Jan. 16, 1934. C. M. YODER 1,943,407

BENDING MACHINE

Filed Feb. 24, 1930 4 Sheets-Sheet 1

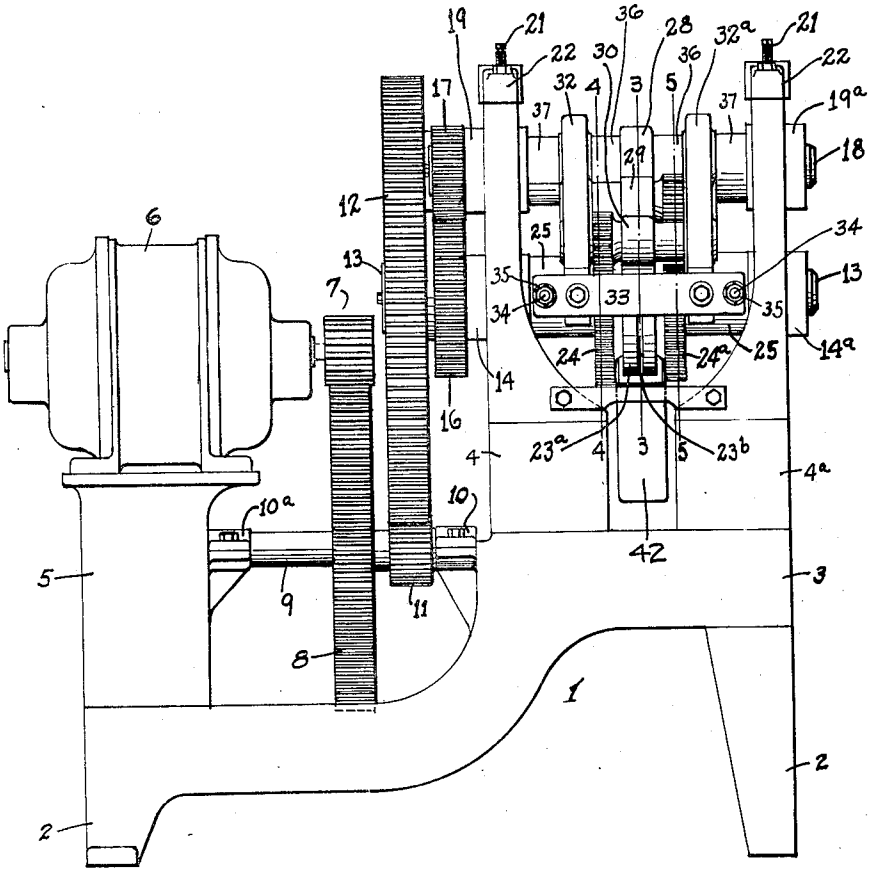


FIG. 1

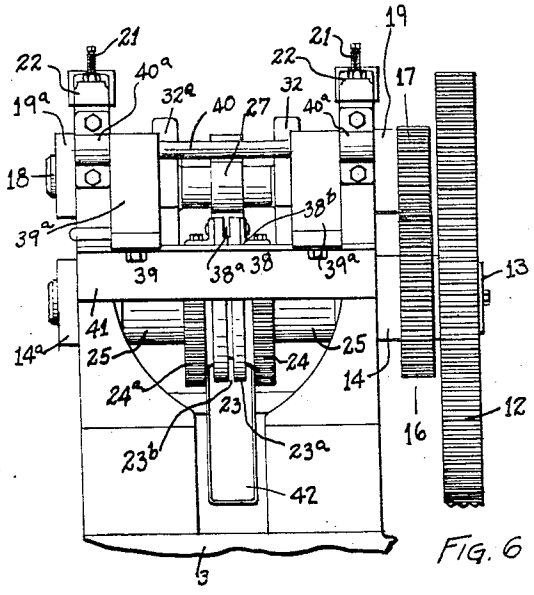


FIG. 6

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BENDING MACHINE

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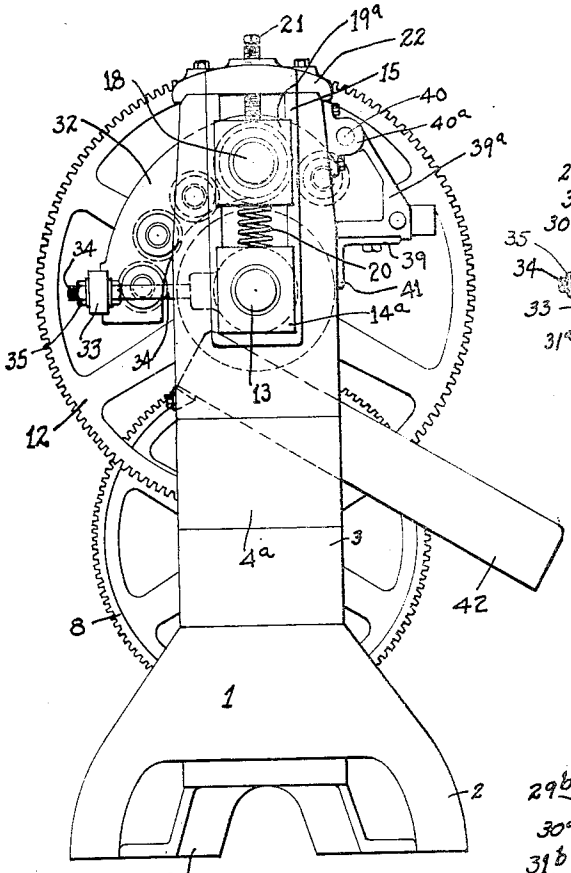


FIG. 2

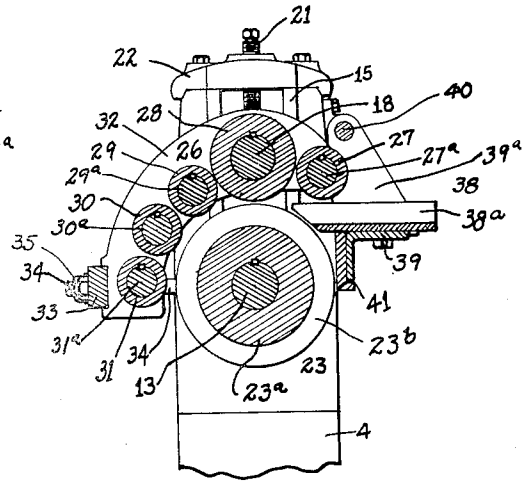


FIG. 3

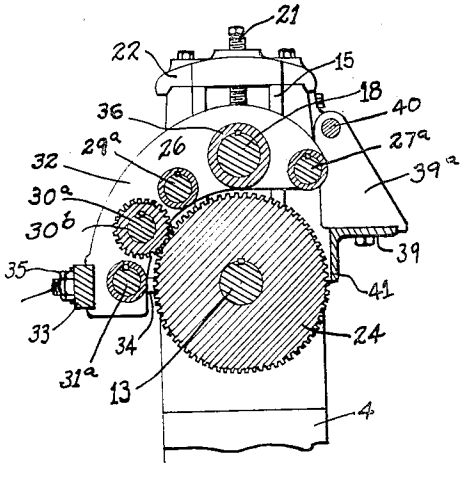


FIG. 4

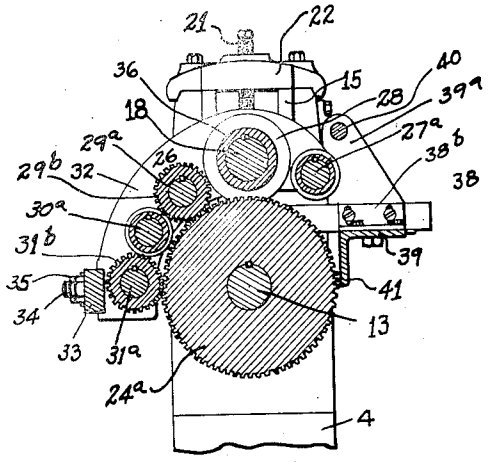


FIG. 5

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BENDING MACHINE

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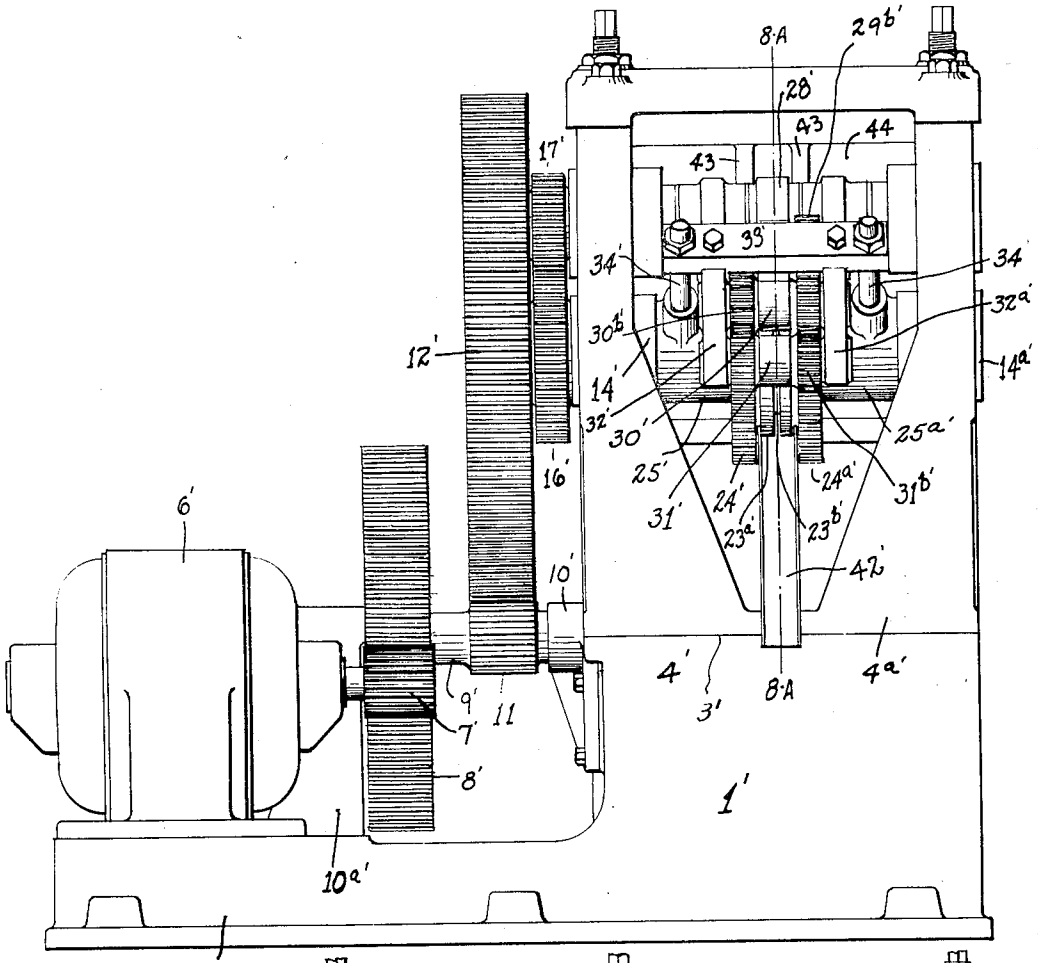


FIG. 7

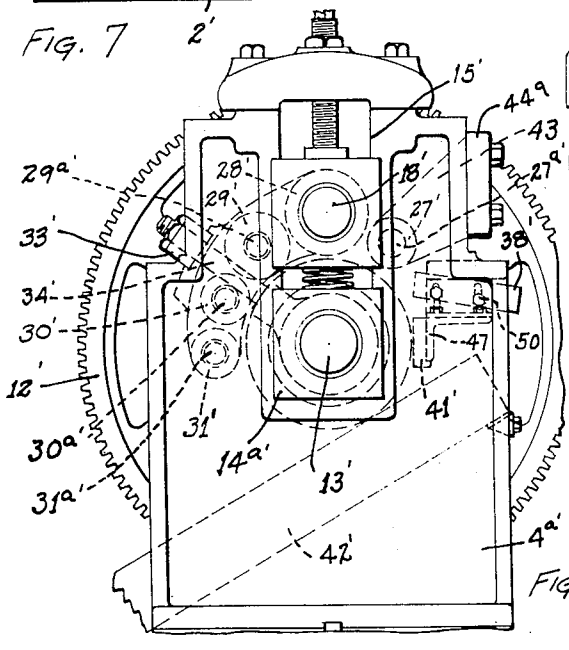


FIG. 8

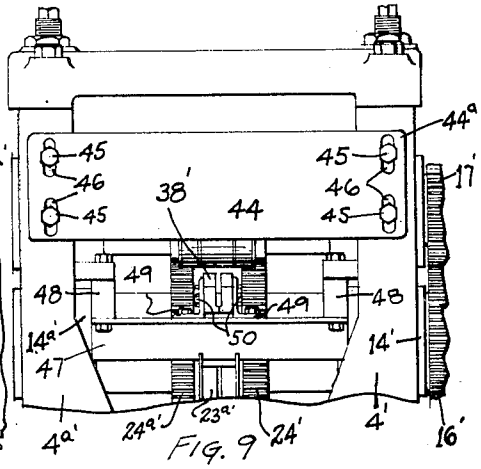


FIG. 9

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Filed Feb. 24, 1930 4 Sheets-Sheet 4

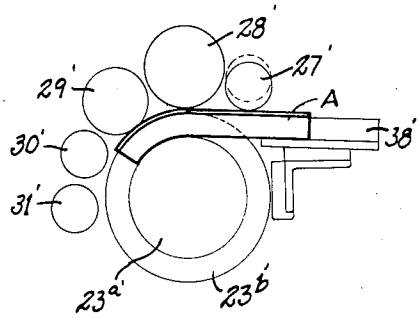


FIG. 11

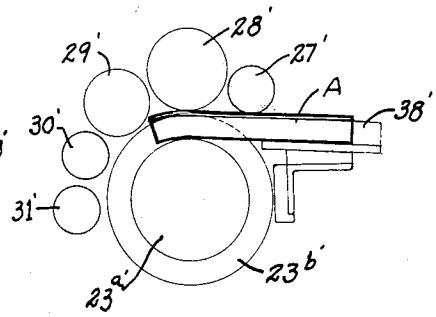


FIG. 10

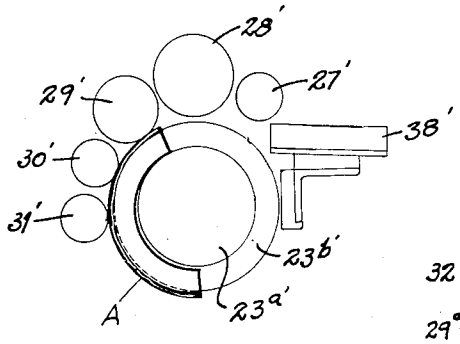


FIG. 12

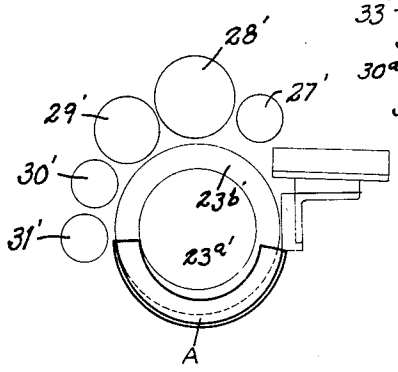


FIG. 13

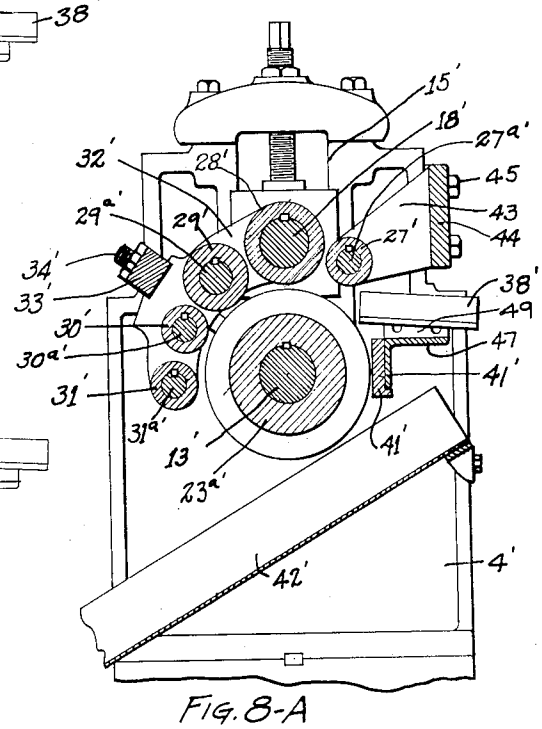


FIG. 8-A

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UNITED STATES PATENT OFFICE

1,943,407

BENDING MACHINE

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Application February 24, 1930. Serial No. 430,873

6 Claims. (Cl. 153—56)

This invention relates to a machine for bending sections of metal into curvilinear shape. The metal sections may be of varying shapes in cross section, for example, strips of square or rectangular shape, angle bars, T-bars and the like. The embodiments herein illustrative of my invention are adapted to operate upon and bend T-bars, which may be used, when shaped, as shoes for brakes, such as brakes on vehicles.

One object of the invention is to provide a machine of this character that is durable, relatively simple in construction, and capable of bending metal sections in a rapid manner.

Another object of the invention is to provide a machine of this character in which the metal sections may be bent or shaped in a rapid manner to a predetermined size and curvature.

Other objects of the invention will be apparent to those skilled in the art to which my invention relates from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a rear elevation of a machine embodying my invention.

Fig. 2 is a side elevation.

Fig. 3 is a fragmentary section on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary section on the line 4—4 of Fig. 1.

Fig. 5 is a fragmentary section on the line 5—5 of Fig. 1.

Fig. 6 is a fragmentary front elevation.

Fig. 7 is a rear elevation of another embodiment of my invention.

Fig. 8 is a fragmentary side view of parts shown in Fig. 7.

Fig. 8A is a fragmentary section on the line 8—A—8—A of Fig. 7.

Fig. 9 is a fragmentary front elevation of the machine shown in Fig. 7.

Figs. 10, 11, 12 and 13 are diagrammatic views showing the process of bending a T-bar into curvilinear shape.

In the drawings, 1 indicates as an entirety a frame mounted of suitable legs 2. The frame is preferably elevated at one end and shaped to provide a bed 3, on which are rigidly secured, in spaced relation upright standards 4, 4*a*, to be later referred to. The opposite end of the frame 1 carries a support 5 to which is secured a motor 6. 7 indicates a pinion fixed to the motor shaft and meshing with a gear 8, fixed to a shaft 9. The shaft 9 is mounted in suitable bearings 10, 10*a*, carried by the side walls of the bed 3 and support 5, respectively. The shaft 9 has fixed to it a pinion 11, meshing with a gear 12, which is fixed to the extended end of a shaft 13. The shaft 13 is mounted in journals provided in blocks 14, 14*a*, which removably fit within suitable guides 15 provided in the upper portions of the standards 4, 4*a*. The opposite faces of the blocks 14, 14*a*, are formed with grooves or channels to receive the guides 15. 16 indicates a gear fixed to the shaft 13 between the block 14 and hub of the gear 12 and meshing with a gear 17 fixed to a shaft 18. The shaft 18 is mounted in journals provided in blocks 19, 19*a*, removably mounted in the guides 15, and adjustable relative to the blocks 14, 14*a*. The blocks 19, 19*a* are supported on the blocks 14, 14*a*, by compression springs 20 and held against upward movement by adjusting screws 21 mounted in threaded openings formed in cross members 22, the latter being suitably secured to the upper ends of the standards 4, 4*a*.

23 indicates guiding and supporting means for the metal sections to be bent or shaped. These means comprise one or more rolls fixed to the shaft 13 dependent on the cross sectional shape of the metal sections to be shaped. Where the sections consist of T-bars I provide a single roll 23*a* (preferably formed in two parts and secured together) formed intermediate its side faces with an annular groove or channel 23*b* to receive the leg of the T-bar. The side walls of the groove 23*b* serve to prevent buckling of the leg and also insure movement of the metal section in an endwise direction at right angles to the axis of the roll. At either side of the supporting and guiding roll 23*a*, I provide gears 24, 24*a*, which are suitably keyed to the shaft 13, as shown in Figs. 4 and 5. The purpose of the gears 24, 24*a*, will later be set forth. I also provide on the shaft 13 between each gear and the adjacent block suitable spacers 25.

26 indicates as an entirety means which co-operate with the supporting and guide roll to shape the metal sections. The means 26 comprise in the present arrangement, a plurality of rolls disposed about the axis of the roll 23*a*. Where the blank or section to be rolled into curvilinear form fits into a groove or channel formed in the supporting roll or the co-operating rolls, then the latter may be in contact or substantially in contact with the supporting roll, but where the blank or section or portions thereof pass between the surfaces of the rolls, then the co-operating rolls are disposed in spaced relation to the supporting roll. In the present embodiments of the invention I provide five co-operating shaping rolls 27, 28, 29, 30 and 31, one intermediate roll (28) being fixed to and driven by the shaft 18 and the remaining rolls being fixed to shafts 27*a*, 29*a*, 30*a*, 31*a*, respectively, which are rotatably mounted at their opposite ends in a pair of spaced supporting members 32, 32*a*, adjustable about the axis of the roll 28. To provide for this adjustment, the members 32, 32*a*, are formed with aligned openings through which the shaft 18 extends, the shaft forming a pivot for these members, whereby their rear portions may

be moved outwardly or inwardly to adjust the rolls 27, 29, 30 and 31 relative to the roll 23*a*. The supporting members 32, 32*a*, are connected together in spaced relation at their rear ends by a tie member 33 and are maintained fixedly in their adjusted relation by the following instrumentalities: 34 indicates a pair of rods each suitably secured in an opening formed in a boss provided on the adjacent spacer 25 and extending radially from the axis of the roll 23*a*. The outer portions of the rods 34 are threaded and extend through openings formed in the extended end portions of the tie member 33. 35 indicates nuts threaded on each rod 34 and adapted to be tightened against the opposite faces of the tie member 33 to secure it to the rod 34. By adjusting the nuts 35, the tie member 33 and through it the supporting members 32, 32*a*, may be adjusted to effect the desired or necessary cooperation between the rolls 27, 29, 30, 31 and the roll 23*a*.

36 indicates suitable spacers on the shaft 18 between the roll 28 and the supporting members 32, 32*a*, and 37 indicates suitable spacers between the members 32, 32*a*, and the blocks 19, 19a.

By preference each of the rolls 29, 30, 31, is positively driven. For this purpose the shafts 29*a*, 31*a*, have fixed to them at one side of the rolls carried thereby gears 29*b*, 31*b*, which mesh with the gear 24*a* (see Fig. 5), and the shaft 30*a* has fixed to it at one side of the roll carried thereby (but on the opposite side of the roll with respect to the gears 29*b*, 31*b*) a gear 30*b* which meshes with the gear 24 (see Fig. 4).

Each of the rolls 27, 28, 29, 30 and 31 preferably has a width equal to the width of the roll 23*a*.

38 indicates a combined guide and feed device arranged at the front of the machine and arranged to support and guide each metal section A as it is fed to and between the rolls. The device 38 may comprise two flanged members arranged side by side to form a groove or channel 38*a* which receives the leg of the T-bar, this groove being in line with the channel or groove 23*b* formed in the roll 23*a*. The device 38 is secured by angles 38*b* to a support 39 having at its opposite ends arms 39*a*, swingably mounted on a shaft 40 suitably supported at its ends in brackets 40*a* fixed to the standards 4, 4*a*. Each metal section after being shaped is carried around with the roll 23*a*, since the leg of the T is frictionally held in the channel 23*b* between the side walls thereof. To disengage each shaped blank from the roll 23*a* after its rear end moves beyond the roll 31, I provide in the path of movement of the forward ends of the shaped sections an arrester or stop 41, preferably depending from the support 38. Accordingly as each section completes the pass between the rolls, it engages or abuts the arrester 41 which frees the section from the roll and permits it to drop downwardly into a chute 42. The support 39 is swingably mounted as above set forth, so that in the event the operative desires to allow any one or more of the sections to pass through and between the rolls more than once, he can, after feeding a section to the rolls, swing the support outwardly and upwardly to move the depending member 41 into an in-operative position; the metal section will then continue to move around with the guiding roll 23*a* and again pass between the rolls. Thereupon the operative may return the feed device 38 to its operating position and allow the stop 41 to arrest the shaped blank and cause it to drop into the chute 42.

The support 39 may comprise an angle bar arranged to extend laterally beyond the front faces of the standards 4, 4*a*, so that the latter serve as stops to limit the downwardly swinging of the support. The engagement of the support with the standards also serves to determine the proper relation of the guide device to the rolls, so that by holding the support against the standards, as shown in Figs. 2 and 6, the feed device 38 will have a fixed and predetermined relation to the rolls.

Referring to Figs. 7, 8 and 9, 1' indicates a frame having a base 2', which is preferably elevated at one end to provide a bed 3'. 4', 4*a*', indicate standards mounted on the bed 3'. The opposite end of the base forms a support for the motor 6'. The motor shaft is provided with a pinion 7', meshing with a gear 8', that is fixed to a shaft 9'. The shaft 9' is supported in suitable bearings provided in a bracket 10', and at the upper end of a hanger 10*a*' provided on the base 2'. 11' indicates a pinion fixed to the shaft 9' and meshing with a gear 12', which is fixed to a shaft 13'. The shaft 13' is mounted in journals provided in boxes or blocks 14', 14*a*' which slidably fit suitable guides 15' formed in the standards 4', 4*a*'. The shaft has secured to it a gear 16' meshing with a gear 17' fixed a second shaft 18' mounted in the standards 4', 4*a*', similarly to the shaft 18 as shown in Figs. 1 to 6. 23*a*' indicates the supporting and guiding roll for the blanks or metal sections A and 27', 28', 29', 30' and 31' indicate the co-operating bending rolls, the roll 28' being fixed to the shaft 18' and the rolls 29', 30' and 31' being fixed to shafts 29*a*' 30*a*', 31*a*', respectively, which are mounted in spaced supporting members 32', 32*a*', these members being formed with openings through which the shaft 18' extends to form a pivot therefor, whereby the rear ends of the members may be moved to adjust the rolls 29', 30', 31', 24', 24*a*', indicate gears fixed to the shaft 13', the gear 24' meshing with a gear 30*b*' fixed to the shaft 30*a* and the gear 24*a*' meshing with gears 29*b*, 31*b*', fixed to the shafts 29*a*', 31*a*', whereby the co-operating rolls 29', 30', 31', as well as the roll 28' are positively driven. The spacing means for the rolls on the shafts 13', 18', 29*a*', 30*a*', and 31*a*' are similar to the spacing means provided for corresponding rolls in the form of construction shown in Figs. 1 to 6.

In this form of construction the roll 27' is mounted independently of the remaining co-operating rolls, whereby it may be adjusted, preferably vertically, relative to the lower surface of the roll 28', the purpose being to feed the blanks A at an angle to a horizontal plane disposed tangentially to the lower surface of the roll 28', whereby the latter roll will effect a preliminary bending of the blank before it engages the remaining cooperating rolls and thus prevent distortion of any portion of the blank intermediate its ends due to its engagement with the next roll or any succeeding roll.

To provide for the adjustable mounting of the roll 27', the shaft 27*a*' therefor is supported at its ends in arms 43 formed integrally with a cross member 44 having lateral extensions 44*a* which are secured by cap screws 45 to the front faces of the standards 4', 4*a*'. The openings 46 in the extensions 44*a* for the cap screws 45 are elongated vertically so that the cross member 44 may be

raised or lowered and fixed in any desired position of adjustment.

47 indicates an angle secured to depending brackets 48, which are secured to the standards 4', 4a'. The horizontal flange of the angle 47 forms a support for a pair of angle plates 49, 49, between which the feed device 38' is adjustably mounted, whereby the latter may be arranged at different angles according to the adjustment of the roll 27'. The feed device 38' is secured to the plates 49 by cap screws 50, which extend through openings formed in the vertical portions of the plates 49. These openings are elongated so that the device 38' may be inclined at the proper angle and secured in the desired position, as shown in Fig. 8. The vertical flange of the angle 47 carries a bar 41' which forms a stop or knock-out member that is engaged by the shaped sections, as shown in Fig. 13, and the latter caused to drop into the chute 42'.

The supporting members 32', 32a', are connected together by a tie member 33' and adjustably spaced relative to the roll 23a by means similar to those already described, except that the openings in the supporting members 32', 32a', for the bolts which secure the tie member thereto are arranged at points remote from their rear ends, so that the connecting rods 34' extend upwardly, radially of the shaft 13' from the spacers 25' at an angle to the horizontal and are connected to the members 32' 32a', at a point intermediate their ends, preferably at a point substantially in a plane cutting the axis of the roll 29' and the lower surface of the roll 28'. In such arrangement I have found that the rods 34' relieve a large portion of the strain on the shaft 18' and transmit it to the shaft 13' which is relatively large in diameter as compared to the shaft 18'.

In Fig. 10 is shown a blank A as it is fed to the roll 28' and given a preliminary bend; Fig. 11 shows the bending effected as the blank feeds past the roll 29'; Fig. 12 shows the completion of the bend on the rear portion of the blank; and Fig. 13 shows the blank as it moves around on the roll 23a' into engagement with the stop 41'.

From the foregoing description it will be seen that the blanks may be fed in a rapid manner to the shaping rolls and that each blank is shaped to a predetermined curvature without undue strain on any of the rolls or their shafts and the supports for the latter.

It will be understood that the co-operating rolls may be arranged about the axis of the shaft 18 and the blank bent upwardly. In this arrangement the roll on the shaft 18 becomes the guiding roll.

To those skilled in the art to which my invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. My disclosures and the description herein are purely illustrative and not intended to be in any sense limiting.

What I claim is:

1. In a machine for bending metal sections, the combination of a guiding roll, a series of co-operating rolls disposed about the axis of said guiding roll, means for driving one of said rolls, a guide for supporting each section while it is fed to said rolls, said guide being movably supported to permit it to be moved to an inoperative position after each section has been fed to said rolls, whereby the section may be re-passed to said rolls, and means carried by said guide arranged to be engaged by each blank as it completes its pass through said rolls and arrest it and guide it to a receiver.

2. In a machine of the class described, the combination of a support, a guiding roll rotatably mounted thereon, a separate roll rotatably mounted on said support in opposed relation to said guiding roll, a pair of spaced supporting members mounted at one end on the shaft of said separate roll, a series of rolls rotatably supported between said members substantially in an arc about the shaft of one said rolls and co-operating with said rolls to bend metal sections, and means connected to the roll shaft about which said series of rolls is supported for rigidly supporting the opposite ends of said members.

3. In a machine of the class described, the combination of a support, a guiding roll rotatably mounted thereon, a separate roll rotatably mounted on said support in opposed relation to said guiding roll, a pair of spaced supporting members pivotally mounted at one end on the shaft of said separate roll, a series of rolls rotatably supported between said members substantially in an arc about the shaft of said guiding roll and co-operating with said rolls to bend metal sections, and means connected to the shaft of said guiding roll for rigidly supporting the opposite ends of said members, said supporting means being adjustable.

4. In a machine of the class described, the combination of a support, a guiding roll rotatably mounted thereon, a separate roll rotatably mounted on said support, and a series of rolls disposed substantially in an arc about the axis of said guiding roll and co-operating therewith and said separate roll to bend metal sections, a guide forward of said guiding and separate rolls for supporting a blank while it is being fed to said rolls, and a preliminary blank engaging roll disposed between the inner portion of said guide and said separate roll, the surface of the last mentioned roll adapted to be disposed in a plane below the surface of said separate roll.

5. In a machine of the class described, the combination of a support, a guiding roll rotatably mounted thereon, a separate roll rotatably mounted on said support, and a series of rolls disposed substantially in an arc about the axis of said guiding roll and co-operating therewith and said separate roll to bend metal sections, a guide forward of said guiding and separate rolls for supporting a blank while it is being fed to said rolls, and a preliminary blank engaging roll disposed between the inner portion of said guide and said separate roll, the last mentioned roll being adjustable in a direction substantially at right angles to the direction of movement of the blank to said guiding and separate rolls.

6. In a machine for bending metal sections, the combination of a pair of related rolls, a series of co-operating rolls disposed about the axis of one of said related rolls, means for driving one of said related rolls, and a pair of guide devices for supporting each section while it is fed to said related rolls, said guide devices being adjustable relatively to each other and said related rolls and co-operating with the latter for imparting a preliminary bend to the blanks.

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