

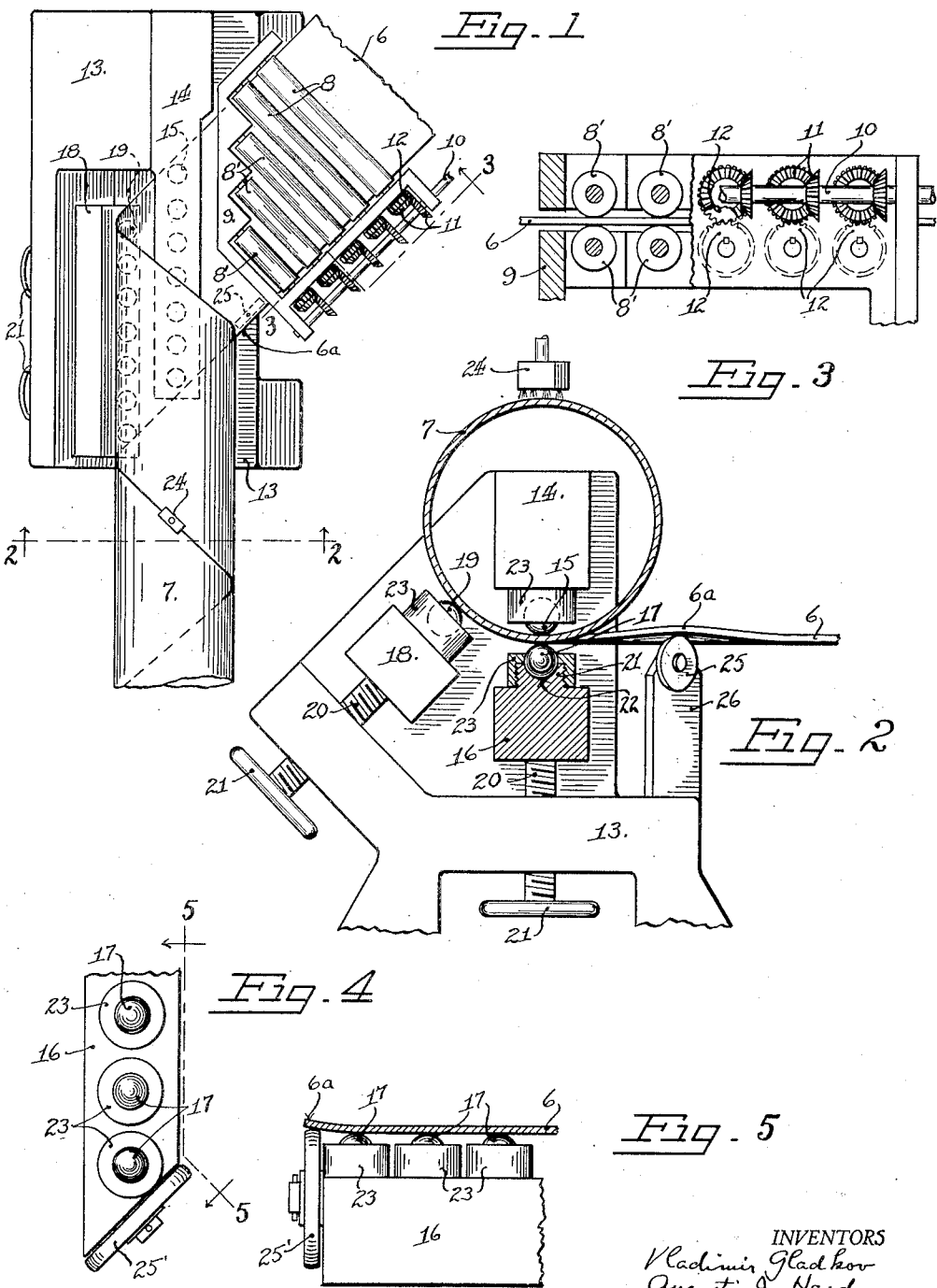
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SPIRAL PIPE MACHINE

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UNITED STATES PATENT OFFICE

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SPIRAL PIPE MACHINE

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The present invention relates to the art of making so-called spiral pipe from sheets or strips of metal, particularly steel of comparatively heavy gauge.

5 The principal object of the invention is to reduce friction to a minimum by providing true rolling contact between the advancing sheet and its feeding and winding means. A second object is to provide an improved feeding means to eliminate the risk of buckling 10 the sheet prior to the winding thereof. A third object is to provide a machine in which the welding of the meeting helically directed edges of the wound sheet can be carried on continuously at a point in proximity to the 15 bending means.

A still further object of the invention is to provide bending means for winding the sheet accurately throughout its entire width 20 into true cylindrical form. In the helical winding of a sheet or strip of metal, especially of heavy gauge, it has been found by actual experience that the edge portions of the strip tend to assume a curvature different from that of the center portion, so that 25 if the same bending force is applied throughout the width of the sheet, its edges, particularly the forward edge, are bent upon a radius slightly greater than that of the central 30 portion of the strip. This results in a distortion of the tube from the true cylindrical form along the helical line of the seam. Such distortion is objectionable not only because it affects the form of the finished pipe, but also 35 because it increases the difficulty of making a perfect weld between the meeting edges.

Our invention provides means for correcting the distortion of the forward edge of the sheet in such a manner as to cause it to be 40 wound into true cylindrical form. Similar means may be applied to the rear edge if desired, but because the normal tendency to distortion is less at the rear edge, it is usually unnecessary to treat it differently from the 45 central portion of the sheet.

Other objects and advantages of the invention will be apparent from the following description, which should be read with the understanding that the form, proportion and 50 arrangement of the several parts may be va-

ried within the scope of the claims hereto appended, without departing from the spirit of the invention.

The accompanying drawing shows a simple form of apparatus embodying the invention. 55

Fig. 1 is a plan view of the complete apparatus.

Fig. 2 is an end elevation enlarged, the formed pipe being shown in section, taken 60 on the line 2—2 of Fig. 1, and the lower bending member being also shown in section to illustrate its construction.

Fig. 3 is a side view partly in section of the feeding means taken on the line 3—3 of 65 Fig. 1.

Fig. 4 is a plan view of the end of the lower bending member, showing a modified form of over-forming means.

Fig. 5 is a distorted side elevation of the 70 same taken on the line 5—5 of Fig. 4.

In the drawing, the reference numeral 6 designates a sheet or strip of metal which is wound helically to form the pipe 7. The feeding of the sheet 6 is accomplished entirely 75 by a series of rolls 8 and 8' which push said sheet into the bending means, to be described later. This pushing of the sheet produces a column action between the feeding rolls and the bending means which tends to buckle the sheet. In order to reduce such 80 tendency to buckling to a minimum, we provide a plurality of feeding rolls, some of which, as shown at 8', are of successively shorter lengths. This enables the pushing 85 force to be applied to the sheet along a line approximately parallel to the diagonal line of bending, and permits the feeding rolls to be positioned in close proximity to said bending line. 90

The feed rolls 8 and 8' are mounted in a suitable frame 9, and are arranged in pairs above and below the sheet, as shown in Fig. 3. Any suitable means is provided for driving 95 the rolls, such means being illustrated herein as comprising a shaft 10 connected by beveled gears 11 with the shafts of the upper rolls, and intermeshing spur gears 12 connecting each upper roll with its corresponding lower roll. 100

The bending means comprises a plurality of series or rows of freely rotatable balls, between which the sheet is forced by the action of the feed rolls 8 and 8'. Three rows of balls are shown in the drawing, each mounted in a suitable supporting beam. The three rows of balls are preferably all parallel to the line of bending of the sheet, although this is not essential.

The frame 13 of the machine supports from its rear end a beam 14 which lies above the sheet 6 and within the first convolution of the pipe 7. Upon the under side of said beam are mounted a row of freely rotatable balls 15. A second beam 16, Fig. 2, is mounted below the beam 14, and carries a row of balls 17 bearing against the underside of the sheet. A third beam 18 is mounted to one side of the lower beam 16 and carries a third series of balls 19, also bearing against the outside of the sheet at a higher elevation than the balls 15 and 17. Thus the sheet, being forced by the feed rolls 8 and 8' over the balls 17 and 19, and beneath the balls 15, is bent or wound helically into tubular form.

The lower or exterior beams 16 and 18 are preferably adjustable in the frame of the machine, in order to permit variation in the diameter of pipe formed. Any convenient means for adjustably mounting said beams may be employed as, for example, screw shafts 20, Fig. 2, operated by hand wheels 21. The balls may be mounted in the beams in any suitable manner to permit free rotation. As an example of means for mounting said balls, we have shown the beams as provided with projecting threaded bosses 21, each boss having a semi-spherical socket 22 in its end, and a cap 23 screwed thereupon to retain the ball in said socket.

It will readily be appreciated that because the balls are capable of rotating in any direction, there is no slipping or rubbing between them and the surfaces of the sheet. Consequently the only friction is that between the balls and their sockets, which can be easily lubricated by any suitable and well known means, not shown in the drawing.

By bending the sheet upwardly instead of downwardly, i. e. by forming the tube above the level of the incoming sheet rather than below, we are able to locate a continuous welding instrumentality at a point in proximity to the end of the bending means. It is practically necessary, in order to successfully use a continuous welder, illustrated, for example, as a torch 24, that said welder be positioned above the seam upon which it is operated. By winding the pipe upwardly, we are able to position the welder 24 less than half a revolution beyond the last row of bending rolls 19. This leaves comparatively little unwelded formed tube between the bending means and the welder, and reduces the risk of reforming said tube before it is welded.

In order to bend the forward edge 6a of the sheet upon the same radius as the central portion thereof, we have found it necessary to initially over-form said edge. One means for accomplishing this purpose is shown in Figs. 1 and 2, and comprises a roll 25 mounted upon a suitable bracket 26. As shown in Fig. 2, the top of the roll 25 is positioned slightly above the level of the balls 17, so that the edge portion 6a of the sheet is initially curled or bent upon a slightly shorter radius than that of the remainder of the sheet. This initial over-forming of the edge portion 6a is sufficient to counteract the normal tendency of said edge to bend upon a radius greater than that of the remainder of the sheet, and results in a pipe of true cylindrical form throughout the entire width of each convolution.

If desired, the over-forming roll may be mounted upon the diagonally formed end of the lower beam 16, as shown at 25' in Figs. 4 and 5. As before, the top of said roll is slightly above the level of the balls 17, so that the over-forming effect of the edge 6a is produced, as clearly indicated in Fig. 5.

We claim:—

1. In a spiral pipe machine, means for bending a sheet helically into tubular form; and means for feeding said sheet to said bending means, said feeding means comprising a plurality of rolls positioned with their axes substantially transverse to the direction of movement of the sheet, and having their ends arranged in stepped relation along a line approximately parallel to the line of bending of said sheet.

2. In a spiral pipe machine, means for bending a sheet helically into tubular form; and means for feeding said sheet to said bending means, said feeding means comprising a plurality of rolls of successively decreasing length each having one end arranged along a line approximately parallel to the line of bending of the sheet.

3. In a spiral pipe machine, means for bending a sheet helically into tubular form; and means for feeding said sheet to said bending means, said feeding means comprising a plurality of pairs of rolls between which the sheet passes, one end of each pair of rolls being arranged along a line approximately parallel to the line of bending of said sheet.

4. In a spiral pipe machine, a plurality of freely rotating balls between which a sheet is passed and by which it is bent helically into tubular form; and means for feeding the sheet between said balls, said feeding means comprising a plurality of rolls arranged with one end of each in stepped relation along a line approximately parallel to the axis of the formed tube.

5. In a spiral pipe machine, means for bending a sheet helically into tubular form,

said means including a series of freely rotatable balls bearing against one surface of the sheet, and a roller mounted in a plane different from that of said balls and adapted for contact with the edge portion of said sheet to bend it initially to a curvature different from that of its central portion; and means for feeding said sheet into said bending means.

against one side edge portion of the advancing sheet for continuously bending said edge portion to a curvature different from that of the central portion of the sheet.

In testimony whereof we have signed our names to this specification.

VLADIMIR GLADKOV.
AUGUSTIN J. HAND.

6. In a spiral pipe machine, means for advancing a sheet substantially horizontally; a series of freely rotatable balls bearing against the upper surface of said sheet along a line diagonal to its direction of advance; means for bending said sheet upwardly and around said series of balls to wind it helically into tubular form; and means for welding together the meeting edges of the wound sheet upon their first passage over the top of the tube.

7. In an apparatus for winding a sheet of metal helically into tubular form, a holding member disposed longitudinally of the formed tube and extending diagonally across the sheet; a row of freely rotatable balls mounted in said holding member and bearing upon one surface of said sheet; and means for feeding said sheet over said row of balls to cause it to bend along a line diagonal to the direction of its advance.

8. In an apparatus for winding a sheet of metal helically into tubular form, a plurality of holding members disposed longitudinally of the formed tube and extending diagonally across the sheet; a row of freely rotatable balls mounted in each holding member, said rows of balls bearing upon opposite surfaces of said sheet; means for feeding the sheet between said rows of balls to cause it to bend along a line diagonal to the direction of its advance; and means for moving one of said holding members toward and away from the axis of the formed tube to vary the diameter thereof.

9. In an apparatus for winding a sheet of metal helically into tubular form, a holding member disposed longitudinally of the formed tube and extending diagonally across the sheet; a row of freely rotatable balls mounted in said holding member and bearing upon one surface of said sheet; means for feeding said sheet over said row of balls to cause it to bend along a line diagonal to the direction of its advance; and means positioned at one end of said row of balls for bearing against the edge portion of the sheet to bend it initially to a curvature different from that of its central portion.

10. In an apparatus for winding a sheet of metal helically into tubular form; means for continuously feeding the sheet; bending means bearing upon one surface of the advancing sheet along a line diagonal to the direction of its advance and parallel to the axis of the formed tube; and means bearing

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