July 22, 1930. G. MAFERA 1,771,051

BENDING MACHINE

Filed Nov. 19, 1929 3 Sheets-Sheet 1

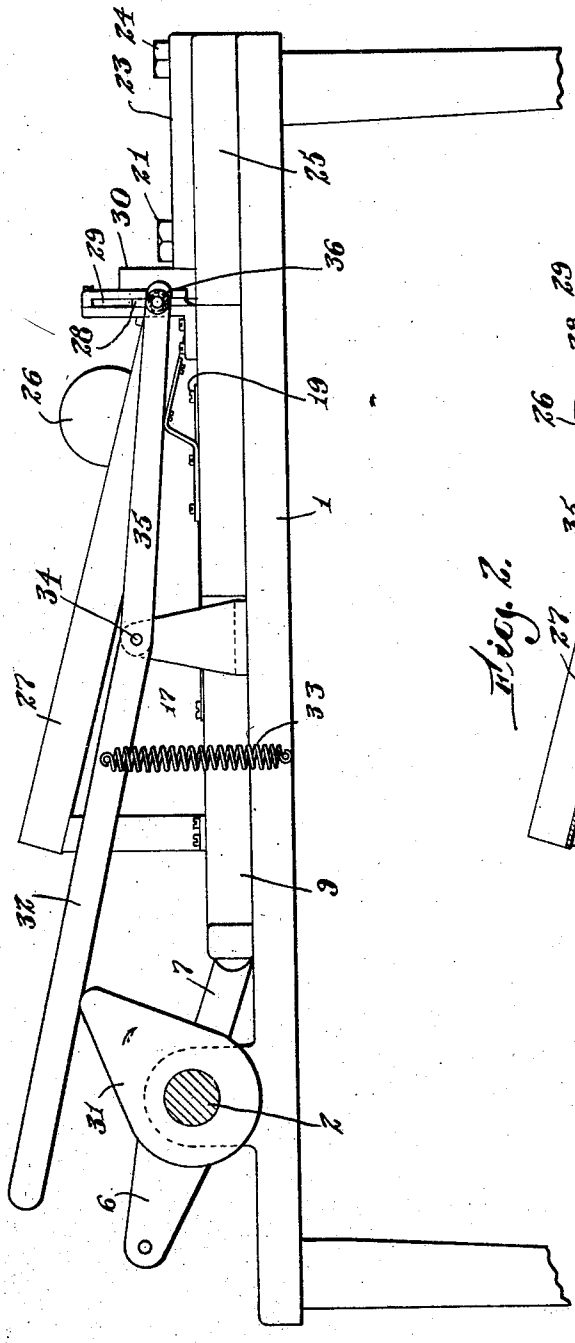


Fig. 1.

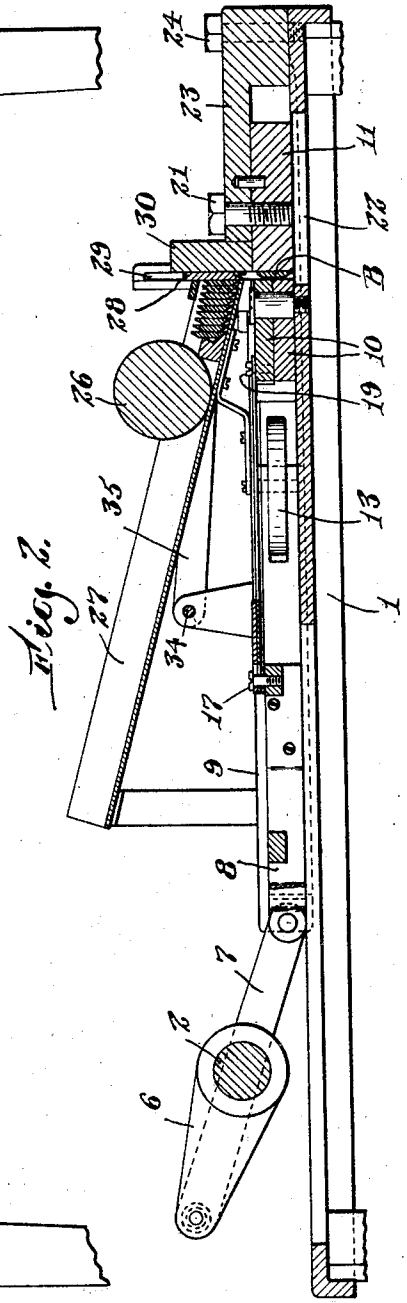


Fig. 2.

Inventor
Guy Mafera
by Rob B Rawlings.
Attorney

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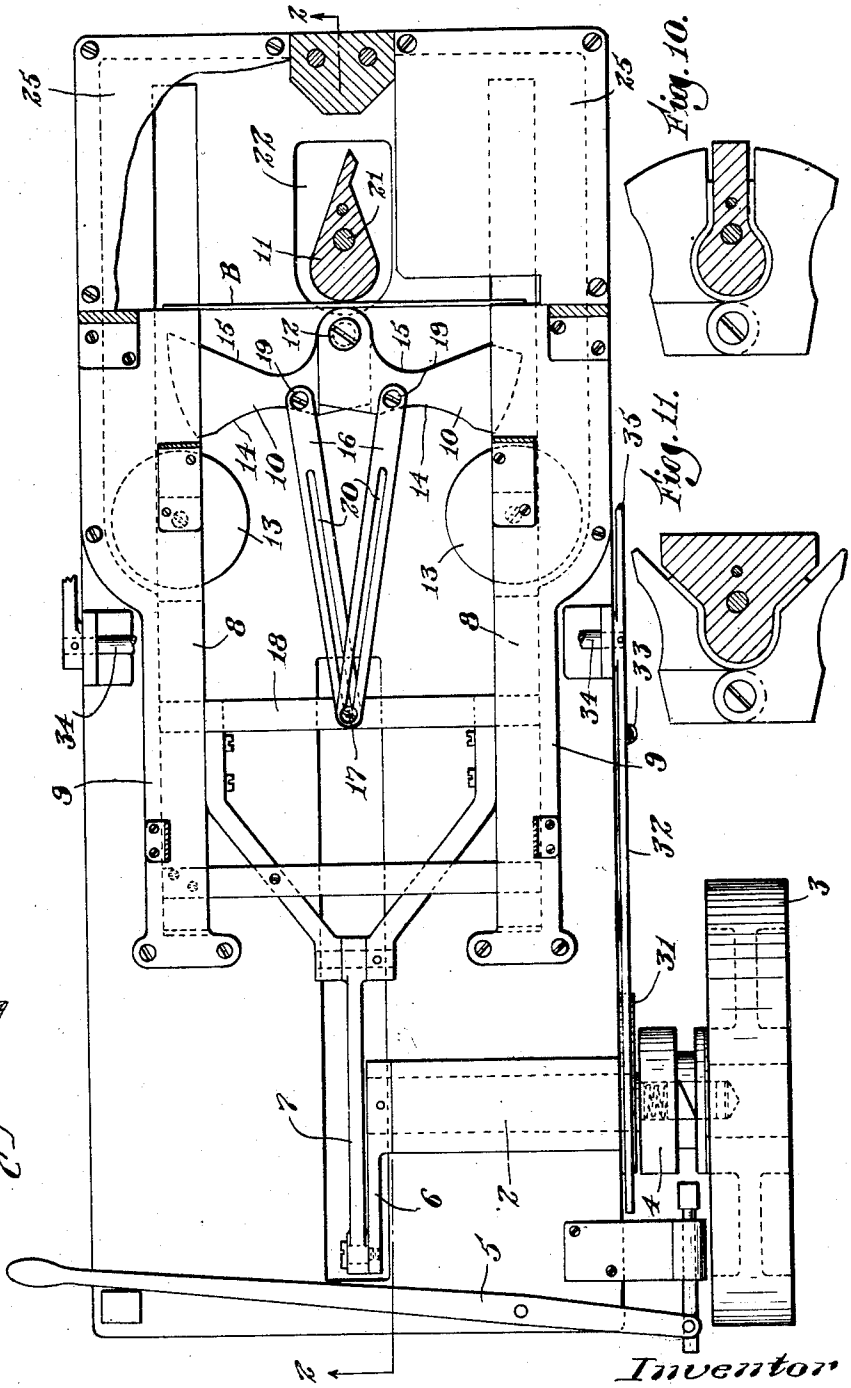


Fig. 3.

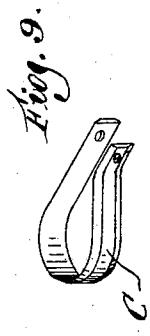


Fig. 9.

Fig. 10.

Fig. 11.

Inventor
Guy Mafera
by Geo B Rawlings.
Attorney

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BENDING MACHINE

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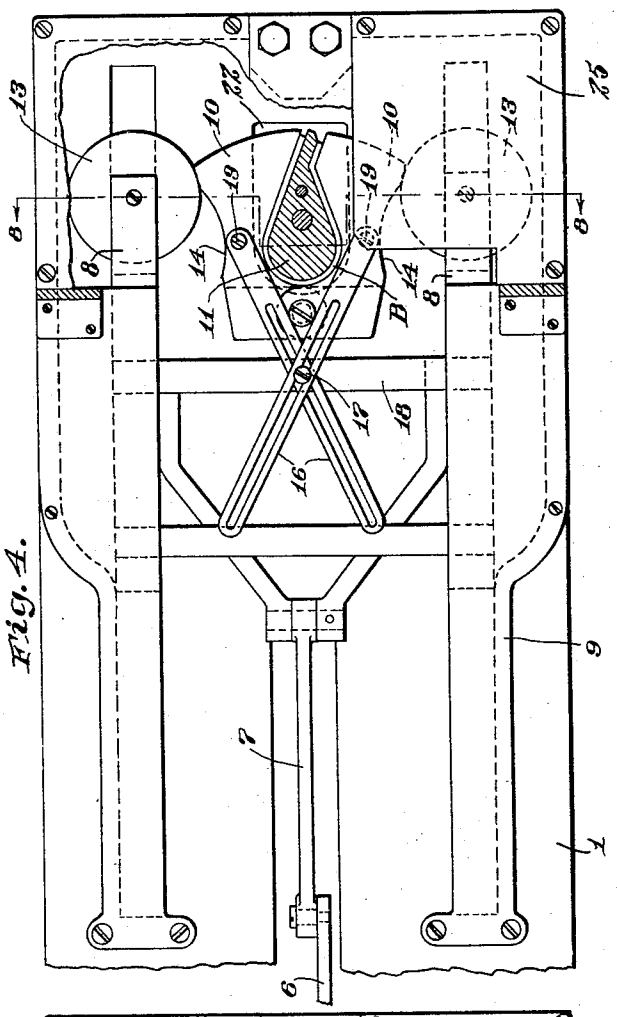


Fig. 4.

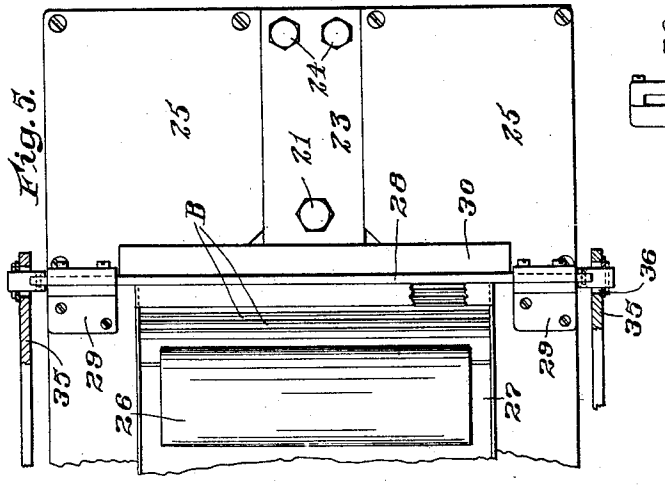


Fig. 5.

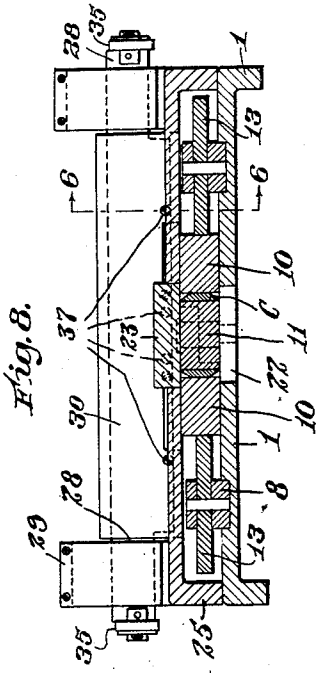


Fig. 8.

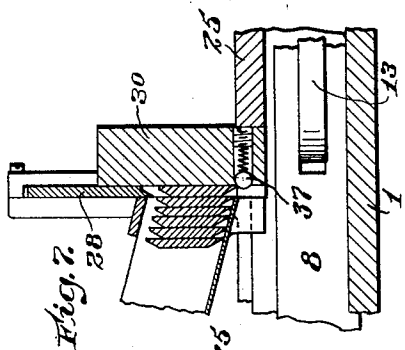


Fig. 7.

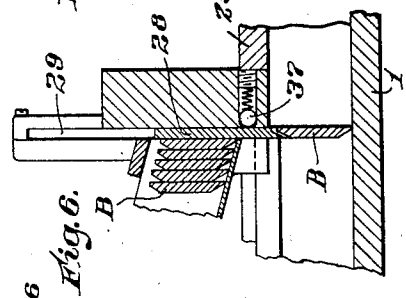


Fig. 6.

Inventor
Guy Mafera
by Geo. B. Rawlings.
Attorney

Patented July 22, 1930

1,771,051

UNITED STATES PATENT OFFICE

GUY MAFERA, OF REVERE, MASSACHUSETTS

BENDING MACHINE

Application filed November 19, 1929. Serial No. 408,228.

This invention relates to bending machines, and particularly to a machine for bending to shape the collars used in chain fencing to fasten the stretcher bars which carry the fence links to the fence posts.

Such collars have heretofore been bent to shape by hand. Hand methods, however, are slow and expensive and it is the general object of my invention to provide a simple, efficient and reliable machine for bending these collars more rapidly, accurately and cheaply than is possible with present hand methods.

This object is secured in the machine of the present invention through the coordinated operations of novel blank feeding and blank bending mechanisms functioning in properly timed relation to each other successively to feed and bend the blanks into collars of the desired shape or shapes.

In my machine, the feed of the collar blanks to the bending dies is synchronized with the operation of the bending mechanism. Such mechanism comprises a relatively stationary die and a pair of laterally disposed pivoted dies which are automatically opened and closed in properly timed relation to the feed of blanks whereby the blanks are admitted singly to the dies while the dies are open, after which the dies are automatically closed to bend the blank to shape, and again opened to permit the bent collar to be discharged from the machine while a new blank is being fed to the opened die.

The lateral dies are pivoted on a common pivot which is disposed in the line of the stationary die. These dies are closed by a pair of die closing members in the form of rolls carried by a reciprocable slide, and are opened by a pair of slotted links connected to said slide at a common point which is in line with the pivot for the dies.

The blanks descend by gravity along a blank feed chute and at the discharge end of the chute are releasably detained by a detent which yields in the direction of feed of the blanks along said chute. The resistance of the detent is overcome and the endmost blank in the chute is positively ejected past the detent by an ejector operating in a plane transversely across the discharge end of the chute. Such ejector is actuated in synchronism with the slide for opening and closing the pivoted dies.

Although particularly adapted for bending fencing collars, my machine is not restricted to such use, and the principles may be applied to the bending of a wide variety of blanks of sheet material.

In the drawings:

Fig. 1 is a side elevation, partly in section, of a collar-bending machine in accordance with my invention.

Fig. 2 is a longitudinal section on the line 2—2 of Fig. 3.

Fig. 3 is a fragmentary plan view with the bending dies shown in their open position.

Fig. 4 is a fragmentary plan view with the bending dies shown in their closed position.

Fig. 5 is a partial plan view particularly showing the automatic blank feed mechanism.

Figs. 6 and 7 are sections on the line 6—6 of Fig. 8 and showing the blank ejector in its ejecting and non-ejecting positions, respectively.

Fig. 8 is a cross section on the line 8—8 of Fig. 4.

Fig. 9 is a perspective view of one of the finished collars bent on my machine, and

Figs. 10 and 11 are fragmentary details showing bending dies which may be interchanged with the dies shown in the other figures of the drawing whereby to bend slightly different forms of collars from that illustrated in Fig. 9.

I have indicated at 1 a bed or table and at 2 a power shaft which takes its drive from any suitable power source, as the driving pulley 3. The shaft 2 is journaled transversely of the bed or table at one end thereof in suitable bearings, and the drive therefore is applied through any suitable clutch mechanism, indicated generally at 4, and shipper lever 5.

Fast on the inner end of the power shaft 2 is a crank 6 which through a pitman 7 reciprocates a slide 8 back and forth longitudinally of the bed 1.

The slide 8 is guided in a channeled guide-

way 9 fixed to the bed 1 and on its forward stroke (Fig. 4) swings a pair of oppositely disposed bending dies 10 inwardly relatively to a fixed die or anvil 11 whereby to bend an interposed collar blank B about said fixed die.

The pivoted dies 10 are pivoted at 12 on a common pivot stud and are swung inwardly by a pair of oppositely disposed rollers 13 revolubly mounted on the slide 8 at either side thereof. The outer face of the dies 10 are curved as indicated at 14 to conform to the curvature of the rollers 13, and their inner faces are curved as at 15 to cooperate with the fixed die 11 in imparting to the blank B the desired shape.

When the slide 8 reaches the limit of its forward stroke, (Fig. 4) the rollers 13 have fully closed the swinging dies 10 about the fixed die 11.

It will be noted that the swinging dies 10 are not only pivoted on a common pivot 12 but that such pivot is located in the line of the fixed die 11 as well as in the line of travel of the reciprocating slide.

On the return stroke of the slide (Fig. 3) the dies 10 are opened. In this movement of the slide, the rollers 13 are withdrawn from their engagement with the dies 10 and said dies are swung outwardly on their pivot 12 by means of a pair of crossed links 16. The links 16 are connected at their rear ends by a common fastening stud 17 to one of the cross members 18 of the slide disposed in the line of the pivot stud 12 and at their forward ends as at 19—19 to the dies 10. The links 16 are longitudinally slotted as at 20 and the anchor stud 17 travels back and forth in said slots, as appears in Figs. 3 and 4 according to the direction of movement of the slide.

When the slide 8 reaches the limit of its rearward stroke (Fig. 3) the links 16 have fully opened the dies 10.

The fixed die or anvil 11 is bolted or otherwise detachably fastened as at 21 over a delivery opening 22 (Figs. 2 and 3) in the bed 1 of the machine through which opening the bent collars discharge into any suitable collection receptacle or conveyor belt (not shown). The die block which carries the stationary die or anvil 11 is indicated at 23 (Fig. 2) and is bolted to the bed of the machine as at 24. The die 11, block 23 and delivery opening 22 may be removably covered by any suitable cap plate 25 (Figs. 1 and 3).

The blanks B are fed by gravity, assisted if desired by a sliding or rolling follower 26, down an inclined feed chute 27 which is suitably supported on the bed 1, and are discharged singly into the space between the pivoted dies 10, when opened, and the fixed die 11 in properly timed relation to the opening and closing movements of the pivoted dies 10.

To accomplish this, I provide a blank ejector 28 operating across the lower or discharge end of the chute 27. This ejector, as here shown, reciprocates vertically, and is operated from the same drive shaft 2 which operates the slide 8.

The ejector 28 is guided in suitable guideways 29 (Figs. 6 and 7) at the discharge end of the chute 27 and operates in advance of a stop block or plate 30 mounted on the fixed die 11 between the ejector 28 and the inner edge of the die block 23 (Fig. 2).

The ejector is lowered by means of a cam 31 (Figs. 1 and 3) fast on the power shaft 2 and operating beneath a rocker arm 32. The rocker arm 32 works against the action of a return spring 33 and is fast on a rock shaft 34 which extends transversely across the machine beneath the feed chute. Fast to the rock shaft 34 at either side of the machine is a rocker arm 35, which is loosely connected at 36 (Fig. 5) to the ends of the ejector 28.

When the ejector is raised to the position shown in Fig. 7, the endmost blank in the feed chute is held against escape from the chute by one or more spring pressed detents 37 which project beneath the bottom edge of said blank. The detents 37 operate in suitable slots formed in the stop plate 30 and yield forwardly in the direction of feed of the blanks down the chute when the ejector 28 descends, such descent forcing the endmost blank downwardly into the space between the pivoted dies 10 and the fixed die 11, as clearly shown in Fig. 6 whereupon the detents 37 immediately return to the position of Fig. 7 when the ejector 28 ascends, thereby to engage and hold from escape the next blank in the chute until the ejector descends again.

It will thus be seen that the blanks are successively registered with the ejector while the ejector is raised but are prevented from escape by the spring detents 37 until positively ejected therepast by the descending ejector, and that this operation is synchronized with the operation of the bending dies.

One of the finished collars bent on my machine is illustrated in perspective in Fig. 9. Figs. 10 and 11 show two different variants of the collar C shown in Fig. 9, together with the particular shapes of bending dies necessary to produce these particular shapes of collars. To adapt the machine shown in Figs. 1 to 8 for the production of either collar shown in Figs. 10 and 11, it is simply necessary to remove the dies 10 and 11 and substitute therefor the corresponding dies shown in Figs. 10 or 11. This may be accomplished with the minimum ease and without disturbing the general adjustment of the machine.

Various modifications in the construction and operation of my device may obviously be resorted to if within the spirit and scope

of my invention without departing from the limits of the appended claims.

What I therefore claim and desire to secure by Letters Patent is:

1. In combination, a reciprocable slide, a relatively fixed die, a pair of pivoted dies disposed one on either side of said fixed die, means operated by said slide in one direction of travel thereof to close the die pair, means operated by said slide in the opposite direction of travel thereof to open said die pair, a blank feed, and a blank ejector operating in timed relation to said slide to deliver blanks successively to said dies when open.

2. In combination, a reciprocable slide, a relatively fixed die, a pair of pivoted dies disposed one on either side of said fixed die, a common pivot for said die pair disposed in the line of said fixed die, means operated by said slide in one direction of travel thereof to close the die pair, means operated by said slide in the opposite direction of travel thereof to open said die pair, a blank feed, and a blank ejector operating in timed relation to said slide to deliver blanks successively to said dies when open.

3. In combination, a reciprocable slide, a relatively fixed die, a pair of pivoted dies disposed one on either side of said fixed die, a revoluble roller carried by said slide at either side of said die pair and active on said dies in one direction of travel of the slide to close the same, means operated by said slide in the opposite direction of travel thereof to open said die pair, a blank feed, and a blank ejector operating in timed relation to said slide to deliver blanks successively to said dies when open.

4. In combination, a reciprocable slide, a relatively fixed die, a pair of pivoted dies disposed one on either side of said fixed die, a revoluble roller carried by said slide at either side of said die pair and active on said dies in one direction of travel of the slide to close the same, means operated by said slide in the opposite direction of travel thereof to open said die pair, and comprising a pair of slotted links crossed upon each other and fastened at one end to said die pair, and a stud set through the slots of said links and through said slide, a blank feed, and a blank ejector operating in timed relation to said slide to deliver blanks successively to said dies when open.

5. In combination, a reciprocable slide, a relatively stationary die, a pair of pivoted dies disposed one on either side of said stationary die, a pair of die closing members mounted on said slide at either side of said pair of dies and acting on the outer faces of said dies in one direction of travel of the slide to close said dies, means operated by said slide in the opposite direction of travel thereof to open said die pair, a blank feed chute for delivering article blanks singly to said dies, and a blank ejector operating at the discharge end of said chute in timed relation to said slide to deliver blanks successively to said dies when open.

6. In combination, a reciprocable slide, a relatively stationary die, a pair of pivoted dies disposed one on either side of said stationary die, said pair of dies being pivoted on a common pivot and having their inner faces shaped to conform to the shape of the ultimate article to be bent from the article blank and having their outer faces curved to receive closing members, a pair of die closing members mounted on said slide at either side of said pair of dies and acting on the outer faces of said dies in one direction of travel of the slide to close said dies, means operated by said slide in the opposite direction of travel thereof to open said die pair, a blank feed chute for delivering article blanks singly to said dies, and a blank ejector operating at the discharge end of said chute in timed relation to said slide to deliver blanks successively to said dies when open.

7. In combination, a power shaft, a slide reciprocated therefrom, a relatively stationary die and a pair of laterally swinging dies disposed on opposite sides of said stationary die, a pair of die closing members mounted on said slide at either side of said pair of dies and acting on the outer faces of said dies in one direction of travel of the slide to close said dies, a pair of slotted links crossed upon each other and fastened at one end to said slide and at their opposite end each to one of said pivoted dies for opening said die pair upon movement of the slide in the opposite direction, a blank feed chute for delivering article blanks singly to said dies, and a blank escapement mechanism operated from said power shaft in timed relation to said slide to deliver blanks successively to said dies when open.

8. In combination, a power shaft, a slide reciprocated therefrom, a relatively stationary die and a pair of laterally swinging dies disposed on opposite sides of said stationary die, said pair of dies being pivoted on a common pivot and having their inner faces shaped to conform to the shape of the ultimate article to be bent from the article blank and having their outer faces curved to receive closing members, a pair of die closing members mounted on said slide at either side of said pair of dies and acting on the outer faces of said dies in one direction of travel of the slide to close said dies, a pair of slotted links crossed upon each other and fastened at one end to said slide and at their opposite end each to one of said pivoted dies for opening said die pair upon movement of the slide in the opposite direction, a blank feed chute for delivering article blanks singly to said dies, and a blank escapement

mechanism operated from said power shaft in timed relation to said slide to deliver blanks successively to said dies when open.

9. In combination, a power shaft, a slide reciprocated therefrom, a relatively stationary die and a pair of pivoted dies disposed on opposite sides of said stationary die, a pair of die closing rolls mounted on said slide at either side of said pair of dies and acting on the outer faces of said dies in one direction of travel of the slide to close said dies, and a pair of slotted links crossed upon each other and fastened at one end to said slide by a fastening set through the slots of said links and fastened at their opposite end each to one of said pivoted dies for opening said die pair upon movement of the slide in the opposite direction.

10. In combination, a power shaft, a slide reciprocated therefrom, a relatively stationary die and a pair of pivoted dies disposed on opposite sides of said stationary die, means operated by said slide in one direction of travel thereof to close said pair of dies, means operated by said slide in the opposite direction of travel thereof to open said pair of dies, a blank feed chute, an ejector reciprocable across the delivery end of said chute, motion transmitting connections from said power shaft to said ejector for operating said ejector in timed relation to the opening and closing movements of said pivoted die pair, and a yieldable detent normally disposed in the path of said ejector for engagement with the endmost blank in said chute and yieldable upon movement of the ejector in one direction to permit successive ejection therepast of the endmost blank in said chute.

11. In combination, a reciprocable slide, a relatively fixed die, a pair of pivoted dies disposed one on either side of said fixed die, a common pivot for said die pair, means operated by said slide in one direction of travel thereof to close the die pair, and means operated by said slide in the opposite direction of travel thereof to open said die pair, and disposed in the line of said common pivot for the die pair.

12. In combination, a power shaft, a slide reciprocated therefrom, die closing means operated by said slide, a pair of pivoted bending dies adapted to be closed thereby, a fixed bending die disposed between said pivoted die pair, a pair of die opening links fastened at their forward ends to said die pair and at their rear ends to said slide, said links being slotted and the fastening which attaches them to said slide being disposed in the slots of the links, a blank feed chute, a stop at the discharge end of said chute including a spring detent yielding in the direction of feed of the blanks, and ejector reciprocable across the discharge end of the chute and effective to eject the endmost blank in said chute past said yieldable detent, and motion transmitting connections between said ejector and said power shaft for operating said ejector in timed relation to said slide.

13. In combination, a power shaft, a slide reciprocated therefrom, die closing rolls mounted on said slide, a pair of pivoted bending dies disposed in the path of said rolls, a fixed bending die disposed between said pivoted die pair, die opening means operated by said slide, a blank feed chute, a stop at the discharge end of said chute including a spring detent yielding in the direction of feed of the blanks, an ejector reciprocable across the discharge end of the chute and effective to eject the endmost blank in said chute past said yieldable detent, and motion transmitting connections between said ejector and said power shaft for operating said ejector in timed relation to said slide.

14. In combination, a power shaft, a slide reciprocated therefrom, die closing rolls mounted on said slide, a pair of pivoted bending dies disposed between said pivoted die pair, a pair of die opening links fastened at their forward ends to said die pair and at their rear ends to said slide, said links being slotted and the fastening which attaches them to said slide being disposed in the slots of the links, a blank feed chute, a stop at the discharge end of said chute including a spring detent yielding in the direction of feed of the blanks, an ejector reciprocable across the discharge end of the chute and effective to eject the endmost blank in said chute past said yieldable detent, and motion transmitting connections between said ejector and said power shaft for operating said ejector in timed relation to the operation of said slide.

In testimony whereof I affix my signature.

GUY MAFERA.