May 19, 1936. B. DE H. MILLER 2,041,199

BENT PIPE

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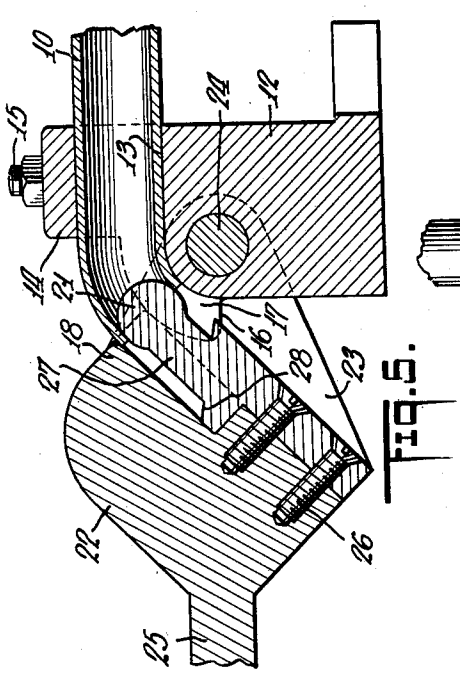


Fig. 5.

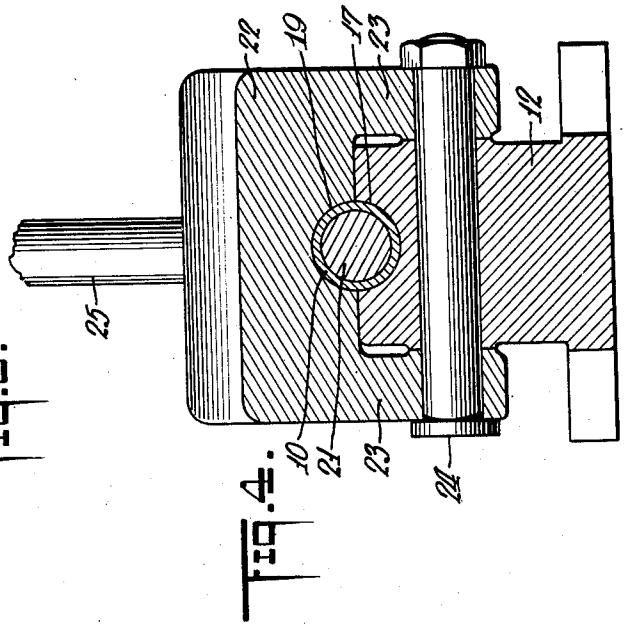


Fig. 4.

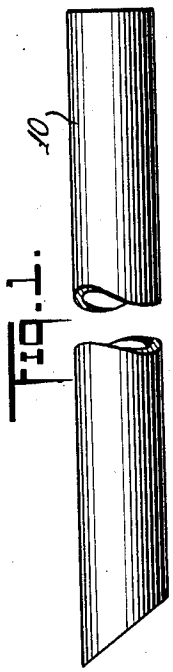


Fig. 1.

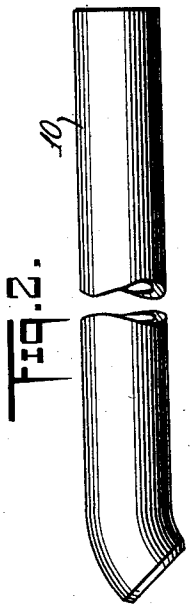


Fig. 2.

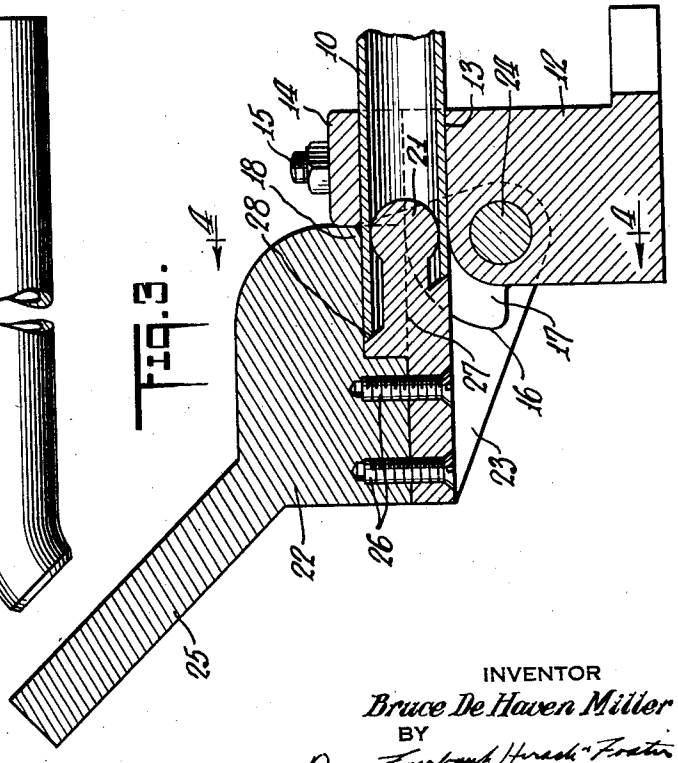


Fig. 3.

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BENT PIPE

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Application February 10, 1934, Serial No. 710,631

1 Claim. (Cl. 138—47)

This invention relates to straight pipe sections having curved end portions. In my improved device, the bend at the end of the pipe section may be easily formed without changing the wall thickness, and without subjecting the pipe section to excessive stresses.

The main object is to provide as a new article of manufacture, a straight pipe section made of ductile, weldable material, and having an end portion bent in a curve and extending through an arc of approximately 45°. Two pipe sections of this type can be connected together at right angles to each other by a single weld along the abutting edges of the bends, thereby simplifying the installation of a pipe line, and reducing its cost. The bends may be readily formed on the pipe sections at the time and place of use.

In the accompanying drawing

Fig. 1 is a side view of a pipe section before being subjected to a bending operation.

Fig. 2 is a side view of a pipe section after bending.

Fig. 3 is a section through one form of my improved device which may be employed for forming the terminal bend, and shows the pipe section of Fig. 1 clamped in position before being subjected to the operation of the device.

Fig. 4 is a section taken on the line 4—4 of Fig. 3, and

Fig. 5 is a section similar to Fig. 3, but showing the parts in the position which they assume in the bending operation.

In forming my pipe bend, I use a straight pipe section 10 made of ductile, weldable material such as wrought iron. This is cut diagonally at an angle of approximately 45° at the end where the bend is to be formed, so that at the completion of the bending operation, the outer end of the bend will lie approximately along a radial plane of the bend. The bending may be effected by means of the device shown in Figs. 3, 4 and 5, and in which the pipe section may be clamped during the bending operation.

The device in the form shown includes a base 12 having a semi-cylindrical groove 13 for seating the pipe section, and a clamping section 14 secured to the base 12 by means of bolts 15, and also having a semi-cylindrical groove for engaging the upper portion of the pipe section.

The bending means includes a fixed external die 16 formed on or otherwise connected to the base 2, and in and over which the inner or short radius side of the bend is shaped. This die presents a surface 17 having a convex base curved concentrically with the center of radius of the completed bend, and side extensions coacting with the curved base to form a channel or groove which is semicircular in cross-section, and into which the pipe section is forced. An external pivotally mounted die 18 for the outer or long radius side of the bend has a straight concave die surface 19 of semicircular outline, this surface coacting with the die surface 17 to encompass therewith the entire periphery of the pipe section. Also cooperating with the fixed external die 16 is an internal mandrel 21 which has a cross-section corresponding to the inner cross-section of the pipe section, and which is adapted to engage the inner surface of the pipe section 10 along the radial plane of the section. The mandrel 21 is advantageously in bulbous or spherical form, and is rigidly connected to the die 18.

The die 18 and the mandrel 21 are arranged to follow the same circular movement in accordance with the radius of the completed bend. For that purpose, the die 18 is integral or otherwise connected to a yoke 22, straddling the base 12 and having a pair of spaced flanges 23 engaging the sides of the base 12, and pivotally connected thereto by means of a pivot bolt 24. The yoke is provided with a suitable handle 25 for swinging it about its pivotal connection either manually or by power means.

Connected to the yoke 22 by any suitable means, as for instance screws 26, is an arm or shank 27 for supporting the mandrel 21. The shank 27 presents a shoulder 28 which may extend at an angle corresponding to the angle of the diagonal end of the pipe section 10 shown in Fig. 1, and which serves to engage said diagonal end to determine the clamped position of said section during the bending operation.

The pivot bolt 24 is located with its axis at the center of curvature of the completed bend, so that the swingable die 18 and mandrel 21 will have movements concentric with the base curvature of the die surface 17.

In bending a pipe section by means of the device shown, the yoke 22 is swung into the position shown in Fig. 3, with the inner side thereof abutting one side of the clamping bracket 14. The shank 27 will extend axially of the opening formed between the base 12 and the clamping bracket 14. The pipe 10 is then inserted axially into said opening and into the position shown in Fig. 3, and rotated if necessary to bring the diagonal end thereof into abutting engagement with the diagonal shoulder 28. In this position, the long side of the pipe section will be in an

uppermost position. The pipe section 10 may then be clamped in position by tightening the bolts 15.

The handle 25 is then operated to swing the yoke 22 downwardly to the position shown in Fig. 5. During this operation, the end of the pipe section 10 will be curved longitudinally, the portion of the mandrel 21 engaging the shorter side of the pipe forcing said side into the curved die surface 17, and the die 18 forcing the longer side of the pipe over the moving mandrel 21. The mandrel also serves as a die and engages the entire inner periphery of the pipe section during the drawing operation, and is moved during the bending operation to more effectively stretch the metal during the drawing operation so as to form a bend having a more uniform thickness and less inherent strains. The diagonal end of each pipe section is cut at such an angle that the completion of the bend operation illustrated in Fig. 5 will leave the outer end of the bend formed substantially in the same plane with a radial plane of the bend, thereby minimizing or eliminating waste of material caused by the trimming or facing of the end of the bend. The resultant article of manufacture formed as shown in Fig. 2 may be chamfered at the outer end of the bend in preparation for the welding process.

The bending device is of such a nature and its operation is so simple that it may be easily carried to the place where the pipe line is to be erected and there used.

A bend of comparatively short radius, for instance not xceeding one and one-half times the inside diameter of the pipe, can be made by means of my improved device. A pipe section having a bend of such short radius is highly desirable for certain purposes. A drawn pipe bend of such short radius but of a greater angle than 45° would have greater inherent strains due to the upsetting of the material in the pipe section during bending operation. By forming half of a 90° fitting at the end of each pipe section, I produce a bend having a more uniform thickness and less inherent strains. Furthermore, the smaller angle permits the pipe section to be cold drawn more easily.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

As a new article of manufacture a substantially straight pipe made of ductile weldable metal and having at one end thereof and integral therewith a curved end section terminating in a plane at an angle of 45° to the axis of the pipe and radially to the axis of curvature of said end section, the walls of said pipe and its end section being of substantially uniform thickness throughout, and the internal and external diameters being also uniform, said pipe being adapted to be welded to a similar pipe with the curved sections abutting in said plane to form a 90° bend with the pipes at right angles to each other.

BRUCE DE HAVEN MILLER.