

Feb. 4, 1930.

W. R. HUME

1,745,539

MACHINE FOR BENDING METAL PLATES OR SHEETS

Filed May 16, 1928

2 Sheets-Sheet 1

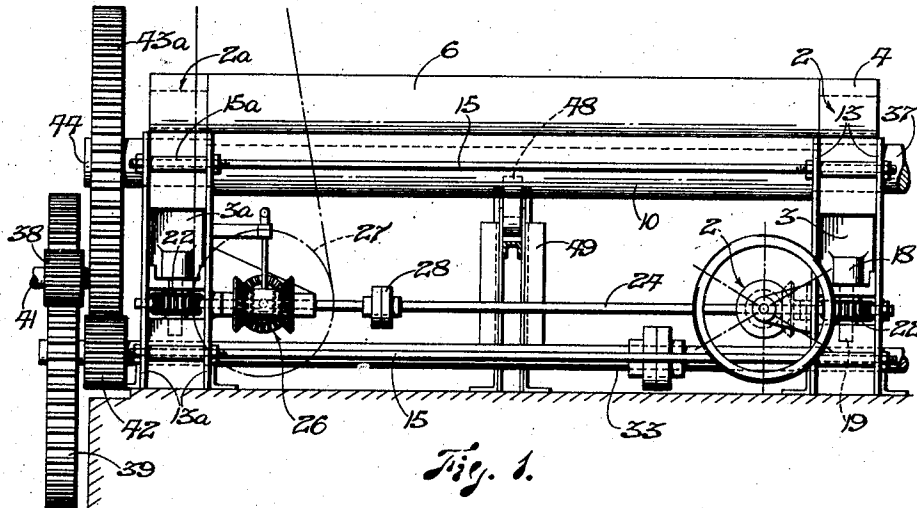


Fig. 1.

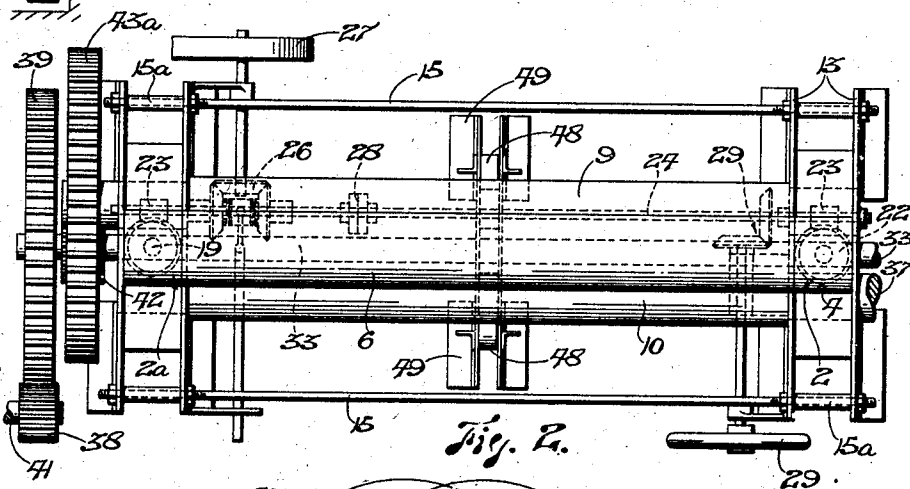


Fig. 2.

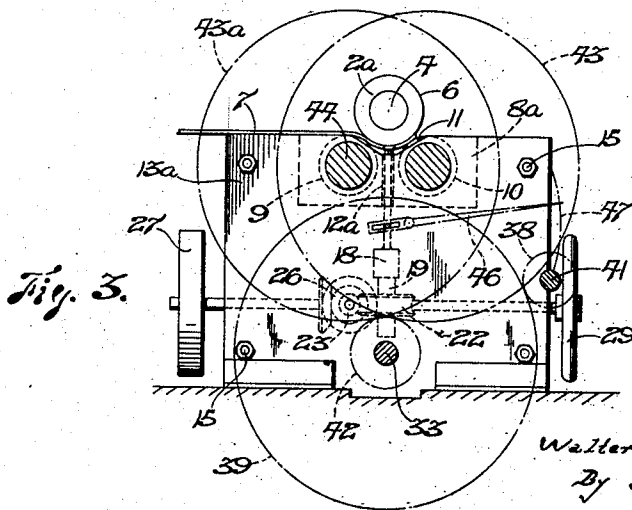


Fig. 3.

Inventor.
Walter Reginald Hume
By *L. J. Powell*
Attorney.

Feb. 4, 1930.

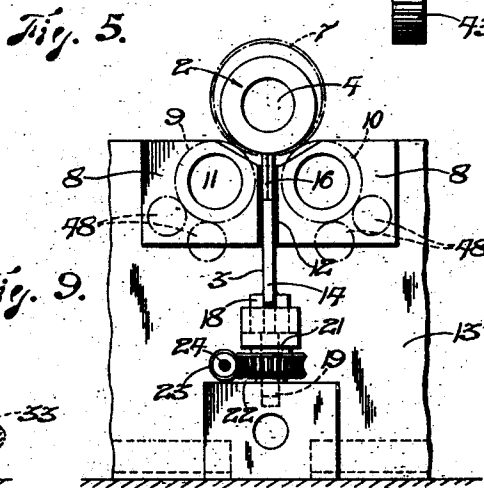
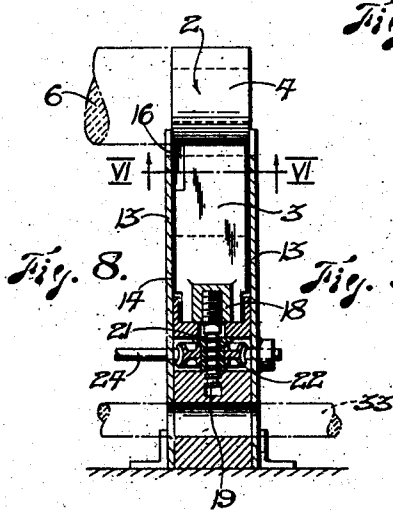
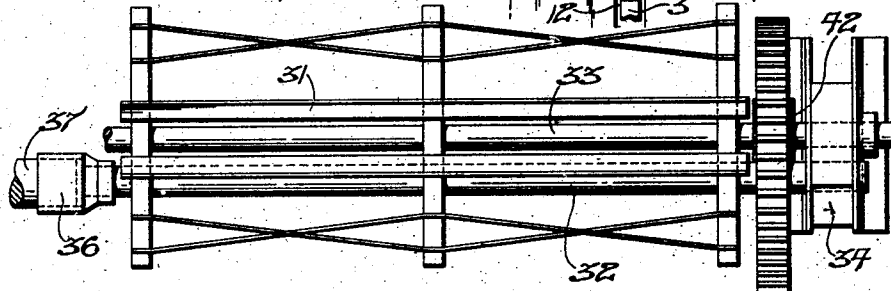
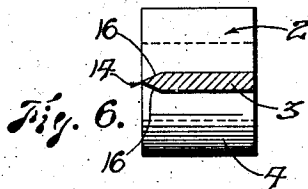
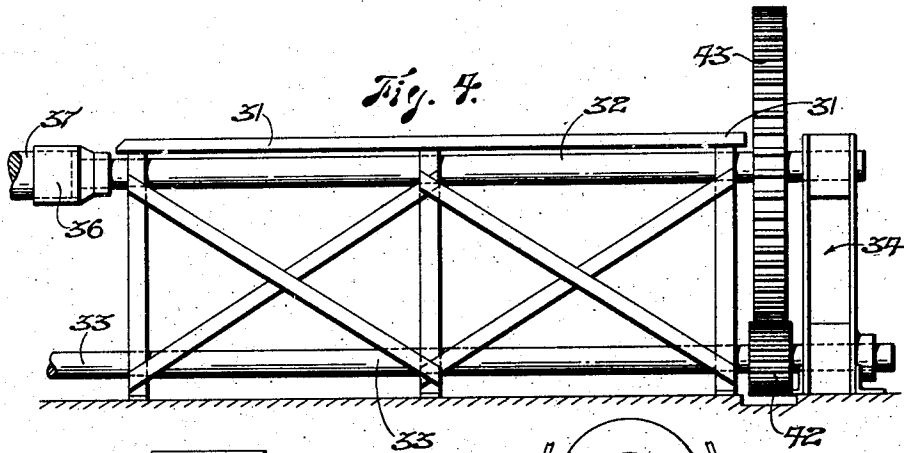
W. R. HUME

1,745,539

MACHINE FOR BENDING METAL PLATES OR SHEETS

Filed May 16, 1928

2 Sheets-Sheet 2



Inventor:
Walter Reginald Hume.
By *Lucas B. Wheeler* Attorney.

UNITED STATES PATENT OFFICE

WALTER REGINALD HUME, OF MELBOURNE, VICTORIA, AUSTRALIA

MACHINE FOR BENDING METAL PLATES OR SHEETS

Application filed May 16, 1928, Serial No. 278,211, and in Australia May 21, 1927.

This invention relates to machines for bending metal plates or sheets, as for instance in the bending of metal sheets into circular form for the manufacture of pipes and the like.

Such machines, which are commonly termed "bending rolls," usually comprise a series of parallel rollers namely a pair of lower rollers and an upper roller which is disposed above and between the centers of the lower rolls. In the bending of metal plates or sheets for the manufacture of pipes and the like the sheet, which has previously been cut to the required size, is passed between the upper and lower rollers and bent around the upper roller so that it assumes a circular or cylindrical form with a slight space or gap extending between the longitudinal or meeting edges of the sheet which are subsequently united to form the complete tubular article.

An objection to existing machines of the above-mentioned type is the necessity for removing a bearing or support at one end of the upper roller in order that the bent plate may be withdrawn lengthwise therefrom. For this purpose the said bearing or support at one end of the upper roller is usually hinged or pivoted so that it may be swung clear of the roller end to permit of the withdrawal of the circularly bent sheet or plate. This operation of removing and replacing the roller bearing or support for the withdrawal of each bent sheet involves considerable time and labor and thus greatly reduces the output of the machine.

The primary object of the present invention is to overcome the above-mentioned disadvantage by the provision of an improved bearing or support for use in connection with the said upper roller whereby a metal sheet which has been bent into a substantially circular form around said roller, may be readily withdrawn lengthwise thereof, without removal of the said bearing or support or any other parts of the machine. The relative output of the machine is thus greatly increased in a simple and effective manner.

A further object of the invention is to provide improved means for raising and low-

ering the upper roller to facilitate removal and insertion of the sheets and to enable the upper roller to be set slightly out of parallel with the lower rollers in the treatment of sheets varying in thickness or their degree of hardness at opposite ends.

The invention also provides an improved construction and arrangement of the driving mechanism for rotating the rollers whereby a more powerful and efficient drive is obtained.

But in order that this invention may be better understood, reference will now be made to the accompanying sheet of drawings which are to be taken as part of this specification and read herewith:—

Figure 1 is a side elevation of a machine for bending metal plates or sheets in accordance with this invention.

Figure 2 is a plan view of Figure 1.

Figure 3 is a view looking at the left-hand end of Figure 1.

Figure 4 is a side elevation of a delivery table for the curved sheets and of certain driving means for the bending rollers seen in Figures 1 to 3.

Figure 5 is a plan view of Figure 4.

Figure 6 is an inverted plan of the improved bearing and standard taken approximately on the line VI—VI in Figure 8.

Figure 7 is a fragmentary end or face view of the bearing and standard.

Figure 8 is a part sectional side elevation showing a bearing and standard with vertical adjusting means therefor.

Figure 9 is a side view of Figure 8, an end plate of the machine frame being removed.

According to the invention there is provided in lieu of the movable or swinging bearing or support at the outer end of the roller around which the metal plate or sheet is bent: an improved bearing or support 2, seen more clearly in Figures 6 to 9, comprising a vertical standard or bracket 3 of narrow elongated shape in cross-section, this standard carrying at its upper end a suitable boss 4 or bearing member in which the adjacent or outer end of the usual upper bending roller 6 turns.

The formation of the standard 3, constitutes an important feature of the invention, the width or thickness of said standard in a lateral direction, that is in a direction transversely of the roller 6, being reduced to such an extent that it is adapted to pass through the aforesaid narrow gap or space between the longitudinal or meeting edges of the bent sheet 7, as the latter is withdrawn from the roller. It will thus be evident that by bringing the gap or space of the sheet bent around the roller 6 into a position opposite and in longitudinal alignment with the vertical standard 3, as indicated in Figure 9, the bent sheet may be withdrawn from said roller without removal of said bearing.

In order to provide the necessary strength in the standard 3 of the improved end bearing on account of its reduced width, the cross-sectional dimension of said standard in the direction of the length of the roller may be considerably greater than its width or thickness in a lateral direction. The standard is thus preferably of narrow elongated form in cross-section as illustrated.

In order to reduce to a minimum the distance which the upper roller 6 must be raised to release the sheet 7 from pressure and thus permit of its withdrawal longitudinally past the bearing standard 3, a block or transverse member 8, or a pair thereof of the machine frame, which constitutes a bearing for the outer ends of the two lower rollers 9, 10, is cut away or recessed on its upper face, as at 11 in Figures 7 and 9, immediately beneath the outer end of the upper roller. The recess 11 is inclined downwardly from either side of the adjacent top roller bearing 2, to a central vertical slot 12, which is formed through said transverse member 8 or between a pair thereof, to slidably accommodate the improved bearing standard or bracket 3. The transverse member 8 may be disposed between and suitably secured to upstanding plates 13, the upper edges of which may be recessed similarly to the upper edge of said member 8.

In order to facilitate removal of the curved sheet 7, past the bearing 2 at the outer end of the upper roller 6, a portion of the inner edge 14 of the respective bearing standard 3, may be beveled as at 16 (Figure 6) so as to readily pass between the longitudinal edges of the curved sheet.

If desired a bearing 2^a having a vertical standard for 3^a as before mentioned may be provided to support the other or inner end of the upper roller 6. The standard 3^a may be accommodated in slot 12^a formed in a transverse frame member 8^a supported by upstanding plates 13^a at the other end of the machine. The bearing standard 3^a need not have a beveled portion as described with reference to the standard 3. The plates 13 and 13^a at opposite ends of the machine may be

tied by tie rods 15, which may be encircled by distance pieces 15^a.

In machines of the type referred to, means are usually provided for raising and lowering the upper roller 6, in order to relax the pressure on the bent sheet 7, so that the latter may be withdrawn, and to adjust the machine to receive plates or sheets of different thicknesses. To provide for such raising and lowering of the upper roller 6, each of the standards 3, 3^a, supporting the bearings 2, 2^a, may, in accordance with the invention, be provided with a suitable boss or the like 18, preferably located at its lower end to receive a vertical adjusting screw 19, which may pass through a renewable nut 21, detachably fixed in a worm-wheel 22, suitably supported with the end plates 13 or 13^a. These worm-wheels 22 may be operated by worms 23 on a horizontal shaft 24, which may be driven through miter or other suitable reversing gear 26, to thereby raise and lower the roller 6. This reversing gear may be conveniently driven by a belt pulley 27 from an overhead countershaft, by means of a quarter twist belt and suitable pulleys, (not shown).

Suitable means, such as a coupling 28, or a clutch device interposed in the shaft 24 which may be in two longitudinal sections, may be advantageously provided whereby one of the upper roller bearings 3, 3^a may be positioned slightly higher or lower than the other, so that the upper roller 6 may be inclined in relation to the lower rollers 9, 10, in the treatment of sheets varying in thickness or hardness at opposite ends as aforesaid. A hand-wheel gear 29, may also be provided in conjunction with the above-mentioned coupling or clutch device to permit either or both of the upper roller bearings being manually raised and lowered. Thus, should it be desired to independently raise or lower one end of the upper roller 6, the coupling 28, or the clutch device, is disconnected and the hand-wheel gear 29 may be operated so that only one of the worms 23, is brought into operation. A hand-wheel gear may be provided at each side of the coupling, if so desired.

A suitable delivery table 31, (Figures 4 and 5) may be disposed adjacent the outer ends of the rollers so as to conveniently receive the bent sheets 7 therefrom.

The roller driving mechanism in accordance with the invention preferably includes upper and lower shafts 32, 33 respectively, the latter forming the main shaft which is of considerably greater length than the rollers and extends from the inner end of the machine past the outer ends of the rollers 6, 9, and 10 and under the above-mentioned delivery table 31, to a suitable bearing bracket or frame 34, between which and the outer ends of the rollers said table is located. The

upper shaft 32 is connected by a coupling 36, to the outer end of one of the lower roller spindles, preferably the spindle 37, of the front lower roller, so as to form an axial extension thereof, which also passes beneath the delivery table 31, and is supported at its outer end and in said bearing bracket 34.

The drive may be transmitted by means of a pinion 38, and a spur wheel 39, from a pulley or first-motion shaft 41, to said elongated main shaft 33 which carries adjacent each end a pinion 42. One of these pinions engages a relatively large spur wheel 43, on the outer end of the said upper elongated shaft 32, whilst the other pinion 42 engages a similar spur wheel 43^a, fastened to the spindle 44 of the other or rear lower roller 9 at the inner end of the machine. By this means an extremely powerful and efficient drive onto the lower rollers is obtained.

In removing a bent sheet or plate 7 from a machine fitted with a bearing or support 2, having a standard 3, in accordance with the invention, it is merely necessary to discontinue the rotation of the rollers so that the longitudinal gap or space between the meeting edges of the circularly bent sheet 7 is disposed opposite and in longitudinal alignment with the narrow bearing standard or bracket 3, of the upper roller 6, as indicated in Figure 9. The said roller 6 may be then slightly raised by the aforesaid screw adjusting means to relax the pressure upon the bent plate 7, whereupon the latter may be withdrawn past the bearing 2, the narrow standard 3 of which passes through the said gap or space as the bent plate is withdrawn from the roller. The roller 6 may then be lowered to its original position and the next sheet inserted for bending.

It will be evident from the foregoing that it is unnecessary to remove any of the roller bearings or other parts of the machine in order to withdraw the circularly bent sheets. The result is that considerable time and labor are saved and the output of the machine is consequently increased by the use of an extremely simple and inexpensive device which may be readily applied to existing as well as to new machines.

Furthermore owing to the aforesaid recess 11 in the upper face of the transverse frame member 8, which constitutes a bearing for the outer ends of the lower rollers 9, it is not necessary to raise the top roller 6 far enough to clear said frame 8 but merely sufficiently to relax the pressure of the rollers on the curved sheet 7 so that the latter may be drawn through said recess, in passing the bearing standard 3 of the upper roller. The said recess is of particular advantage in the case of a relatively small upper roller 6 which descends to a lower point between the

bottom rollers 9, 10 and, consequently in the absence of said recess, would need to be raised to a greater extent to clear the said frame member. The operation of the machine is thus further facilitated owing to the minimum lifting and lowering movements of the upper roller which are permissible in accordance with this feature of the invention.

If desired, a suitable indicating device such as a pointer 46 adapted to be actuated by vertical movement of the bearing standards 3 or 3^a and associated with a graduated scale 47 may be provided as indicated in Figure 3, to register the various positions of the upper roller relative to the lower rollers. The bottom rollers 9 and 10, may be supported intermediately of their length by idle rollers 48 supported by suitable brackets 49 as indicated in Figures 1, 2 and 9.

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

1. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing for an end of said upper bending roller, said bearing having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, a supporting frame for said lower rollers having in its upper face a recess disposed immediately beneath said end bearing of the upper roller, and means for vertically adjusting said bearing standard in relation to said frame whereby the bent sheet or blank may be withdrawn lengthwise through said recess when released by the upper roller, for the purpose specified.

2. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing for an end of said upper bending roller, said bearing having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, and a beveled or chamfered inner edge to said standard, substantially as and for the purpose specified.

3. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing for each end of said upper or bending roller, said bearings each having a depending standard the thickness of which in a di-

rection transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, for the purpose specified.

4. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing for each end of said upper or bending roller, said bearings each having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, and means for vertically adjusting either or both of said bearing standards, for the purpose specified.

5. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing or support for an end of said upper bending roller, said bearing or support having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, and adjusting means including screw and nut mechanism operatively connected with said bearing standard.

6. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing for each end of said upper bending roller, one or both of said bearings having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, means for vertically adjusting said bearings comprising a separate adjusting screw and nut for each of said bearings, and means whereby said screws may be operated simultaneously or independently of each other.

7. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing or support for an end of said upper bending roller, said bearing or support having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the

latter is withdrawn lengthwise from said upper roller, a screwed adjusting rod connected to the lower end of said bearing standard, and a worm-wheel having a nut therein adapted to engage said adjusting rod, for the purpose specified.

8. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing for each end of said upper bending roller, one or both of said bearings having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, means for vertically adjusting said bearings comprising a separate adjusting screw and nut for each bearing, a nut mounted within a worm-wheel and engaging each of said adjusting screws, worms mounted on coaxially aligned worm shafts and engaging said worm-wheels, and a coupling device connecting said worm shafts, for the purpose specified.

9. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing for each end of said upper bending roller, one or both of said bearings having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, means for vertically adjusting said bearings comprising a separate adjusting screw and nut for each bearing, a nut mounted within a worm-wheel and engaging each of said adjusting screws, worms mounted on worm shafts and engaging said worm-wheels, a coupling device connecting said worm shafts, and reversible driving means for rotating either or both of said worm shafts in either direction, for the purpose specified.

10. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing for each end of said upper bending roller, one or both of said bearings having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, means for vertically adjusting said bearings comprising a separate adjusting screw and nut for each bearing, a nut mounted within a worm-wheel and engag-

ing each of said adjusting screws, worms mounted on worm shafts and engaging said worm-wheels, a coupling device for connecting said worm shafts, reversible driving means for rotating either or both of said worm shafts in either direction, and hand-operated gear for rotating said worm shaft or shafts independently of said reversible driving means, for the purpose specified.

11. In a roller bending machine of the kind comprising an upper bending roller arranged above and between a pair of lower rollers, improved driving means for rotating said lower rollers, said driving means comprising a main driving shaft at least twice as long as said rollers and arranged so as to project longitudinally beyond the outer ends of the rollers for a distance approximately equal to their length, a second shaft approximately equal in length to said rollers and operatively connected to the outer end of one of said rollers or its spindle so as to project longitudinally therefrom, toothed gearing adapted to transmit power from the inner end of the other of said rollers, toothed gearing for transmitting power from the outer end of said second shaft, a bearing or support for the outer end of said upper bending roller, said bearing or support having a depending standard the thickness of which in a direction transversely of said roller is so narrow that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet or blank as the latter is withdrawn lengthwise from said upper roller, and a delivery table extending longitudinally above said main and second shafts from a point adjacent said bearing standard at the outer ends of the rollers, said table being adapted to receive the bent sheets as they are withdrawn lengthwise over said upper roller bearing, substantially as described.

12. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing or support for an end of said upper bending roller, said bearing being provided with a standard extending downwardly from the bottom thereof, and in alignment with a space between said lower rollers, the thickness of said standard in a direction transversely of said rollers being so narrow that when the curved sheet or blank is arranged with its longitudinal meeting edges at the bottom of the upper roller and between the lower rollers, the said standard is permitted to pass through the gap or space between said meeting edges of the blank as the latter is withdrawn lengthwise from the upper roller.

13. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing or support for an end of said upper bend-

ing roller, said bearing having a standard which extends downwardly therefrom in alignment with a space between said lower rollers and which in sectional plan is elongated in a direction lengthwise of the roller, the thickness of said standard in a direction transversely of said roller being such that when the curved sheet or blank is arranged with its longitudinal meeting edges at the bottom of the upper roller and between the lower rollers the standard is permitted to pass through the gap or space between said longitudinal meeting edges of the blank as the latter is withdrawn lengthwise from the upper roller.

14. In a bending machine having lower bending rollers disposed beneath an upper bending roller around which the work such as a metal sheet or blank is to be bent, a bearing or support for an end of said upper bending roller, said bearing comprising a boss or bearing member which is unsupported from above and a standard depending from said boss, said standard having a cross-section which is elongated in a direction axially of said boss and roller and is of such narrow transverse dimension that it is adapted to pass through the gap or space between the longitudinal meeting edges of the bent sheet as the latter is withdrawn lengthwise from said upper roller.

In testimony whereof I affix my signature.
WALTER REGINALD HUME.

70
75
80
85
90
95
100
105
110
115
120
125
130