J. O. HOLMBERG.

MACHINE FOR BENDING METAL.

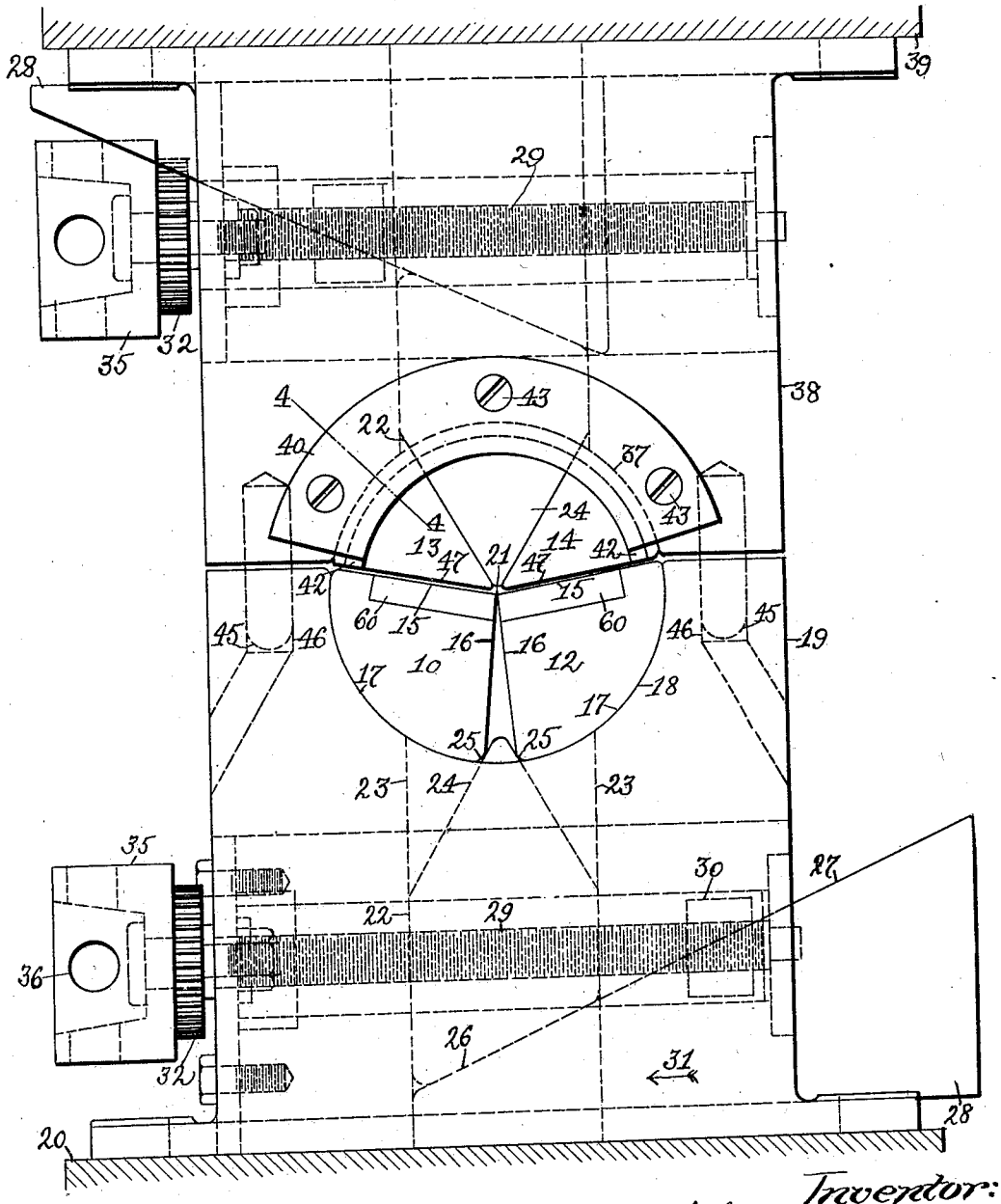
APPLICATION FILED FEB. 19, 1921.

1,406,384.

Patented Feb. 14, 1922.

3 SHEETS—SHEET 1.

Fig. 1.



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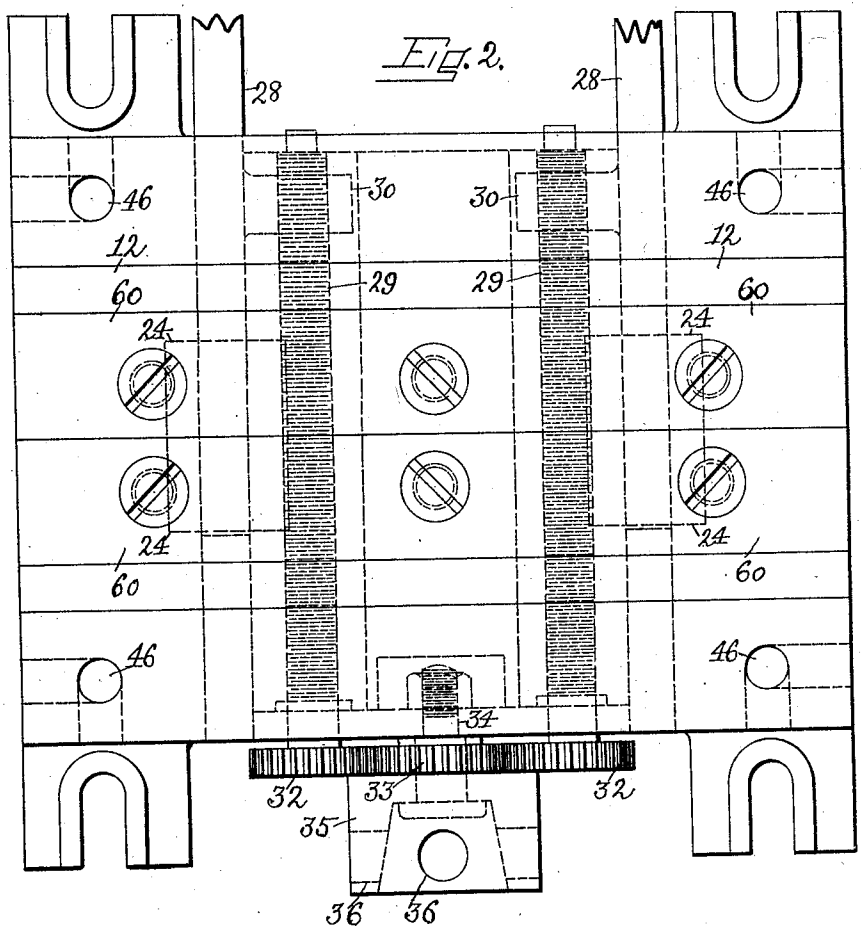
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3 SHEETS—SHEET 2.

Fig. 2.



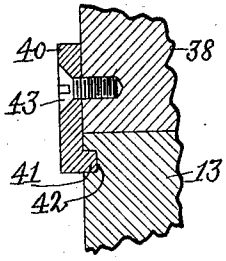


Fig. 4.

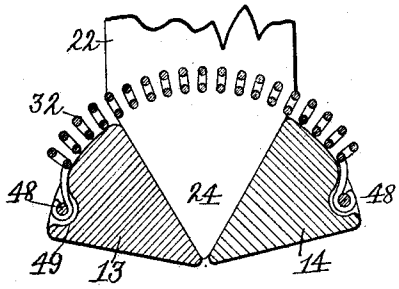


Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 5.

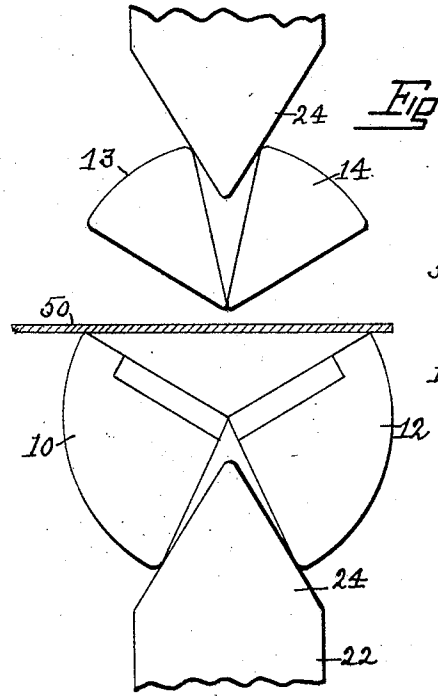


Fig. 6.

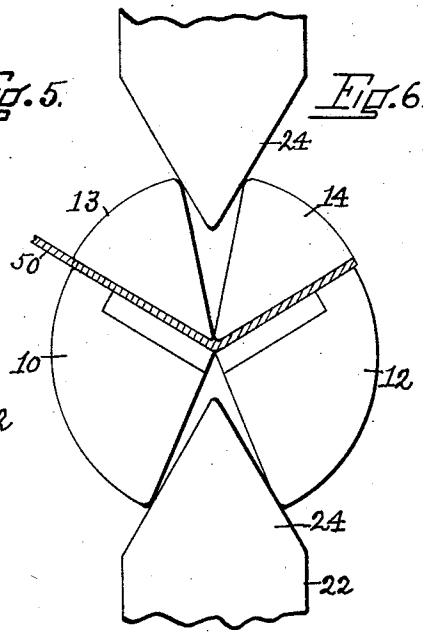


Fig. 7.

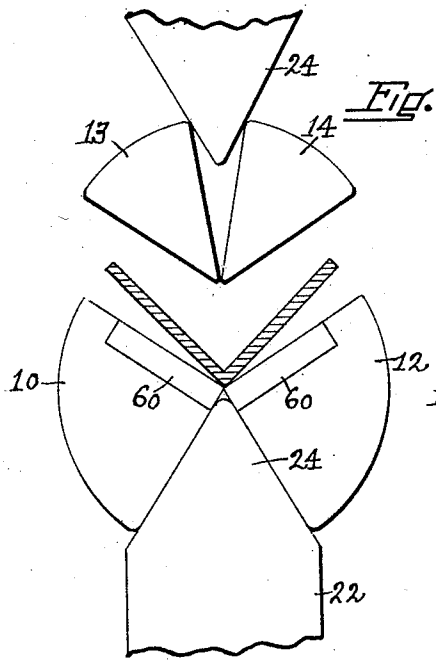
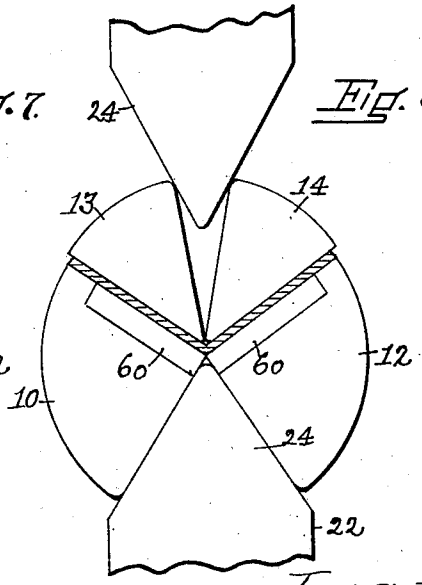


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHAN OSCAR HOLMBERG, OF QUINCY, MASSACHUSETTS.

MACHINE FOR BENDING METAL.

1,406,384. Specification of Letters Patent. Patented Feb. 14, 1922.

Application filed February 19, 1921. Serial No. 446,439.

To all whom it may concern:

Be it known that I, JOHAN OSCAR HOLMBERG, a citizen of the United States, residing in Quincy, county of Norfolk, and State of Massachusetts, have invented an Improvement in Machines for Bending Metal, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to a machine for bending metals and has for its object to provide a machine with which metals in the form of plates, bars, strips and the like may be bent into any desired angular relation at a minimum cost.

The invention is especially adapted for flanging plates, and for forming angle bars, strips or the like, and to enable any desired angular relation to be obtained with the same dies or formers.

The invention further has for its object to provide a machine with which the metal is supported at the point where the bend occurs, irrespective of the angle of the bend, whereby projections on the outside of the bend are prevented and the necessity of heating and hammering to remove the same, are avoided.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Fig. 1 is an elevation of one form of machine embodying this invention.

Fig. 2, a plan of the lower member or half of the machine shown in Fig. 1.

Fig. 3, a sectional detail of the upper dies or formers shown in Fig. 1.

Fig. 4, a sectional detail on the line 4—4, Fig. 1, and

Figs. 5 to 8 inclusive, diagrammatic views to illustrate the operation of the machine.

The machine herein shown as embodying the invention is provided with a lower set of dies or formers 10, 12, and an upper set of dies or formers 13, 14.

The lower set of dies or formers 10, 12 are made as segments of a cylinder and each is provided with two surfaces 15, 16 which intersect substantially at the center of the circular outer surface 17 of said segment. The circular outer surfaces 17 bear upon the wall of a substantially semi-circular recess 18 in a carrier or supporting member 19, which is designed to be stationary and rests upon a suitable foundation or base 20.

The dies of formers 10, 12 are capable of being moved bodily in a circular path whose center is the center 21 of the recess 18, so as to bring their upper or metal shaping surfaces 15 into different angular positions with respect to each other, according to the angle it is desired the metal plate, strip, bar or the like should have, when bent. The dies or formers 10, 12 may be moved in the semi-circular recess about the center 21 by means of a vertically movable device 22, arranged to slide in a suitable guideway 23 in the lower or stationary member 19. The device 22 is provided at its upper end with a tapering nose 24, which is designed to be forced between the surfaces 16 of the dies or formers 10, 12 so as to rotatively move them in the recess 18 about the center 21 and thus position their shaping surfaces 15 into the desired angular relation, as represented in Figs. 5 to 8.

The surfaces 16 of the dies or formers 10, 12 are connected with the circular surfaces 17 by round corners 25, which cooperate to form an entrance opening with which the apex of the tapered nose 24 cooperates when the dies or formers are in what may be considered their inoperative position with their surfaces 16 in contact or substantially in contact.

The device 22 constitutes a positioning member for the dies or formers 10, 12 and is provided with an inclined surface 26, with which cooperates an inclined surface 27 of a wedge bar or member 28, arranged to slide in a suitable guideway in the stationary member 19 and to be actuated by a suitable screw or threaded shaft 29, which has its ends mounted to turn in the stationary member 19.

The screw shaft 29 is extended through a threaded opening in a lug or boss 30 attached to the wedge bar or member 28, and by rotating the screw shaft in one direction, the wedge bar or member 28 is moved in the direction of the arrow 31 in Fig. 1, and its inclined surface 27 effects upward movement of the positioning member 22, which has its tapered nose forced between the dies or formers 10, 12 to effect rotation of the said dies in opposite directions about the center 21 until the shaping surfaces 15 of the latter have been brought into the desired or proper angular relation.

When the dies or formers 10, 12 have been properly positioned, they are retained in

such position against backward movement by the positioning member 22, wedge 28 and screw shaft 29. By turning the screw shaft 29 in the opposite direction, the wedge bar 28 is moved in the direction opposite to that indicated by the arrow 31, which permits the positioning member 22 to descend and the dies or formers 10, 12 to be moved back into their starting position by gravity.

In the present instance a machine is shown of sufficient size to bend substantially long or wide plates, bars, strips and the like, and the dies or formers 10, 12 are represented as of material length and weight, and in order to enable such dies or formers to be easily moved by a single workman, two positioning devices 22 are employed, which are located on opposite sides of the center of the machine as represented in Fig. 2, and two wedge members 28 and screw shafts 29 are also employed. The screw shafts 29 are provided with gears 32 which mesh with and are rotated by a gear 33 loosely mounted on a stationary shaft 34 secured to the stationary carrier 19. The gear 33 has attached to it a head 35 provided with holes 36 for the reception of a bar or handle (not shown) by which the gear 33 may be turned to effect movement of the dies or formers 10, 12 as above described.

The lower dies or formers 10, 12 have cooperating with them the rotatable upper dies or formers 13, 14, which are also made as segments of a cylinder and are rotatable about the center 21 in a substantially semicircular recess 37 in a carrier or movable member 38, which may be actuated in any suitable manner, and in practice may be secured to the ram 39 of an hydraulic or other press of known construction.

The upper dies or formers 13, 14 may be actuated by positioning devices 22, wedge bars or members 28, screw shafts 29, gears 32, 33, and head 35, in the same manner as described with relation to the lower dies or formers 10, 12. Provision is made for preventing the upper dies or formers from dropping out of the recess 37 in the movable upper carrier 38 and to this end, curved plates 40 are employed.

The plates 40 are provided with circular flanges 41 which extend into circular grooves or channels 42 in the opposite ends of the dies or formers 13, 14 after the manner shown in Fig. 4. The plates 40 are secured as by screws 43 to the opposite end walls of the movable frame or die carrier 38. It will be understood that the movable carrier 38 and the parts carried by it are bodily movable toward and from the stationary carrier 19, and may and preferably will be provided with guiding pins 45 which are designed to enter openings 46 in the upper surface of the stationary or lower carrier 19, after the manner represented in Fig. 1.

In operation with the machine herein shown, the lower dies or formers are rotated about the center 21 until their upper or shaping surfaces 15 are positioned in the proper angular relation, and then the upper dies or formers 13, 14 are rotated about the same center until their lower or shaping surfaces 47 are correspondingly positioned and are parallel or substantially parallel with the shaping surfaces 15 of the lower dies or formers, and are held in this position by the springs 32, which have their ends suitably engaged with the dies or formers 13, 14 after the manner represented in Fig. 3, wherein a spring 32 is represented as engaged at its ends with rods 48 located in recesses 49 in the curved outer surfaces of the dies or formers 13, 14 and supported by the end walls of said recesses. When the upper and lower sets of dies or formers have been properly positioned to bend a plate, bar, strip or the like 50 to the desired angle, the said plate, bar, strip or the like is laid across the lower dies or formers 10, 12 as represented in Fig. 5, and then the upper die carrier 38 is moved toward the lower die carrier, and the plate or bar is forced down into the space between the lower dies or formers 10, 12 until the plate, bar or the like is firmly pressed by the upper dies or formers against the lower dies or formers, after the manner represented in Fig. 6, wherein the plate, bar, strip or the like 50 shown in Fig. 5 is shown as bent to form an obtuse angle.

In Figs. 5 and 6, the apparatus is represented as forming a flange in a plate, bar or the like, and in Figs. 7 and 8, it is represented as operating upon a previously formed angle bar to change the bevel of the same.

In this latter case, the angle bar is positioned by the operator with its apex bearing against the contacting edges of the dies or formers 10, 12, and may be held in this position by the operator until the upper set of dies or formers 13, 14 in their movement toward the lower dies or formers have engaged the sides of the angle bar, and on the further movement of the upper dies or formers toward the lower dies or formers, the angle bar is opened up and its bevel changed as desired and as represented in Fig. 8. In Fig. 7, the angle of the bar is shown as a right angle and in Fig. 8 as an obtuse angle.

It will be understood, that the plate, bar or the like 50 may be bent into any angle desired within limits, by simply adjusting the rotatable dies or formers in the recesses 18, 37 about the center thereof into the proper position to obtain the desired bend in the metal.

In this manner, a wide range of bends may be made with the same dies or formers.

Furthermore, it will be observed that the dies or formers and especially the lower set of dies or formers 10, 12 are rotated about the center 21 and that the center edges of the said dies or formers touch or substantially touch, so that in the different adjusted positions of these lower dies, which may be designated the supporting dies or formers, the shaping surfaces 15 of said formers cooperate to form a continuous or substantially unbroken surface for the bent metal member, thereby preventing the formation or projections or bulges on the outside and at the apex of the bend, and avoiding the necessity of heating and hammering to smooth out the said bulge or projection. By reference to Figs. 5 and 8, it will be seen that the bent plate, bar, strip or the like 50 is solidly supported by the lower dies or formers at the apex of the bend, and no opportunity is afforded for the metal at the bend to be forced between the said dies or formers.

The formers 10, 12, may and preferably will be provided with hardened steel inserts 60 to withstand the wear upon these formers.

One embodiment of the invention is herein shown, but it is not desired to limit the invention to the particular construction shown.

Claims—

1. In an apparatus for bending metal, in combination, a set of segmental formers movable in opposite directions in circular paths having a common center, means for supporting said formers, a device movable between said formers to effect movement thereof in opposite directions to position the shaping surfaces thereof into different angular relations, and a second set of formers movable in opposite directions in circular paths having a common center and cooperating with the first mentioned set of formers, a support for the second set of formers, a device movable between the formers of said second set to position the shaping surfaces thereof into angular relations to each other and substantially parallel with the shaping surfaces of the first mentioned set, and means for moving said positioning devices.

2. In an apparatus for bending metal, in combination, a set of formers movable in circular paths and having metal shaping surfaces arranged to form a substantially continuous surface in all positions of the said formers, means for moving said formers in said circular paths to present said shaping surfaces in different angular relations without destroying the substantial continuity of said surfaces, and means cooperating with said shaping surfaces for forcing the metal to be bent into contact with said shaping surfaces.

3. In an apparatus for bending metal, in combination, a set of formers movable in opposite directions about a common center and having metal shaping surfaces arranged to form a substantially continuous surface in all positions of the formers, means for moving said formers in opposite directions about said common center, to position their shaping surfaces into different angular relation to each other, while maintaining the shaping surface substantially continuous, a second set of formers movable in opposite directions, and having shaping surfaces cooperating with the shaping surfaces of the first mentioned set of formers, means for moving the second set of formers in opposite directions to position their shaping surfaces in different angular relations corresponding to the angular regulations of the shaping surfaces of the first mentioned set of formers.

4. In an apparatus for bending metal, in combination, a set of formers having their shaping surfaces arranged to cooperate and form a substantially continuous surface in different angular relations of said shaping surfaces, and means for moving said formers to position their shaping surfaces into different angular relations, while maintaining the substantially continuous relation of said surfaces, and means cooperating with said surfaces for forcing the metal into contact therewith to be shaped thereby.

5. In an apparatus for bending metal, in combination, a set of formers comprising segments of a cylinder arranged to be moved in opposite directions about the center of said cylinder, and means for moving said segments about the said center to position their shaping surfaces into different angular relations.

6. In an apparatus for bending metal, in combination, a former provided with a shaping surface and rotatable about a center adjacent to one edge of said shaping surface, and a cooperating former rotatable about a center adjacent to the first mentioned center, and provided with a shaping surface which cooperates with the shaping surface of the first mentioned former.

In testimony whereof, I have signed my name to this specification.

JOHAN OSCAR HOLMBERG.