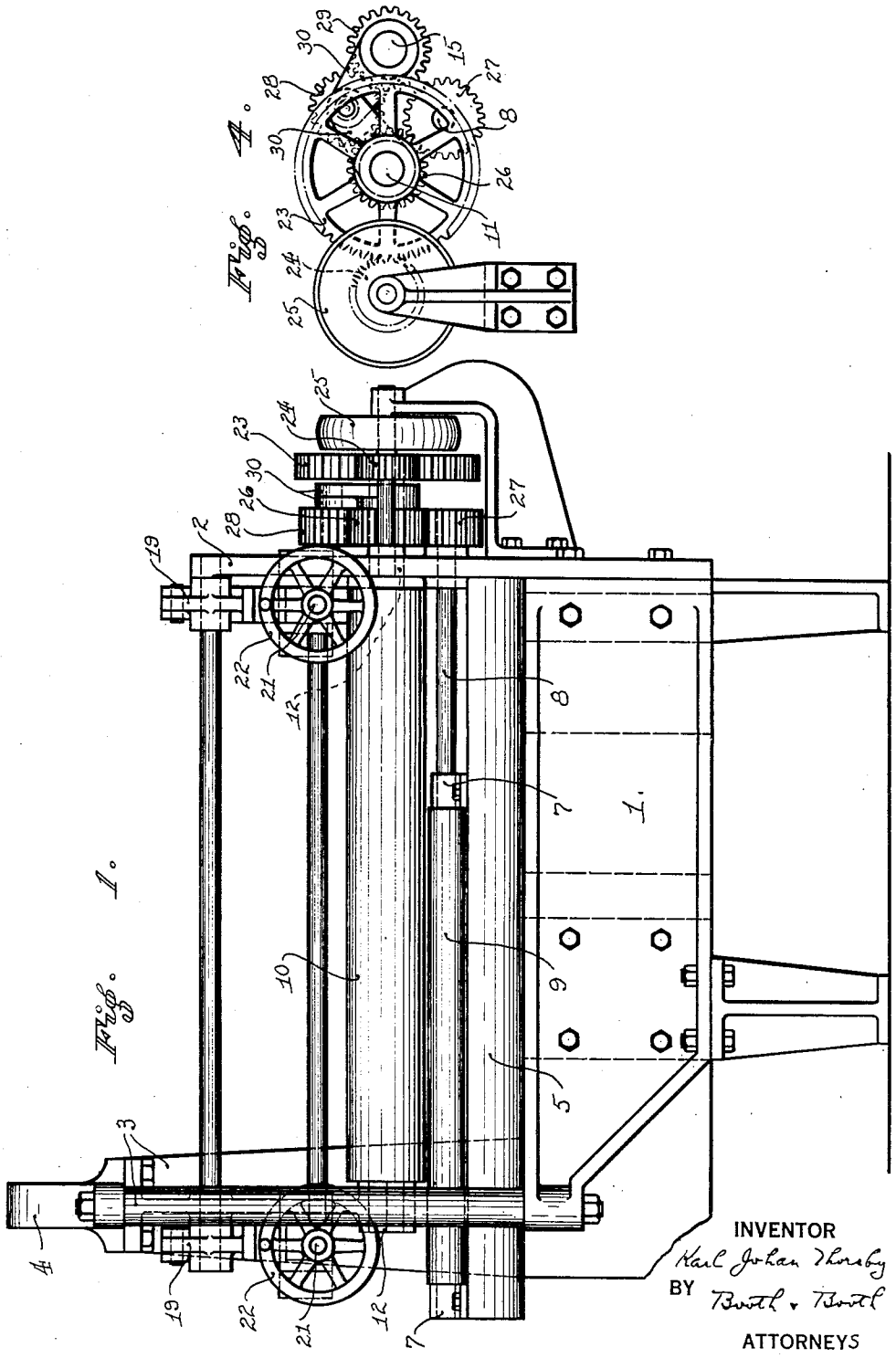
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K. J. THORSBY

MAKING SPIRAL PIPE

Filed June 3, 1925 3 Sheets-Sheet 1



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K. J. THORSBY

MAKING SPIRAL PIPE

Filed June 3, 1925

3 Sheets-Sheet 2

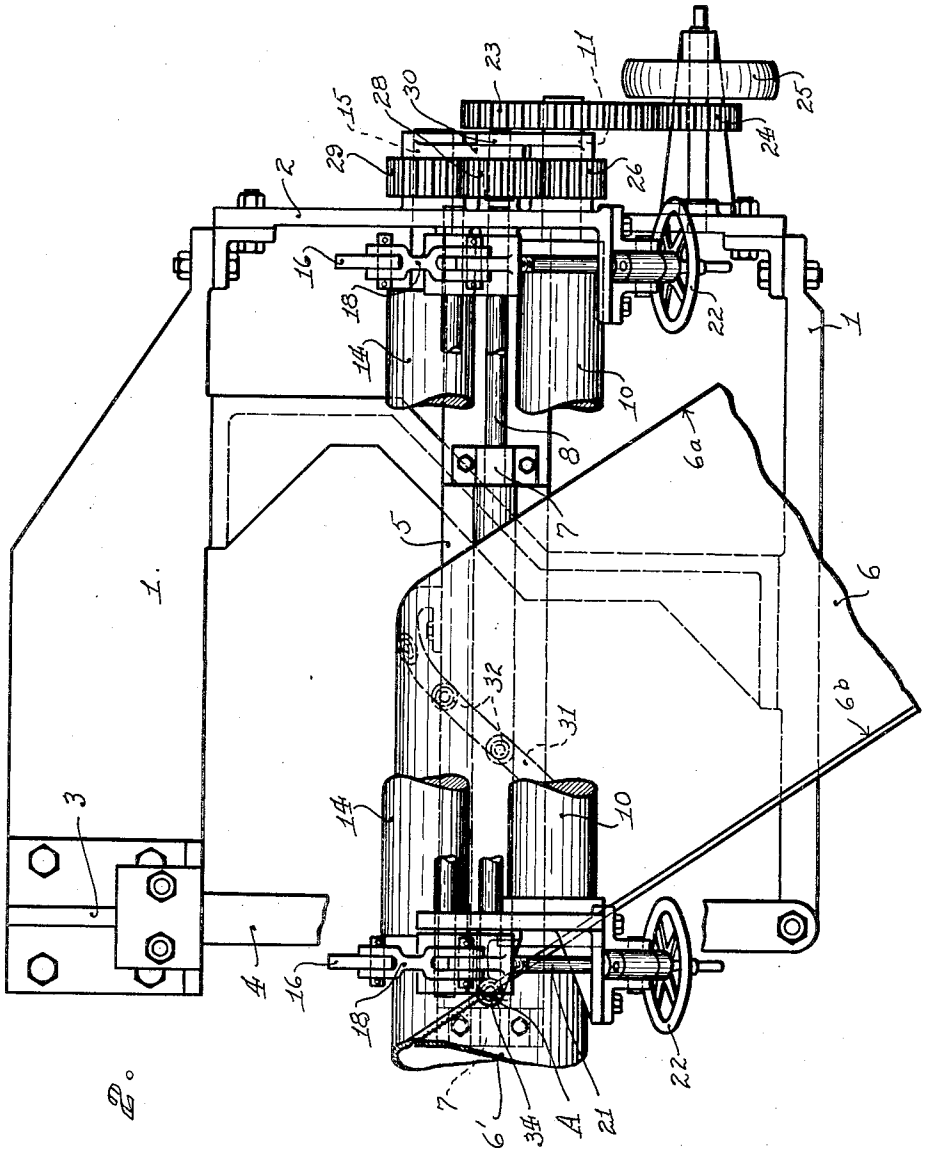


Fig. 2.

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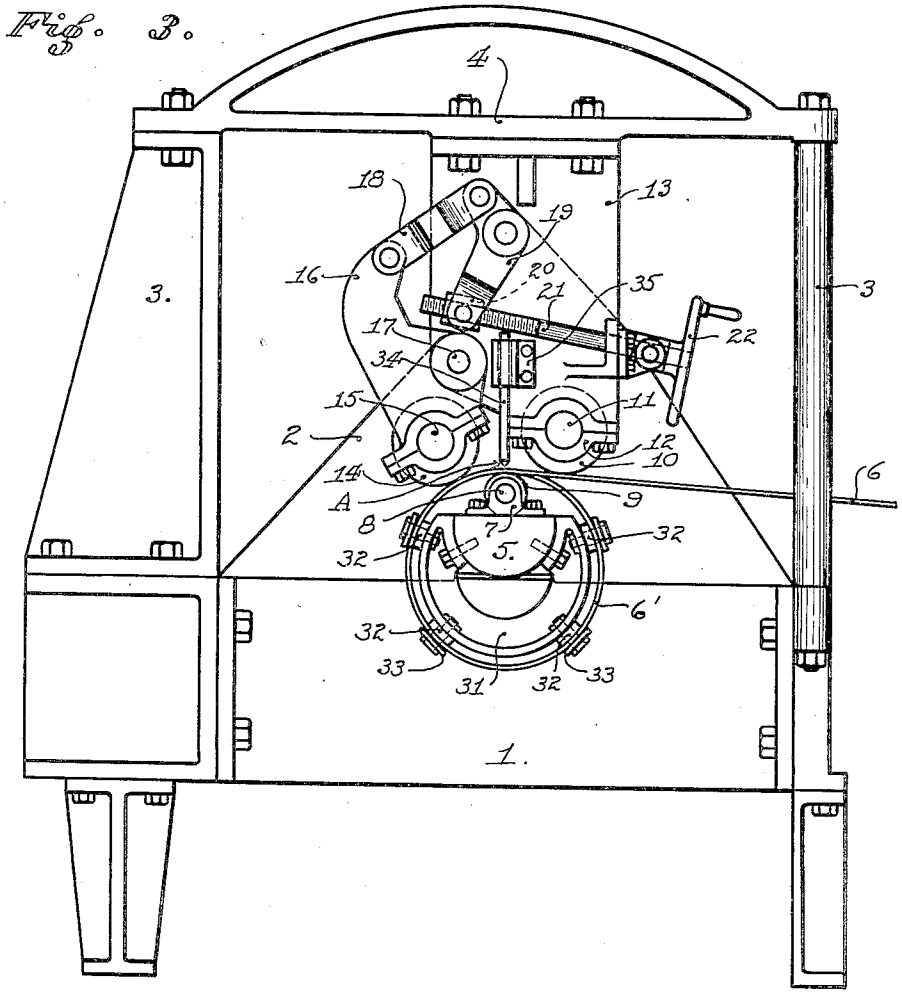
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MAKING SPIRAL PIPE

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3 Sheets-Sheet 3

Fig. 3.



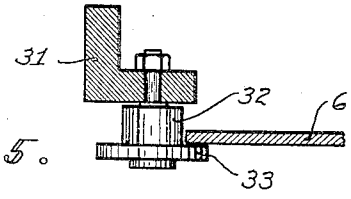
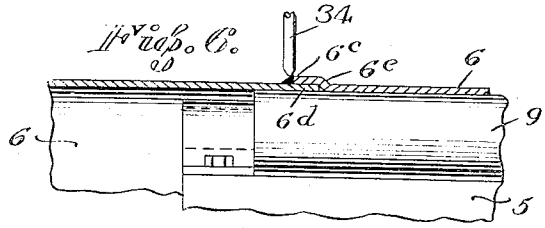


Fig. 5.

Fig. 6.



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UNITED STATES PATENT OFFICE.

KARL JOHAN THORSBY, OF OAKLAND, CALIFORNIA, ASSIGNOR TO CALIFORNIA CORRUGATED CULVERT COMPANY, OF OAKLAND, CALIFORNIA, A CORPORATION OF CALIFORNIA.

MAKING SPIRAL PIPE.

Application filed June 3, 1925. Serial No. 34,569.

My invention relates to the art of making spiral metallic pipe.

The object of my invention is to provide a process and a machine for winding a sheet or strip of metal helically into the form of a tube or cylinder and for automatically and continuously uniting the meeting edges of the wound strip by welding to form a rigid and continuous pipe.

Another object of the invention is to provide a machine capable of operating upon relatively heavy metal. In actual practice I am enabled to use sheet steel of a thickness as great as three eighths of an inch, thereby making a strong and substantial pipe of heavy gage. A still further object of the invention is to provide means for adjusting the machine to form pipes of different diameters.

Other objects and advantages of the invention will be apparent from the following specification which should be read with the understanding that the form, proportion, and arrangement of the several parts may be varied without departing from the essential principles of the invention as expressed in the claims hereto appended.

With this in view, a preferred embodiment of my invention will now be fully described with reference to the accompanying drawings wherein

Fig. 1 is a front elevation of the machine.

Fig. 2 is a partly broken plan view showing the work in position.

Fig. 3 is an end elevation as viewed from the left of Figs. 1 and 2.

Fig. 4 is a detailed end elevation of the driving mechanism shown at the right hand end of Figs. 1 and 2.

Fig. 5 is a sectional detail of one of the guide rollers for guiding the edge of the sheet.

Fig. 6 is a sectional detail illustrating the welding of a lapped seam.

In the drawings, the reference numeral 1 designates a base from which rise a member 2 at one end thereof and a pair of spaced uprights 3 at its other end. The uprights 3 are joined by a bridge member 4. A horizontally disposed horn or stake 5 is supported from its right hand end by the bed 1, its left hand end being free. The strip or sheet 6, shown in Figs. 2 and 3, is wound or wrapped about said stake 5 by a mechanism to be described hereinafter, the cylindrical pipe 6′ formed by the winding of said sheet sliding off the stake 5 endwise toward the left, as viewed in Fig. 2.

The top of the stake 5 is preferably flat as shown, and supports by means of journals 7 a longitudinally disposed shaft 8 upon which is secured a roller 9. A second roller 10 is secured upon a shaft 11 parallel with the shaft 8 and spaced above and forwardly therefrom. The shaft 11 is mounted in journals 12 at the ends of the machine, one such journal being carried by a bracket 13, Fig. 3, depending from the bridge 4, and the other being carried in the end member 2. A third roller 14 parallel with and spaced above and rearwardly from the lower roller 9 is secured upon a shaft 15 which is rotatably mounted in adjustable brackets 16. These brackets, one at each end of the machine, are fulcrumed at 17 as shown in Fig. 3 and are connected by links 18 with bell cranks 19 which carry nuts 20 threaded upon shafts 21, and said shafts are provided with hand wheels 22. Thus by rotation of said hand wheels, the brackets 16 may be rocked about their pivots 17 to move the roller 14 toward or away from the lower roller 9, and by such movement the diameter of the pipe formed may be varied as will be presently described.

The roller shafts 8, 11 and 15 are driven by means of gearing at one end of the machine, as shown in Figs. 1, 2 and 4. The shaft 11 is provided with a gear 23 which is driven by means of a pinion 24 connected with a belt pulley 25. The shaft 11 also carries a pinion 26 meshing with a pinion 27 secured upon the shaft 8. An idler pinion 28 connects the pinion 26 of the shaft 11 with a pinion 29 on the shaft 15. The spindle or bearing of the idler pinion 28 is carried in toggle brackets 30 mounted about the shafts 11 and 15, so that said shaft 15 and its roller 14 may be adjusted laterally without affecting the drive thereof.

The sheet of metal 6 is passed above the roller 9 and below the rollers 10 and 14, as shown in Figs. 2 and 3, and is fed forwardly and bent into helical cylindrical form by said rollers. In order properly to guide the sheet 6 in its angular relation to the rollers, I provide a hellically disposed bracket 31 secured to and extending part way around the stake 5, and said bracket carries guide

rollers 32, as shown in Figs. 2, 3 and 5. The guide rollers 32 are adapted to bear against the edge of the sheet 6, as shown in Fig. 5, in order to properly direct the same, and are provided with flanges 33 adapted to overlie the edge of said sheet to prevent bulging thereof.

The bending of the sheet 6 occurs along the line of its contact with the roller 9, as indicated by the letter A in Fig. 3, this being the line of meeting of the tangential portion and the cylindrical portion of the sheet. Thus it will be seen that by varying the position of the roller 14 with respect to the roller 9, by means of the adjusting hand wheels 22, and by replacing the helical guide bracket 31 with a similar bracket of the proper size, the diameter of the pipe formed may be changed.

Although the bending of the sheet occurs along the line of its contact with the roller 9, the bending forces are applied to said sheet throughout a zone extending from the roller 10 to the roller 14. Such forces, beginning with zero at the line of contact with the roller 10, increase to a maximum at the roller 9, at which point the bending occurs, and then decrease again to zero at the line of contact with the roller 14.

In order to complete the forming of the pipe, I provide means for continuously welding the meeting edges thereof. It will be seen from Fig. 2 of the drawings that the edge 6^a of the sheet 6, after making one complete revolution about the stake 5, is brought into contiguous relation with the opposite edge 6^b, and that this meeting of the two edges of the sheet occurs first at the bending point A.

This point A is the optimum point at which to weld the contiguous edges 6^a and 6^b of the sheet, although such welding may be done successfully at any point lying in the zone of application of the bending forces after said edges become contiguous, that is, at any point between the rollers 9 and 14. For purposes of illustration, I have indicated, in Figs. 2 and 3, an electric welding means positioned at the point A, and comprising an electrode 34, suitably mounted in an insulating bracket 35, such showing being merely indicative of any suitable means for continuously welding the contiguous edges of the sheet.

In the use of the indicated well known form of welding apparatus, an electric current is passed from the frame of the machine to the sheet 6 and thence through a suitable air gap to the electrode 34, thereby heating the edges of the sheet 6 at the point A and welding said edges together. Any suitable electrical connections, not shown in the drawings, may be employed for operating the welding apparatus.

The positioning of the welding apparatus in the zone of application of the bending forces. i. e. between the rollers 9 and 14, is essential to successful operation, for in this zone the edges 6^a and 6^b of the sheet 6 meet in perfect alignment. If the welding were performed at any point in the advancing seam beyond the roller 14, the action of the feed and bending rollers would tend to produce a bulging or buckling of one or the other of the meeting edges, resulting in spreading of the seam and an imperfect or irregular weld, but by welding said edges at the bending point A, or between said point and the end of the zone of application of the bending forces, I am able to produce a smooth and otherwise perfect joint. In the case of a butt joint, the two edges 6^a and 6^b of the sheet lie flush and even throughout the region between the rollers 9 and 14, and in the case of a lap joint shown in Fig. 6 the lapped edges of the sheet are firmly pressed together throughout this region, excluding air pockets and making a perfect weld possible. The ability of the machine to make a perfect weld not only results in the formation of a smooth, strong, and accurate pipe of even size, but also enables the machine to operate at a higher speed than would be possible if the seam were uneven or imperfect.

It will be readily understood from the foregoing that the operation of the machine is continuous and automatic. The sheet 6 is advanced and bent by the continuously rotating rollers 9, 10 and 14, and is forced off the end of the stake 5 in helical form by the guide rollers 32. At the same time, the welding of the joint between the meeting edges 6^a and 6^b of the sheet 6 is carried on continuously so that the pipe issues from the machine as a rigid and continuous cylinder.

In the case of the lapped seam shown in Fig. 6, the weld is made by fusing the extreme edge 6^c of the overlying convolution of the sheet 6 to the outer surface of the underlying convolution, along a helical line lying back of or remote from the edge 6^d by a distance equal to the width of the lap. This makes a strong and substantial seam, the double thickness of metal at the joint forming a helical reenforcement which adds to the stiffness of the pipe. The offsetting of the edge 6^c, as shown, by the formation of the shoulder 6^e is optional, and need be done only when a smooth interior surface is desired.

As hereinbefore stated, the optimum point for welding is at the line of initial bending of the sheet, i. e. at its line of contact with the stake roller 9. This is particularly so when the weld is made by fusing, as herein described, for the reason that said roller 9 serves as a backing for the weld, to prevent the fused metal from flowing through into the interior of the pipe. But at the same time, because of the very slight area of con-

tact between the weld and the comparatively small stake roller, and the continuous advancement of the weld away from said roller, there is no appreciable loss of heat to said roller, so that it is easily possible to make a perfect weld by the fusing process without unduly heating the roller. Moreover, the almost immediate movement of the weld away from contact with said roller enables the weld to harden and cool comparatively slowly.

I claim:—

1. The process of making spiral pipe which consists in bending and winding a sheet of metal helically into tubular form with the edges of its convolutions overlapping to form a helical lapped joint of double thickness parallel with the surface of the tube, and welding said joint by fusing in the absence of pressure, along the edge of one convolution.

2. The process of making spiral pipe which consists in bending and winding a sheet of metal helically into tubular form with the edges of its convolutions overlapping to form a helical lapped joint, continuously welding said joint as it advances by fusing in the absence of pressure, the edge of the outer convolution to the outer surface of the inner convolution, and supporting the inner surface of said inner convolution at a point opposite the point of fusion.

3. A machine for making spiral pipe comprising means for bending and winding a sheet of metal helically into tubular form with the edges of its convolutions overlapping to form a helical lapped joint parallel with the surface of the tube; and means for fusing, in the absence of pressure, the edge of one convolution to the surface of the adjacent convolution to weld said joint.

4. A machine for making spiral pipe comprising means for continuously bending and winding a sheet of metal helically into tubular form with the edges of its convolutions overlapping to form a helical lapped joint; means for continuously welding the advancing joint by fusing, in the absence of pressure, the edge of one convolution to the surface of the adjacent convolution; and means for supporting the opposite surface of the last mentioned convolution at a point opposite the point of fusion.

5. A machine for making spiral pipe comprising a roller; means for bending a sheet of metal over said roller and winding it helically to form a pipe of a diameter materially greater than that of said roller; and means for continuously heating and fusing together, in the absence of pressure, the contiguous edge portions of the wound sheet at the line of contact with said roller.

6. A machine for making spiral pipe comprising a plurality of rollers for feeding a sheet of metal and winding it helically into tubular form, one of said rollers lying within the formed pipe and having a diameter materially less than that of said pipe; and means acting upon the exterior of the pipe at the line of its contact with said interior roller for heating and fusing together, in the absence of pressure, the contiguous edge portions of the wound sheet.

In testimony whereof I have signed my name to this specification.

KARL JOHAN THORSBY.