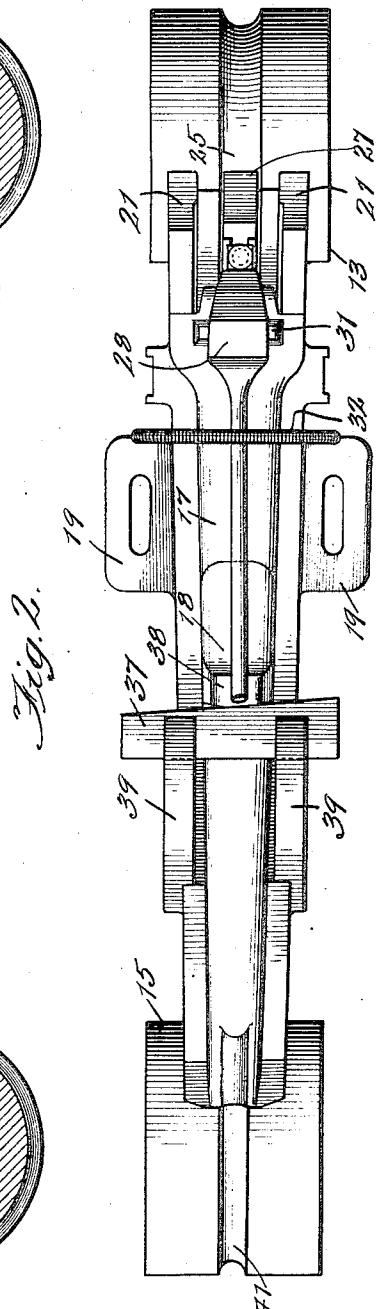
APPLICATION FILED OCT. 30, 1914.

1,124,221.

Patented Jan. 5, 1915.

2 SHEETS—SHEET 1.





Witnesses:

Esther Abrams.

Inventor:

Alexander W. Gillespie

By Munday, Evarts, Adcock & Clarke

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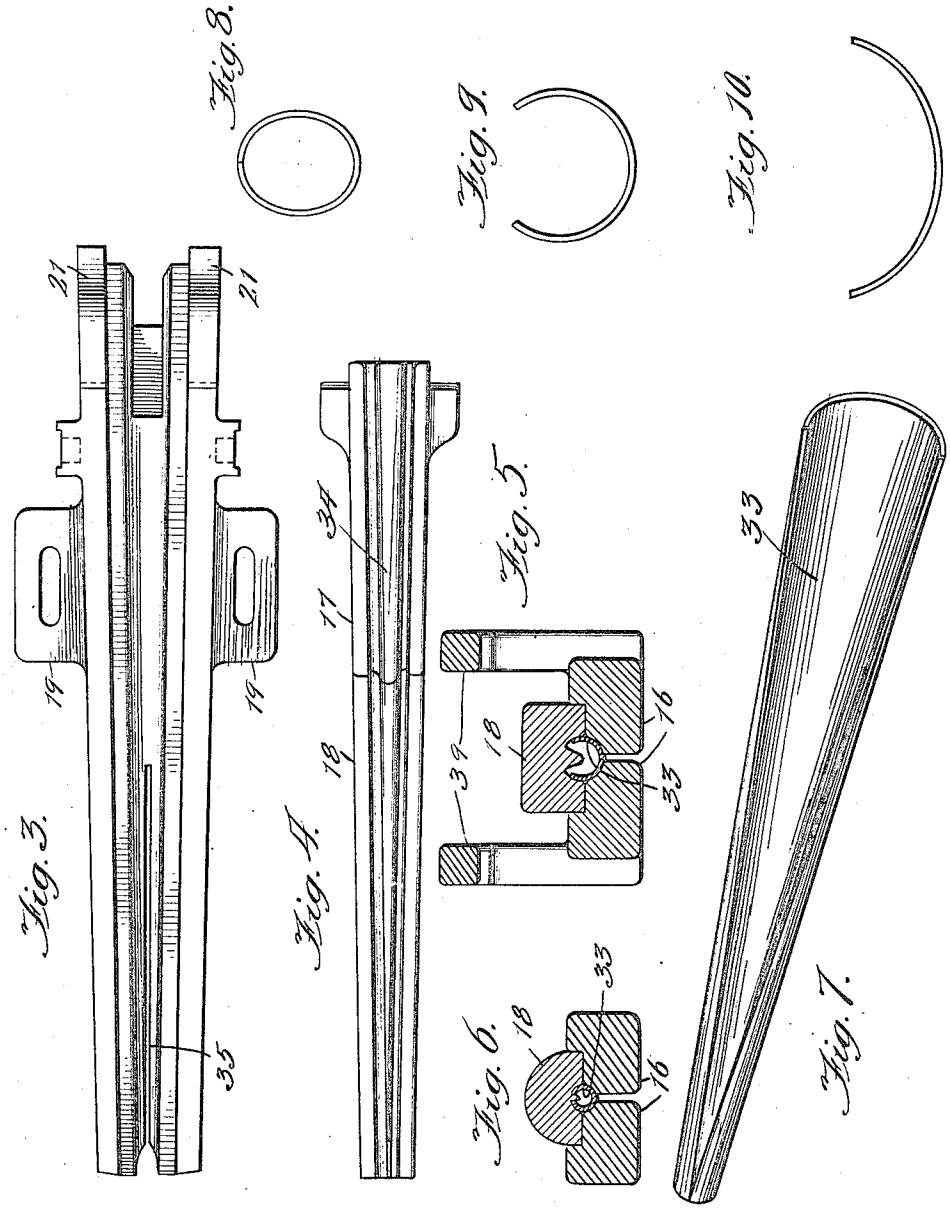
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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR FORMING METAL TUBES.

1,124,221. Specification of Letters Patent. Patented Jan. 5, 1915.

Application filed October 30, 1914. Serial No. 869,358.

To all whom it may concern:

Be it known that I, ALEXANDER W. GILLESPIE, a citizen of the United States, residing in Chicago Heights, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Methods of and Apparatus for Forming Metal Tubes, of which the following is a specification.

My invention relates in general to tube forming apparatus and more particularly to method of forming metal tubes from flat strips of metal having the length of the tube desired and the width equal substantially to its circumference, the tube being formed of such strip by bending the longitudinal edges of said tube until they abut one against the other in a finished cylindrical tube and to apparatus particularly adapted to the practice of such method.

I am aware that numerous forms of apparatus have been tested and employed prior to my invention, but these apparatus have bent the skelp or strip into the finished tube by giving successive portions of it the curvature desired. This requires a sudden bending of each small successive portion, which in certain classes of material I believe to have a weakening effect straining the metal structure in the bending.

It is the principal purpose of my invention to bend the material in forming the tube more gradually, and this I accomplish by first bending the skelp or rather successive portions of it on a relatively wide curve and then gradually bending it more until the longitudinal edges abut one against the other in the finished tube. This gives the molecular structure time to adjust itself and more effectively withstand the bending strain, relieving in large part strain upon the apparatus and reducing also materially the danger of fracturing the material or cracking its outer surface, besides retaining to the fullest extent the native strength of the sheet when in flat condition before bending.

A further object of the invention is the provision of effective guiding means within the former or die for preventing twisting of the tubes.

A still further object is a general improvement in the design and efficiency of such apparatus.

Other objects and advantages of the invention will be apparent as it is better understood from the following description when considered in connection with the accompanying drawing illustrating a preferred embodiment thereof.

Referring to the drawings: Figure 1 is a sectional view taken centrally through an apparatus embodying my invention, parts of which, notably the feeding and delivery rolls, are merely indicated; Fig. 2 is a top plan view of the same with the upper feeding and delivery rolls removed; Fig. 3 is a top plan view of the bottom member of the form; Fig. 4 is a bottom plan view of the top member of the form; Fig. 5 is a section taken substantially on the line 5—5 of Fig. 1; Fig. 6 is a section taken substantially on the line 6—6 of Fig. 1; Fig. 7 is a perspective view of a skelp partially formed into a tube and showing the manner of bending; and Figs. 8, 9 and 10 are diagrammatic views showing the changes wrought in the curvature of the material as it passes through the former.

My present invention concerns itself principally with a die or former adapted to receive a somewhat slightly bent piece of skelp at one end and to turn out a substantially completed tube at the other. This former is generally indicated at 11 in Fig. 1, in which view is indicated also a pair of feeding-in rolls 12 and 13 and a pair of delivery and finishing rolls 14 and 15. These rolls are mounted in a suitable frame or supports which, for the sake of clearness, have been omitted from the drawing and which need not be described herein.

The former in the present embodiment of the invention now to be described consists of a bottom or female member 16 and a two-part top member indicated at 17 and 18. The bottom member 16 has outwardly extending slotted ears or lugs 19 which may be engaged by suitable supports. The forward end of this member is tapered as seen at 21 to extend between the rolls 12 and 13 at the sides. A slit 22 is provided centrally of the former and in this slit rests one end 23 of a separating wedge 24, the forward edge of which 25 rides just above the lower feed roll 13. A channel 26 is formed between the top and bottom members of the former and extends longitudinally therethrough. The forward end of this channel is disposed at the feeding end between the

rolls 12 and 13, the forward end of the channel being formed between the plug or wedge 24 and a movable stripper 26′ having a curved outer face 27 adapted to ride on the face of the feeding roll 12. The stripper 26′ is secured upon a rocking bar 28 having a recess 29 therein in which is engaged a lug 31 upon the upper face of the forward part 17 of the top member. A spring 32 holds the stripper 26′ in contact with the roll 12 and causes it to effectively separate the entering skelp from the upper roll. The feeding-in rolls 12 and 13 are formed to produce a slightly bent skelp, the form of which is substantially that shown in Fig. 10. If necessary other rolls may be provided to aid in producing this form.

The channel 26 is curved in all its portions and narrowing or reducing toward its delivery end. The bottom and top portions of the skelp in passing through it are curved to substantially but not accurately semi-circular form and particularly toward the delivery end these portions are connected by intermediate side curves, giving the tube, as it leaves the former, a slightly elliptical or oval shape, as is seen in Fig. 8, it being intended that the finishing rolls will force the tube into perfect cylindrical form. Figs. 8, 9 and 10 indicate the shape given a single portion of the skelp as it passes different points in the die. While these portions are all nearly circular, they are off of a circle sufficiently to permit the oval shape shown in Fig. 8 to be gradually produced. All points, however, of each of the sections shown and of intermediate sections, which might be taken are curved on the arcs of circles, several arcs being employed at each successive point in the channel. At the feeding end the centers and radii of these arcs are so nearly the same as to be hardly distinguishable. At the delivery end, however, the difference in radii of these arcs is somewhat more apparent, those of the arcs at the side being greater than those of the arcs forming the top and bottom. This continuous and gradual bending is perhaps best appreciated by viewing Fig. 7, in which is shown a piece of skelp 33 from which it will be noted that there is no sudden bending of the material at any point.

On the two parts of the top member and extending downwardly into the channel formed by it with the bottom member is a longitudinally extending rib 34 which is substantially co-extensive with the former, this rib decreasing in thickness as is demanded by the approaching edges of the skelp. The rib 34 serves to prevent twisting of the skelp in the former and insures that the adjoining edges meet in a substantially straight line. The bottom member is slit from the delivery end inwardly, as seen at 35, to permit it to be adjusted to take up wear. The two parts of the top member contact at beveled surfaces 36, a wedge 37 being provided to engage a lug 38 on the part of the top member having upper surfaces 36 and engaging under lips 39 extending upwardly from the bottom member to hold the parts firmly together in service. A perfect cylindrical shape is given the tube by the finishing rolls. It will be understood that the word elliptical as used herein includes oval or equivalent shapes.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing without further description, and it will be obvious that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing any of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In an apparatus for forming metal tubes, in combination: means for curving a flat piece of skelp first on arcs of large circles continuous from side to side of the skelp and gradually reducing the radii of said curve until said skelp is elliptical in cross section with its edges substantially in contact; and means for reducing the radii of the longer curves of said elliptical form to produce a circle, in cross section.

2. In an apparatus for forming metal tubes, in combination: means for curving a flat piece of skelp first on arcs of large circles continuous from side to side of the skelp and gradually reducing the radii of said curves until said skelp is elliptical in cross section with its edges substantially in contact; and finishing rolls for reducing the radii of the longer curves of said elliptical form to produce a circle, in cross section.

3. In an apparatus for forming metal tubes, in combination: forming rolls and a former having a channel, for curving a flat piece of skelp first on arcs of large circles continuous from side to side of the skelp and gradually reducing the radii of said curves until said skelp is elliptical in cross section with its edges substantially in contact; and means for reducing the radii of the longer curves of said elliptical form to produce a circle, in cross section.

4. In an apparatus for forming metal tubes, the combination of feeding rolls and delivery rolls, and a former positioned between said feeding and said delivery rolls, said former comprising a member having a channel extending longitudinally thereof for forming said tubes, said channel being curved at all points and narrowing continuously and gradually from the delivery to the feed end, said channel being shaped transversely to curve a flat piece of skelp first

on arcs of large circles continuous from side to side of the skelp, and gradually reducing the radii of said curves until said skelp is elliptical in cross section with its edges substantially in contact, and said delivery rolls being shaped to reduce the radii of the longer curves of said elliptical form to produce a circle in cross section.

5. The method of forming metal tubes which consists in curving a flat piece of skelp, first on arcs of large circles continuous from side to side of the skelp, and gradually reducing the radii of said curves until said skelp is elliptical in cross section with its edges substantially in contact, and then reducing the radii of the longer curves of said elliptical form to produce a perfect circle in section.

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