Sept. 4, 1928. 1,683,572

P. MUELLER ET AL

PIPE BENDING MANDREL

Filed Oct. 17, 1925

Fig. 1.

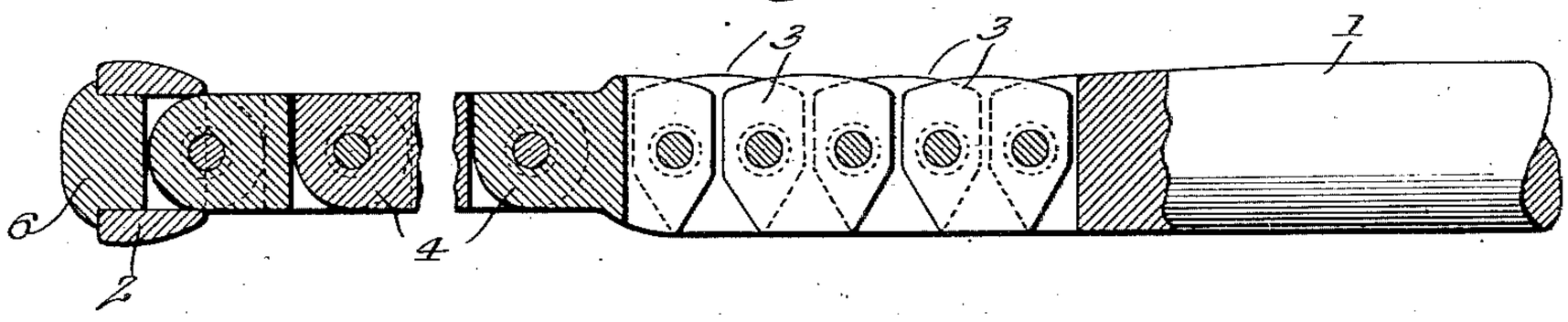
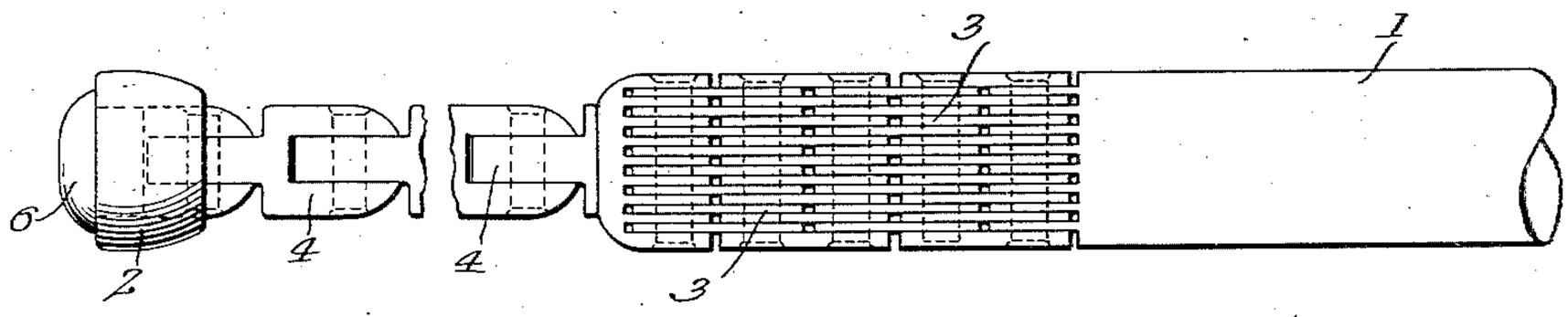


Fig. 2.



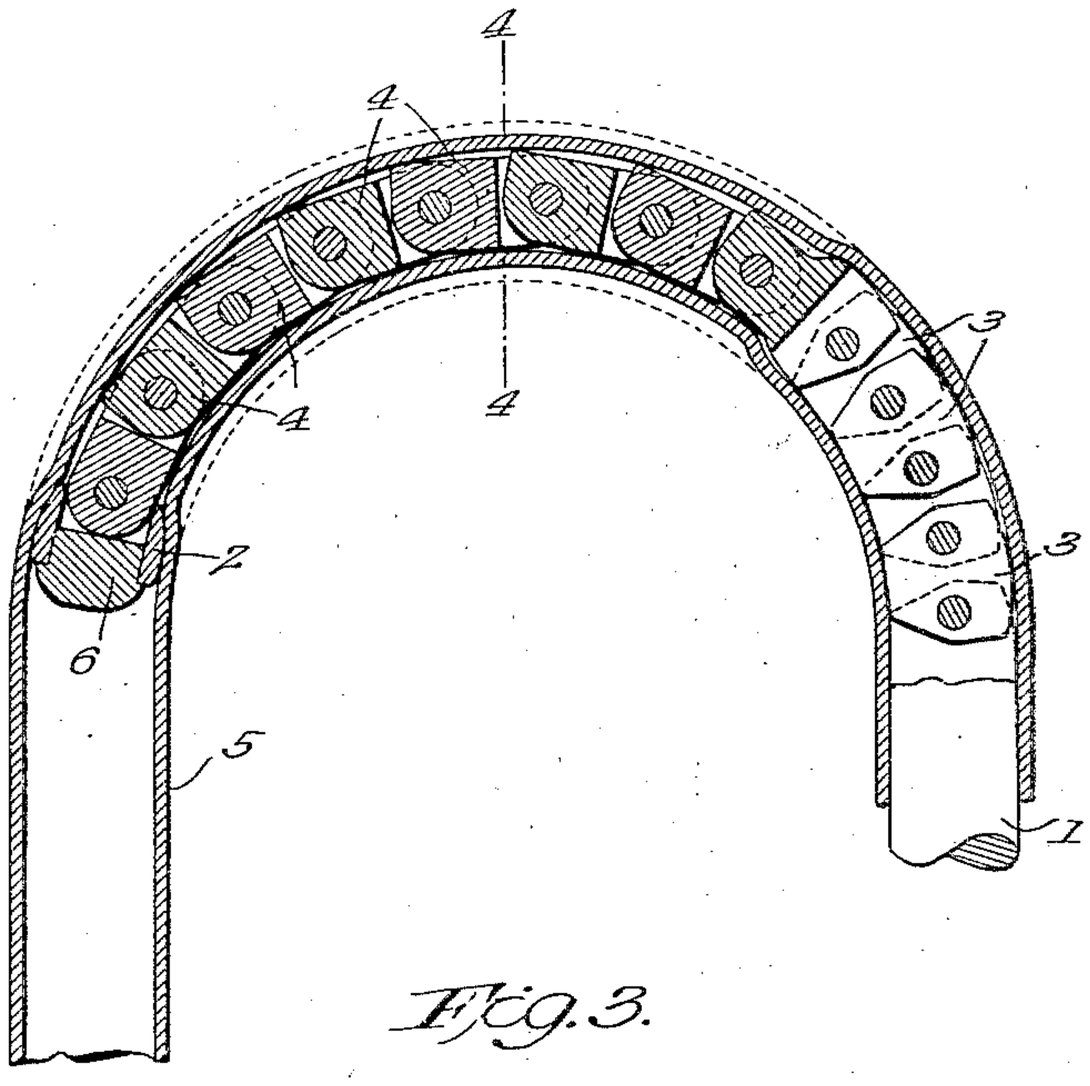
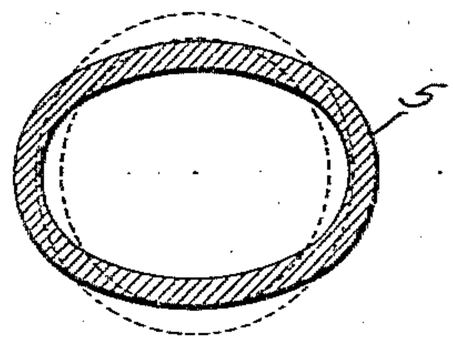


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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PIPE-BENDING MANDREL.

Application filed October 17, 1925. Serial No. 63,186.

The present invention relates to improvements in pipe bending mandrels, and has for its object, primarily, to provide a construction which will be particularly adapted for bending tubes on large radii.

The improved mandrel is of the type or class which comprises a rigid rod or stem and a flexible portion adapted to be received within the tube to be bent and to bend therewith about a suitable axis.

In the use of mandrels of this type, it is found that where the flexible section is of substantially the same diameter throughout its length, that is, from the rigid stem or rod to the sizing head at the terminal end of the mandrel there is a very considerable friction between the mandrel and tube during the bending operation. By the present invention the amount of friction produced during the bending operation and by the withdrawal of the mandrel from the bent tube is materially reduced.

Essentially the invention includes a construction in which there is interposed between the flexible section of the mandrel having substantially the same diameter as the bore of the tube to be bent and the sizing head a reduced section which will bend with the tube, but without producing as great an amount of friction between it and the tube as when the flexible section of the mandrel is of substantially uniform diameter throughout its length.

In the accompanying drawings:

Fig. 1 is a view partly in section of a mandrel constructed in accordance with the present invention.

Fig. 2 is an elevation at right angles to the position shown in Fig. 1.

Fig. 3 is a sectional view through a bent tube showing the position of the mandrel therein at the completion of the initial bending operation.

Fig. 4 is a section of the tube substantially on the line 4—4 of Fig. 3, the mandrel being omitted.

In the drawings, like letters of reference designate corresponding parts in the several figures.

Referring to the drawings, 1 designates the rigid rod or stem of the mandrel which is connected by a flexible section with a sizing head 2. As shown, the portion of the flexible connection between the rod 1 and head 2 comprises a section adjacent the stem which is formed by a series of pivotally connected plates 3 arranged to form a flexible body of cylindrical form in cross section and of substantially the diameter of the bore of the tube to be bent. Between the section formed by the plates 3 and the sizing head 2, there is a reduced flexible section composed of a series of pivotally connected links 4. The particular shape of the links 4 may be considerably varied, it only being necessary that these be of such shape and so connected that they will afford a suitable support for the walls of the tube 5 being bent to prevent crushing or breaking of the tube wall, while exerting less frictional pressure on such wall than is produced by the larger flexible section formed of the plates 3. In using the improved mandrel in bending a tube on a relatively large radius, the relative position of the parts will be as illustrated in Fig. 3. Referring to this figure, it will be seen that while the portions of the tube surrounding the sizing head 2 and flexible portion formed by the plates 3 will be maintained at substantially the normal diameter of the tube bore, the intermediate section through which the flexible extension, formed of the links 4, extends will be permitted to collapse slightly assuming a somewhat elliptical form in cross section, as shown in Fig. 4. When, however, the mandrel is withdrawn after the bending operation, the sizing head 2 will restore the initially slightly collapsed section of the tube to cylindrical form, the walls thereof being expanded to the position represented in dotted lines in Fig. 3.

There can, of course, be various modifications of the particular form of sizing head 2 and the plates 3 forming the section of the mandrel adjacent the rod or stem, but without departing from the spirit of the present invention, which essentially comprises providing a reduced portion between said head and flexible section adjacent the rod or stem, so that the bending operation will produce less friction between the mandrel and tube than would result if the flexible section of the mandrel were of substantially uniform diameter throughout its length.

As shown in the drawing, the sizing head 2 at the free end of the mandrel includes a ring which is freely revolvable about the reduced

shank of the terminal member 6; but the invention is not necessarily limited to the use of this specific form of head.

Having thus described the invention, what is claimed is:—

1. A tube bending mandrel comprising a flexible body section, formed of a plurality of pivotally connected elements, a terminal head having the cross sectional form and transverse dimensions of the bore of the tube to be bent, and a flexible connection between the head and body section of a diameter less than those of the members connected by it.

2. A tube bending mandrel comprising a flexible body section of substantially circular form in cross section, a terminal head of circular form in cross section and having an exterior diameter corresponding to the bore of the tube to be bent, and a flexible means, of less diameter than the body section and head, connecting the head and body section, whereby the portion of the tube surrounding said connecting means will assume a substantially elliptical form in cross section during the bending operation and while the mandrel is positioned therein.

3. A tube bending mandrel comprising a flexible body section, formed of a series of overlapping pivotally connected plates, a terminal head having the cross sectional form and transverse dimensions of the bore of the tube to be bent, and a plurality of pivotally connected links connecting said head and body and having a total width or thickness less than the diameter of either said body or head.

4. A tube bending mandrel comprising a flexible body section, a terminal head including a freely revolvable ring of an exterior diameter corresponding to the bore of the tube to be bent, and a plurality of pivotally connected links connecting said head and body and constituting an intermediate mandrel section of reduced diameter.

5. A tube bending mandrel comprising a stem and a flexible body section, the latter including a portion adjacent the stem of substantially circular form in cross section and of a diameter corresponding to the bore of the tube to be bent, said portion comprising a series of pivotally connected plate-like members, a terminal head of circular form in cross section and of an exterior diameter corresponding to the bore of the tube to be bent, and a portion connecting said body portion and head and of less diameter than said parts connected by it.

In testimony whereof, we, PHILIP MUELLER, and HELENA SCHUERMANN, executrix of the last will and testament of Anton C. Schuermann, deceased, have hereunto set our hands.

PHILIP MUELLER.
HELENA SCHUERMANN,
Executrix of Anton C. Schuermann, Deceased.