

March 14, 1933.

F. H. MEYER

1,901,762

BENDING APPARATUS

Filed Feb. 6, 1931

2 Sheets-Sheet 1

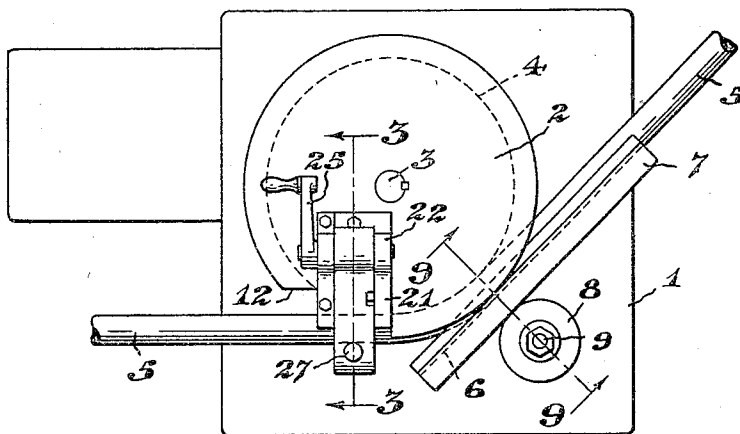


Fig. 1.

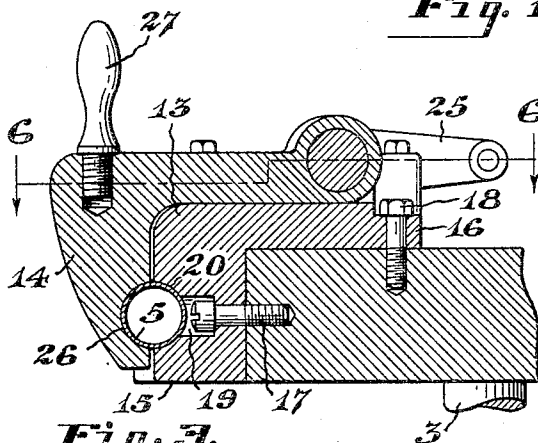


Fig. 3.

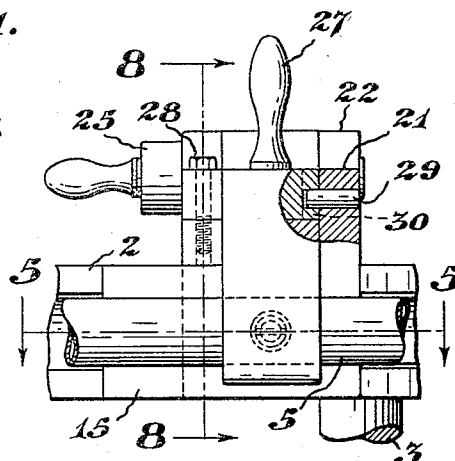


Fig. 2.

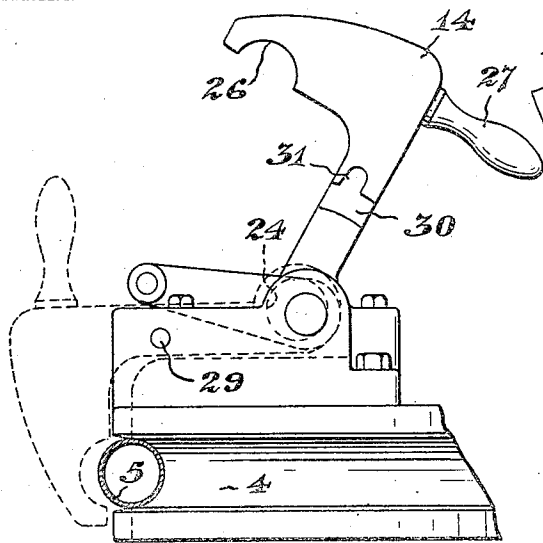


Fig. 4.

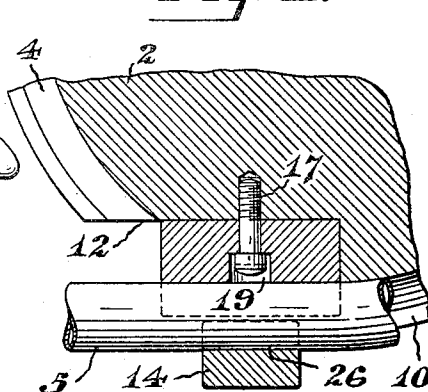


Fig. 5.

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2 Sheets-Sheet 2

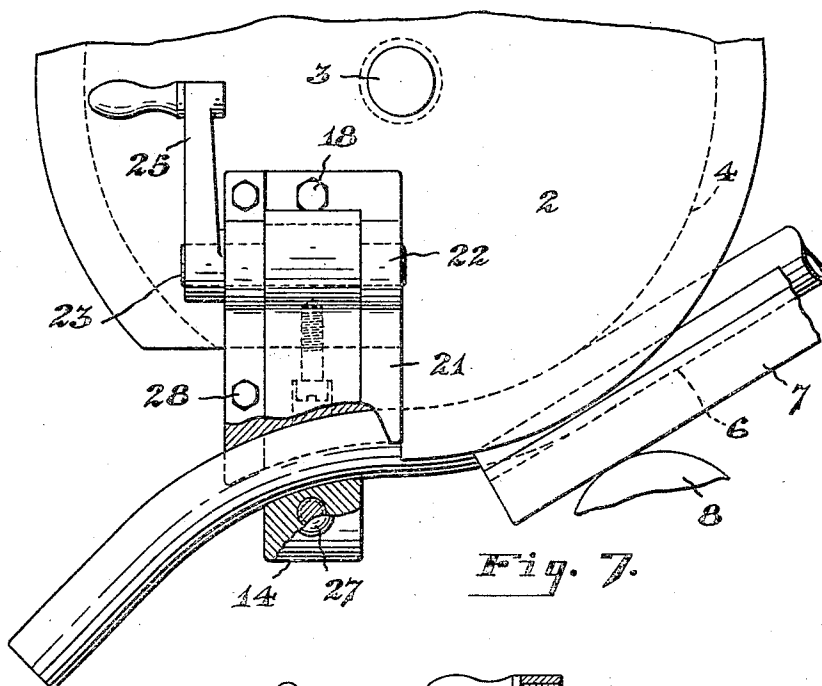


Fig. 7.

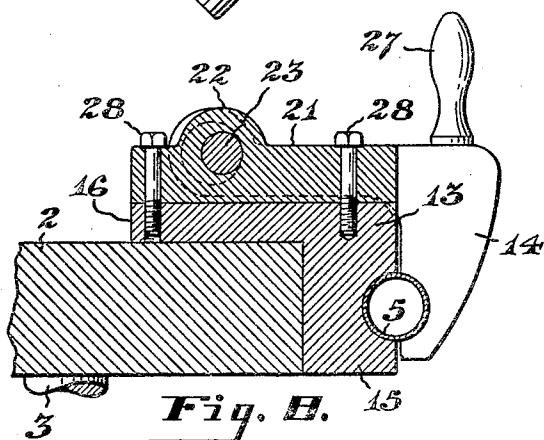


Fig. 8.

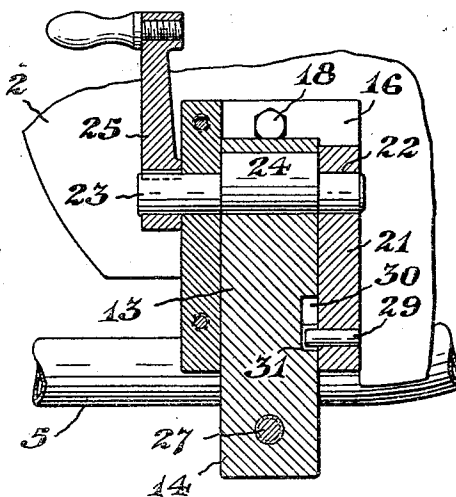


Fig. 9.

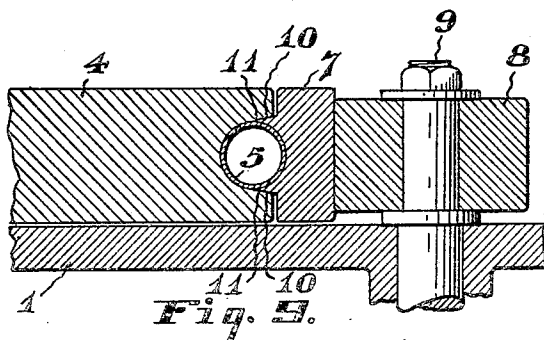


Fig. 10.

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BENDING APPARATUS

Application filed February 6, 1931. Serial No. 513,851.

This invention relates to bending apparatus, and more particularly to apparatus of the rotatable bending roll type used in the bending of long metallic articles.

One of the objects of the present invention is to provide a bending machine of the rotatable bending roll type with new and improved means for clamping the member to be bent to the bending roll.

Another object is to provide a bending machine of the rotatable bending roll type with efficient means for clamping the member to be bent to the bending roll which can be easily and quickly operated to bring the clamping means into and out of engagement with the member to be bent.

A further object is to provide a simple clamping device for the bending roll of a rotatable bending machine which is mounted on an eccentric pin, the pin being rotatable to rapidly bring the clamp into and out of operation.

With the above and other objects in view which will be apparent from the following description, the present invention consists in certain features of construction and combinations of parts which will be readily apparent to those skilled in the art to which the present invention appertains.

In the drawings which illustrate a suitable embodiment of the invention,

Figure 1 is a plan view of a bending machine of the rotatable bending roll type showing a tubular member in the process of being bent to shape about the bending roll;

Fig. 2 is an enlarged fragmentary end elevation of the clamping means and bending roll showing the clamping means in engagement with the tubular member being bent;

Fig. 3 is an enlarged section taken approximately on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged side elevation of the bending and clamping means showing the clamping means in its normal inoperative position and also showing in dotted outline the position of the clamping means just prior to its engagement with the tubular member to be bent;

Fig. 5 is a section taken approximately on the line 5—5 of Fig. 2;

Fig. 6 is a section taken approximately on the line 6—6 of Fig. 3 showing the means for preventing movement of the clamping means during its clamping operation and also showing the eccentric means for operating the clamping lever;

Fig. 7 is an enlarged plan view somewhat similar to Fig. 1 only showing the clamping means in position about a previously bent portion of a tubular member;

Fig. 8 is a section taken on the line 8—8 of Fig. 2; and

Fig. 9 is an enlarged section taken substantially on the line 9—9 of Fig. 1 showing the cooperating face portions of the bending dies.

Referring to the accompanying drawings in which like numerals refer to like parts throughout the several views, the apparatus embodying the invention herein illustrated and described is constructed to bend elongated metallic articles, and more particularly tubular members. The apparatus comprises a supporting structure 1 upon the top of which is mounted a substantially cylindrical peripherally recessed bending roll 2, the roll 2 being mounted upon a suitable shaft 3 that is journaled in the supporting structure 1 and rotated by any suitable means. The bending roll 2 is formed with a tube engaging recess 4 having a cross-sectional shape corresponding to approximately one-half the periphery of the article such as the tube 5 to be bent. This recess 4 is arranged to cooperate with a corresponding recess 6 formed in a follower member 7, the recess 6 being longitudinal of the follower member 7 and arranged to completely contact with the un-bent portion of the tube 5 during the bending operation. The follower member 7 is guided in tangential engagement with the bending roll 2 by means of a roller 8 mounted upon a shaft 9 secured to the supporting structure 1.

The face of the recess 4 in the bending roll is formed with divergent continuation faces 10 that are tangential to the curved surface substantially at the edges of the

recess 4. The recess 6 of the follower member 7 terminates in feather edges 11 that are formed by the convergent side faces of the follower member which mate with the corresponding faces 10 in the bending roll 2.

The feather edges 11 are continuously held in contact with the ends of the face of the recess 4 substantially in a longitudinal plane passing through the axes of the bending roll shaft 3 and the guide roller shaft 9 in order to provide a completely enclosed space for the reception of the tube 5, as shown in Fig. 9.

During the bending operation one end of the tube 5 is clamped to the bending roll 2 and the bending roll 2 is then rotated, which causes the tube to be bent into the recess 4 by the action of the follower member 7, and guide roller 8, which prevents radial movement of the tube 5 away from the bending roll 2. During this bending of the tube into the recess 4, the follower member 7 merely moves tangential to the bending roll 2 because of its engagement therewith.

The present invention relates to the particular means for clamping the end or any portion of the tube adjacent the bend to be formed to the bending roll 2. As shown in Fig. 5, the bending roll 2 is provided with a notched out recess 12 at its periphery which provides perpendicular faces extending transversely of the bending roll. A base 13 is secured to the bending roll 2 for supporting the clamping arm 14 which clamps the tube 5 to be bent to the bending roll. This base 13 is preferably formed with a depending portion 15 that fits within the recess 12 between the transverse faces thereof and a portion 16 that overlaps with the upper surface of the bending roll 2, the base 13 being secured to the bending roll by means of suitable screws 17 and 18 extending through the portions 15 and 16, respectively, into the bending roll 2. The head of the screw 17 preferably lies within a counter bore 19 formed in the outer face of the portion 15 of the base 13. This outer face of the base portion 15 is formed with a recess 20 corresponding in shape to the recess 4 of the bending roll and in the case that a straight pipe is to be bent, this recess 20 is formed tangential to the curved recess 4 in the bending roll substantially at the radial face formed by the recess 12.

The upper face of the base 13 is formed with a pair of spaced portions 21 which extend longitudinally of the base portion 16. These portions 21 receive the clamping arm 14 therebetween, and are provided with journal boxes 22 which support a rotatable shaft 23, the shaft 23 having an eccentric portion 24 lying between the spaced portions 21 of the base which rotatably extends through the innermost end of the clamping

arm 14. One end of the shaft 23 is provided with a crank handle 25 which, when actuated, will cause the clamping arm 14 through the medium of the eccentric portion 24 to be moved relative to the axis of the shaft 23.

The clamping arm 14 is provided with a right angled head portion at its free outer end which is formed with a recess 26 corresponding to the shape of the recess 20 for engaging the portion of the tube not engaged by the recess 20. The clamping arm 14 is also provided with a lifting handle 27 at its outer end.

As shown in the drawings, one of the spaced portions 21 is removably mounted by means of cap screws 28 extending into the base 13. This is provided so that the shaft 23 having the eccentric portion 24 thereon can be easily assembled to the base 7.

In clamping position, as shown in Fig. 3, the crank 25 lies parallel with the bending roll and extends toward the axis thereof, which brings the axis of the eccentric portion 24 between the axis of the shaft 23 and the bending roll axis and clamps the tube 5 within the recesses 20 and 26 of the base portion 15 and head of the clamping arm 14, respectively.

Referring to Fig. 4 which shows the non-clamping positions of the clamping arm, it will be noted that the crank arm 25 is moved to a position of substantially 180 degrees from the position shown in Fig. 3 which, through the medium of the eccentric portion 24, moves the arm 14 radially away from the bending roll, as shown in dotted outline, thereby breaking the engagement with the tube 5. When the clamping arm is in the position shown in dotted outline it can then be pivoted upwardly over the bending roll as shown in solid outline.

One of the spaced portions 21 of the base 13 is provided with an inwardly extending pin 29 which functions to prevent inadvertent movement of the clamping arm when the arm is in operative position. The side of the arm adjacent the pin 29 is formed with a recess 30 which has a continuation portion 31 extending longitudinally of the arm between the sides thereof. When the arm is lowered to a position such as that shown in dotted outline in Fig. 4, the pin 29 lies within the recess 30, and then when the crank 25 is pulled back to the position shown in Fig. 3 and the arm 14 brought into clamping operation, the pin 29 then lies within the continuation recess 31, as shown in Fig. 6, and prevents any pivoting movement of the arm until the arm is again moved to the position shown in dotted outline in Fig. 4.

In the case that a bend is to be formed in a tube or pipe which has previously been bent, the base 13 and the arm 14 may be re-

placed by corresponding portions having recesses that correspond with the previously bent portion of the tube, as shown in Fig. 7.

The adjacent faces of the base portion 15 and the head of the arm 14 may, however, be provided with removable blocks having the desired shape of recess therein which can be readily removed and secured to these portions.

In the operation of the present invention the tube 5 to be bent is moved through the cavity formed by the recesses 4 and 6 of the bending roll and follower member until the same will overlap with the portion 15 of the base 13, the bending roll being in such a position at this time that the outer face of the base 13 lies substantially on a plane passing through the axis of the bending roll shaft 3 and the guide roller shaft 9. The clamping arm 14 is then moved down to the position shown in dotted outline in Fig. 4 and then the crank arm 25 is swung back to the position shown in Fig. 3, thus securely clamping the tube 5 within the recesses 20 and 26 and between the base 13 and head of the arm 14. The machine is then placed in operation by rotating the bending roll 2 which, because the tube is securely clamped to the roll, causes the tube to be bent into the recess 4 of the bending roll. When the bending operation is completed the clamping arm 14 is first brought to the position shown in dotted outline and then to the position shown in solid outline in Fig. 4 so that the tube can be removed from the machine.

The clamping arm 14 is very easily operated, and furthermore can be very quickly operated with the result that considerable time is saved over the prior methods of securing tubes to the bending roll wherein it was necessary to tighten down a plurality of screws and the like.

Aside from the specific embodiment of the invention herein shown and described, it will be understood that numerous details of the construction may be altered or omitted without departing from the spirit and scope of the invention. I do not desire to limit the invention to the exact construction herein set forth, as I desire to claim it broadly as well as specifically as indicated in the appended claims.

What I claim is:

1. In a bending apparatus having a rotatable bending roll, means for clamping the article to be bent to said roll comprising a support secured to said roll and having an article engaging recess therein, an arm pivoted to said support transversely of the axis of said roll and having an article engaging recess therein, means for pivoting said arm, and means for bodily moving said arm radially of said roll to releasably clamp the article to be bent against said support.

2. In a bending apparatus having a rotatable bending roll, means for clamping the article to be bent to said roll comprising a support secured to said roll and having an article engaging recess therein, an arm pivoted to said support transversely of the axis of said roll and having an article engaging recess therein, means for pivoting said arm, and eccentric means for bodily moving said arm radially of said roll to releasably clamp the article to be bent against said support.

3. In a bending apparatus having a rotatable bending roll, means for clamping the article to be bent to said roll comprising an L-shaped arm having one end pivotally mounted on said roll transversely of the axis of said roll, the free end of said arm being arranged to clamp the article to be bent against movement relative to said roll, and eccentric means for bodily moving said arm radially inwardly and outwardly of said roll to clamp and release the article.

4. In a bending apparatus having a rotatable bending roll provided with an article engaging recess, means for clamping the article to be bent to said roll comprising a rotatable shaft mounted on said roll transversely of the axis thereof, an eccentric portion on said shaft, an article engaging arm pivotally carried by said eccentric portion, and means for rotating said shaft to cause said arm to move into and out of clamping position.

5. In a bending apparatus having a rotatable bending roll provided with an article engaging recess, means for clamping the article to be bent to said roll comprising a rotatable shaft mounted on said roll transversely of the axis thereof, an eccentric portion on said shaft, an L-shaped arm pivotally mounted at one end on said eccentric portion, the free end portion of said arm in one position being arranged adjacent the recess in said roll, and means for rotating said shaft to cause said arm to move radially inwardly of said roll to clamp the article to be bent against movement relative to said recess.

6. In a bending apparatus having a rotatable bending roll, means for clamping the article to be bent comprising a support mounted on said roll having a recess therein for receiving the article, a shaft rotatably carried by said support, an eccentric formed on said shaft, a clamping arm pivotally mounted on said eccentric, said clamping arm having a portion engageable with the article for holding the same in engagement with said recess, and means for rotating said shaft to provide movement of said arm radially of said roll.

7. In a bending apparatus having a rotatable bending roll provided with a circumferential forming depression therein, means for rigidly clamping the article to be bent

comprising a support mounted on said roll and having an article engaging recess therein substantially tangential to said depression, a shaft rotatably carried by said support, an eccentric formed on said shaft, a clamping arm pivotally mounted on said eccentric, said clamping arm having a portion engageable with the article for holding the same in engagement with said recess, and means for rotating said shaft to provide movement of said arm radially of said roll.

8. In a bending apparatus having a rotatable bending roll provided with an article engaging recess, means for clamping the article to be bent to said roll comprising a rotatable shaft mounted on said roll transversely of the axis thereof, an eccentric on said shaft, an article clamping arm pivotally carried by said eccentric portion, means for rotating said shaft to cause said arm to move into and out of clamping position, and cooperative means on said roll and arm to hold said arm against pivotal movement when in clamping position.

9. In a bending apparatus having a rotatable bending roll, a pivotally movable L-shaped arm pivoted at one end to said roll transversely of the axis of said roll, the free end of said arm being arranged to clamp the article to be bent against movement relative to said roll, means for moving said arm radially inwardly and outwardly of said roll to clamp and release the article, and means for holding said arm against pivotal movement relative to said roll when said arm is in clamping position.

10. In a bending apparatus having a rotatable bending roll, means for releasably clamping the article to be bent to said roll, comprising a support secured to said roll and having a recess intermediate the sides thereof, a rotatable shaft journaled in said support and extending across said recess, an eccentric on said shaft, a clamping arm of L-shape in said recess and having one end pivoted on said eccentric, the free end of said arm being arranged to clamp the article to said roll, means for rotating said shaft whereby said eccentric will move said arm inwardly and outwardly of said roll to clamp and release the article, a locking slot in said arm parallel to said shaft, and a pin carried by said support and extending into the recess thereof for engaging said locking slot when said arm is in clamping position to prevent inadvertent pivotal movement of said arm when in such position.

In testimony whereof I affix my signature.

FRANK H. MEYER.

CERTIFICATE OF CORRECTION.

Patent No. 1,901,762.

March 14, 1933.

FRANK H. MEYER.

It is hereby certified that the residence of the assignee in the above numbered patent was erroneously described and specified as "Trumbull, Ohio," whereas said residence should have been described and specified as "Warren, Ohio," as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of May. A. D. 1933.

M. J. Moore.

Acting Commissioner of Patents.

(Seal)