Feb. 8, 1955 A. E. FELT ET AL 2,701,485

DRAW ROLL BLANK GRIPPING APPARATUS

Filed Feb. 4, 1954 2 Sheets-Sheet 1

FIG. 1.

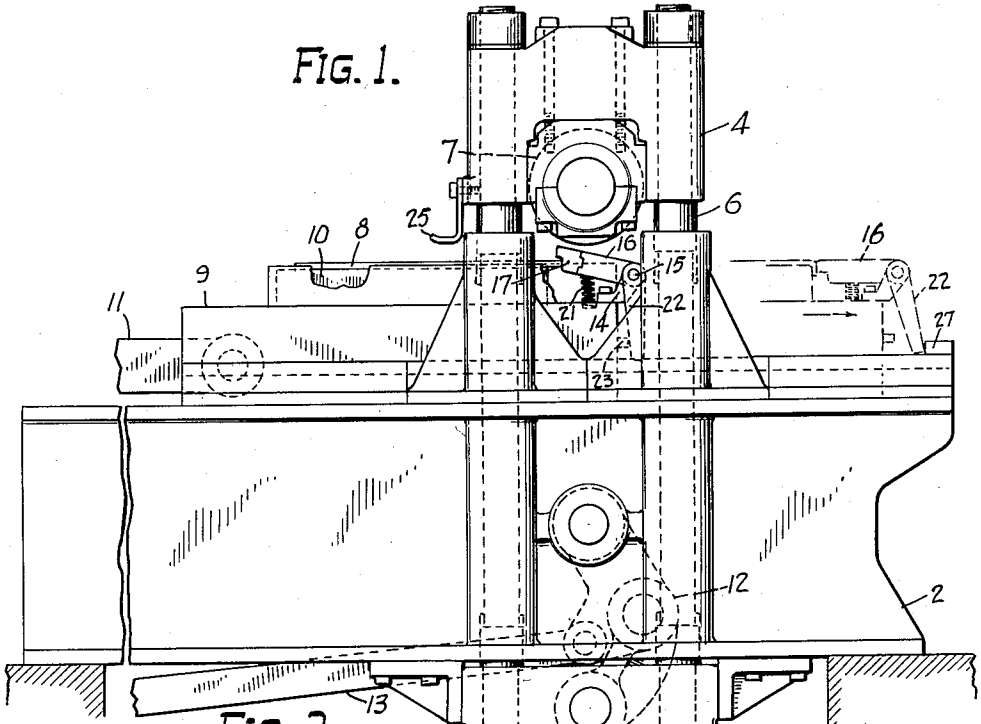


FIG. 2.

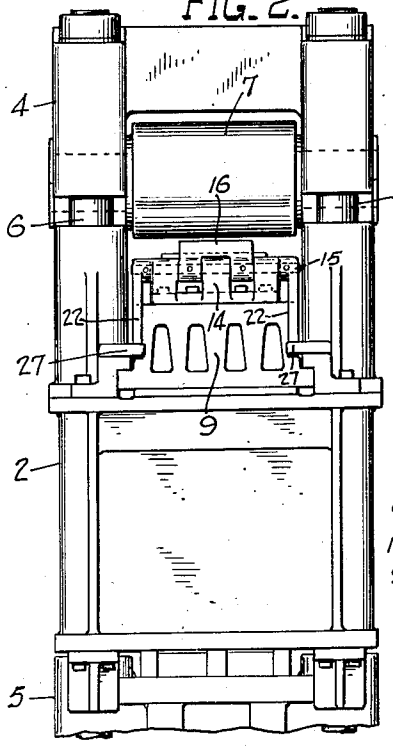
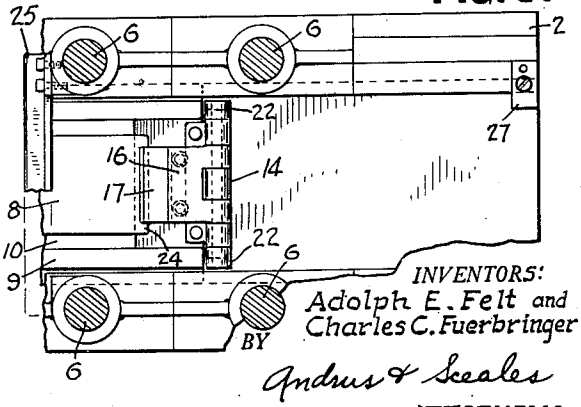


FIG. 3.



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Filed Feb. 4, 1954 2 Sheets-Sheet 2

FIG. 4.

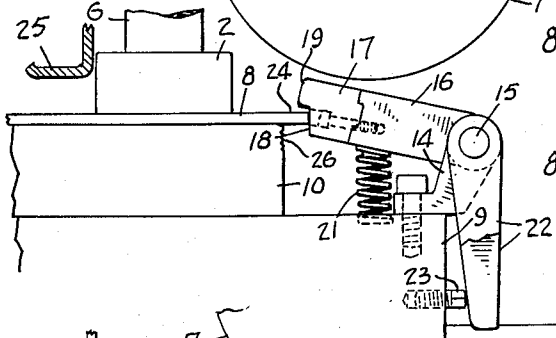


FIG. 8.

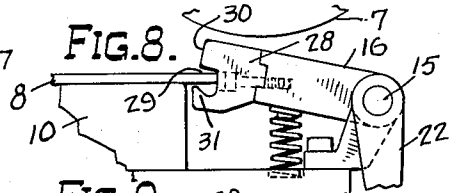
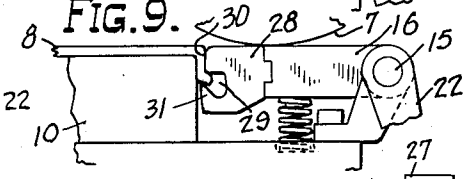


FIG. 9.



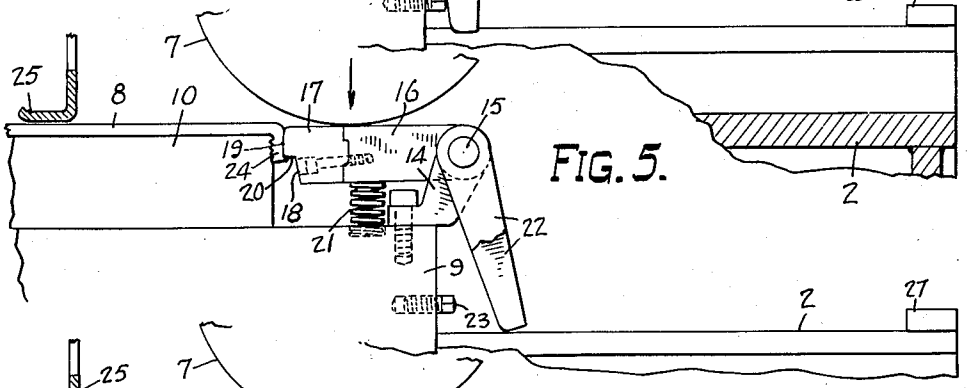


FIG. 5.

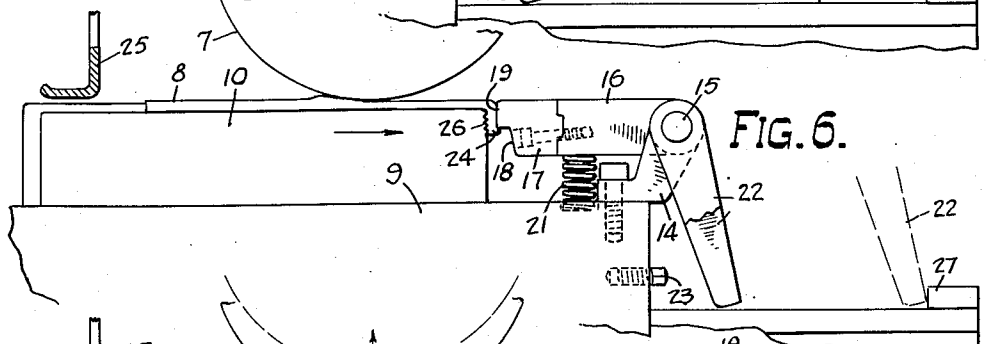


FIG. 6.

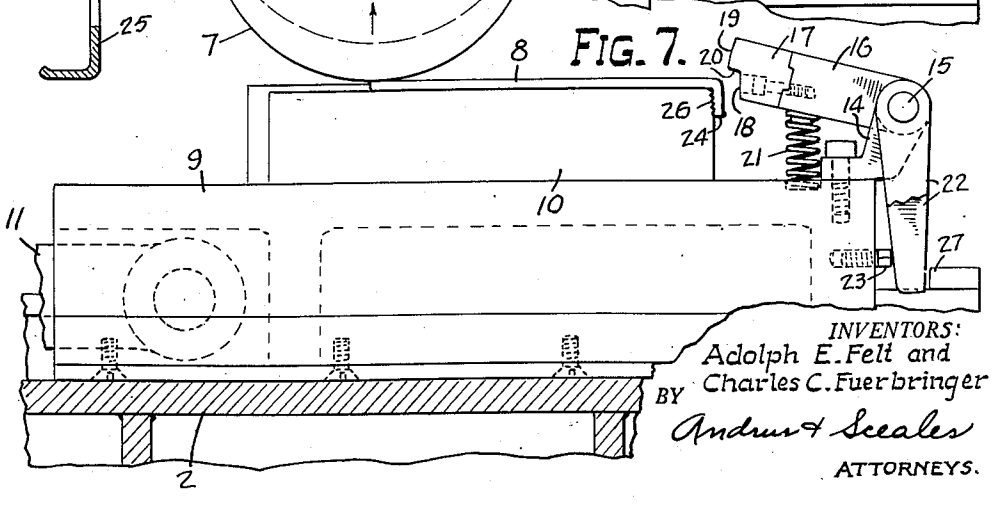


FIG. 7.

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DRAW ROLL BLANK GRIPPING APPARATUS

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Application February 4, 1954, Serial No. 408,250

10 Claims. (Cl. 80—19)

This invention relates to a draw roll blank gripping apparatus and more particularly to a gripping apparatus for a draw rolling mill wherein the blank is secured in the draw roll mechanism by the action of the roll.

More specifically the invention is applied to a draw rolling mill as described in the copending applications of Julius B. Tiedemann, Serial No. 388,177, filed October 26, 1953, now abandoned, and Serial Number 418,966, filed March 26, 1954 entitled "Draw Rolling Mill," and assigned to the common assignee of this application.

According to the invention a gripper block and a die member of a draw rolling mill cooperate to secure the workpiece or blank during the rolling operation. The blank is placed on the die member with an end portion thereof projecting beyond the corresponding end surface of the die member. The projecting end portion engages the recessed end of a clamp or gripper block. At the beginning of the working stroke the working roll of the mill descends from its raised or inactive position and strikes the gripper block or clamp forcing the block and the projecting end portion of the blank downwardly. The downwardly moving gripper block forms a flange on the projecting end portion of the blank and locks the flange between the gripper block and the die member to secure the blank against relative movement with respect to the die member during the rolling operation. At the end of the working stroke arms projecting downwardly from the gripper block strike against stops provided on the bed of the mill and pivot the gripper block to its initial position to thereby release the formed blank for easy removal.

The invention provides a novel and simple device for holding a blank for rolling to the shape desired.

The drawings furnished herewith illustrate the best mode of carrying out the invention as presently contemplated and set forth hereinafter.

In the drawings:

Figure 1 is a side elevation of a draw rolling mill incorporating the invention with parts broken away;

Fig. 2 is a front end elevation of the draw rolling mill with the lower end broken away;

Fig. 3 is a fragmentary sectional view of the draw rolling mill;

Figs. 4 through 7 are diagrammatic views showing the gripping apparatus in progressive stages of the rolling operation; and

Fig. 8 and Fig. 9 are fragmentary sectional views showing a modified form of the invention.

Referring to the drawings there is shown a rolling mill disposed in a pit provided in the foundation 1. The bed 2 of the mill rests on the foundation 1 and extends longitudinally of the pit.

A balancing cylinder 3 is mounted on the floor of the pit and supports a crosshead unit for vertical movement relative to the bed 2. The crosshead unit comprises an upper crosshead 4 disposed above the bed 2 and a lower crosshead 5 disposed beneath the bed joined together by a plurality of tie-rods 6. A pressure roll 7 is mounted in suitable bearing members beneath the upper crosshead 4 and is adapted to move vertically therewith relative to the bed 2.

To support the blank 8 that is to be rolled, a platen 9 is disposed for sliding reciprocation on the bed 2 and a die member 10 to receive the blank 8 is secured on the platen for movement therewith. During the working stroke of the platen 9, the die member and pressure roll 7 cooperate to shape the blank 8 to the form desired.

To reciprocate platen 9 a linkage member 11 is pivotally

attached to the rearward end of the platen. A suitable drive, not shown, acts through member 11 to activate the platen in the desired manner.

Normally the pressure roll 7 is maintained in a raised position with respect to the platen 9. During the working stroke of the platen, however, the crosshead unit and roll 7 move downwardly against the pressure of cylinder 3 and cooperate with die member 10 to shape the blank 8. To raise and lower the roll 7 in sequence with the working stroke of the platen, a toggle mechanism 12 is secured between the fixed bed 2 of the mill and the lower crosshead 5. To operate the toggle mechanism 12 and thereby raise and lower roll 7 with respect to the platen, a connecting rod 13 is pivotally attached to the center pivot of the toggle mechanism. A suitable drive, not shown, oscillates the rod 13 to operate the toggle mechanism 12 sequentially with the platen reciprocation. The sequential operation of the toggle mechanism and platen are more fully described in the copending application hereinbefore referred to.

To adequately secure the blank 8 on the die member 10 during the working stroke of the mill, a gripper apparatus is provided on the platen 9 adjacent the forward end of the die member. The gripper apparatus is comprised of a bearing bracket 14 which is flanged at the bottom for securement by bolting or otherwise to the upper surface of platen 9 forwardly of the die member and extends upwardly from the platen to pivotally support a horizontal shaft 15. A gripper block or clamp 16 is secured on shaft 15 and extends therefrom toward the die member. The end of gripper block 16 nearest the die member is adapted to receive an extension or shoe member 17 which is bolted or otherwise secured thereto.

The free end of shoe member 17 is recessed to provide a somewhat tapered surface 18 that is inset from the vertically extending end surface 19 by undercut surface 20. The gripper block and attached shoe member are normally urged upwardly by a resilient member 21 disposed between the platen 9 and gripper block 16.

An arm 22 is secured to each end of shaft 15 and extends downwardly and forwardly of platen 9. With arms 22 and gripper block 16 being secured on shaft 15, these members pivot together as a unit on the bracket 14. While resilient member 21 urges the gripper block and shoe member upwardly, stop pins 23 are provided on the forward end of the platen in alignment with arms 22 and are normally engaged by the arms to limit the upward pivotal movement of the gripper block so that the tapered surface 18 of shoe member 17 is disposed at the same height as the blank 8 and the surface 20 overlies the projecting end of the blank 24 when the roll 7 is in raised position.

Figs. 4 through 7 diagrammatically illustrate the operation of the gripper mechanism. The blank 8 is placed on the die member 10 with the end portion 24 of the blank projecting beyond the corresponding surface of the die and abutting the tapered surface 18 of the shoe 17. In the initial position gripper block 16 is pivoted to its uppermost position by the resilient member. At the beginning of the working stroke of platen 9, the toggle mechanism 12 is closed by the connecting rod 13 which in turn lowers the pressure roll 7. As the roll 7 moves downwardly the roll strikes gripper block 16 and pivots the same downwardly against the action of resilient member 21. As shoe 17 moves downwardly with the gripper block the end portion 24 of the blank is engaged by undercut surface 20 and is bent over and wedged between the end surface 19 of shoe 17 and the forward face of die member 10. In the operating position the upper surface of the gripper block lies in substantially the same plane as the upper surface of the rolled blank. To restrict a pivoting action of the opposite end of the blank during the bending operation, a hold-down bar 25 is secured to the upper crosshead 4 and moves relatively to the die member with roll 7 and is engaged by the blank when the roll forces gripper block 16 downwardly to bend the projecting end 24 of the blank. The forward face of die member 10 may be serrated, as shown at 26, to assist in gripping the flanged end 24 of the blank.

As the platen 9 begins the working stroke, the pressure roll rolls off the gripper block and proceeds to draw

roll the blank. The flanged or bent over projecting end 24 of the blank is securely held against relative movement with respect to the corresponding end of the die member during the rolling operation by the toggle lock between the shoe member and the blank.

As the platen nears the end of its working stroke the downwardly projecting arms 22 engage the stop blocks 27. With arms 22 arrested in this manner, the remainder of the platen working stroke overcomes the frictional forces between the blank and gripper block and causes the block to pivot upwardly to its open position. The resilient member 21 maintains the gripper block in the raised position within the limit established by the stop pins 23. At the end of the working stroke of the platen the pressure roll 7 is raised by the action of the toggle mechanism 12. After the pressure roll is raised, the finished blank is readily removed from die member 10 and the flange 24 is severed therefrom by any suitable means.

In order to accommodate blanks of varying thickness, the extension or shoe member 17 attached to the gripper block is removable and interchangeable with other shoe members of varying length. Shims, not shown, may also be inserted between the shoe 17 and the block 16 to accommodate blanks of varying thickness and to make adjustments for wear.

A second embodiment of the invention is shown in Fig. 8 and Fig. 9 wherein a shoe member 28 cooperates with the die member 10 to secure the blank 8. The shoe member 28 is provided with a blank engaging recess 29 located substantially centrally of end face 30 of the shoe member adjacent the die member. A hooked lip 31 is formed at the lower surface of recess 29.

In the raised or open position the recess 29 of shoe member 28 is aligned with the upper die surface to receive the projecting end of blank 8 as shown in Fig. 8. As the pressure roll 7 descends for the working stroke and strikes the gripper block 16 forcing the same downward the projecting end of blank 8 is flanged as in the case of the first embodiment. During the flanging operation, however, the extreme end of blank 8 engages the hooked lip 31 and is bent away from the end of the die member and secured between lip 31 and the upper edge of recess 29 as shown in Fig. 9. The blank remains locked in this manner during the working stroke of the platen. At the end of the working stroke the arms 22 on pivot shaft 15 engage the stop blocks 27 to pivot the shoe member 28 to the raised position as described in connection with the first embodiment. As the shoe member 28 pivots upwardly, the hooked lip 31 engaging the blank end carries the blank end upwardly or ejects the same from its position over the end of the die member 10 to assist in the removal of the finished blank.

The invention provides a device for gripping blanks during rolling that utilizes the roll pressure for initiating and effecting the gripping action. The apparatus is relatively simple and permits for rapid operation, as well as being very effective as a blank gripper.

Various modes of carrying out the invention are contemplated as within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

We claim:

1. In a draw rolling mill, a die member adapted to support a blank to be formed with an end portion of the blank projecting beyond a straight edge of the end of the die member, a clamp disposed at said straight edge of the die member and facing said straight edge, stop means associated with said clamp for engagement by the projecting end of the blank, a draw roll initially positioned over said clamp and adapted to be moved relatively to said clamp, and means to effect relative movement between the roll, die and clamp whereby the clamp is actuated by the roll and the blank is rolled on the die by said roll, the said clamp engaging the projecting blank end to bend the same under the force of the roll and clamp the projecting end to the straight edge of the die during the rolling of the blank.

2. In a draw rolling mill, a die supporting means, a die secured to said means and supporting a blank to be formed with an end portion of the blank projecting beyond the corresponding edge of the die, a pressure roll adapted to roll said blank to the shape desired, means to effect relative reciprocating motion between the roll and the die supporting means, a gripper pivotally secured to the die supporting means and having a recessed end adapted to receive the projecting end portion of the blank, means to place the pressure roll at the beginning of the relative movement between the roll and die supporting means into engagement with the gripper to pivot the gripper into engagement with the projecting end portion of the blank and flange said end portion over the edge of the die with the projecting end portion of the blank being frictionally secured between the gripper and die, and said roll being disposed to thereafter engage the secured blank to form the same, and means to hold said blank against the die during the flanging of the projecting end portion of the blank.

3. In a draw rolling mill, a bed, a platen disposed on the bed, a die secured to the platen and supporting a blank to be formed with an end portion of the blank projecting beyond the corresponding end surface of the die, a pressure roll disposed above the die, means to effect relative horizontal reciprocating movement between the roll and platen, an arm pivoted to the platen and having a recessed end overlying the projecting end portion of the blank, means holding said arm normally in a position disengaged from said blank, means cooperating with the horizontal reciprocating means to place the pressure roll into engagement with said arm to initially force the recessed end of the arm against the projecting end portion of the blank and flange said end portion between the end surface of the die and said arm to secure the blank and then thereafter engage the roll with the secured blank and roll the blank to the shape desired, and means connected to the roll engaging the blank at the end opposite the projecting end portion to restrict pivotal movement of the blank during the flanging of said projecting end portion.

4. In a draw rolling mill, a bed, a platen disposed on the bed, a die secured on the platen to support a blank to be formed with an end portion of the blank projecting beyond the corresponding end surface of the die, a pressure roll disposed above the die, means to effect relative horizontal reciprocating movement between the roll and platen constituting a working stroke and a return stroke, an arm pivoted to the platen and having a recessed end overlying the projecting end portion of the blank, resilient means holding said arm normally in a raised position disengaged from the blank and with the recessed end at substantially the same height as the blank, means cooperating with the horizontal reciprocating means to place the pressure roll into engagement with said arm at the start of the working stroke to initially force the recessed end of the arm downwardly onto the projecting end portion of the blank and flange said end portion between the end surface of the die and said arm to secure the blank and then thereafter engage the roll with the held blank and roll the blank to the shape desired, means to hold the blank against the die during the flanging of the projecting end portion of the blank, and means to automatically pivot said arm at the end of the working stroke to a raised position to release the flanged end of the blank for ready removal of the rolled blank from the die.

5. In a draw rolling mill, a bed, a platen disposed on the bed, a die secured on the platen to support a blank to be formed with an end portion of the blank projecting beyond the corresponding end surface of the die, a pressure roll disposed above the die, means to effect relative horizontal reciprocating movement between the roll and platen constituting a working stroke and a return stroke, an arm pivotally disposed on the platen and having a recessed end extending over the projecting end portion of the blank, resilient means holding said arm normally in a raised position with the recessed surface of the arm engaging the blank, means cooperating with the horizontal reciprocating means to place the pressure roll into engagement with said arm at the start of the working stroke to initially force the recessed end of the arm downwardly onto the projecting end portion of the blank and flange said end portion between the end surface of the die and said arm to secure the blank and then thereafter engage the roll with the secured blank and roll the blank to the shape desired, and hold-down means engaging the blank at the end opposite the projecting end portion to restrict pivotal movement of the blank during the flanging of said projecting end portion.

6. A blank gripping apparatus for a draw rolling mill wherein a die member is secured on a platen for reciprocation therewith on the bed of the mill and a pressure roll is disposed above the die member for vertical reciprocation with respect to the die member sequentially with the platen reciprocation, said die member and said pressure roll being adapted to form a blank therebetween when the roll is in its lowered position, said apparatus comprising a pivotal member pivotally secured to the platen and extending toward the die member, a shoe member removably secured on the end of the pivotal member and having an undercut surface and a substantially tapered surface in the end surface thereof adjacent the die member, the length of said shoe member being determined by the thickness of the blank to be formed corresponding substantially to the distance between the die member and the shoe member, and means to normally maintain the tapered surface of said shoe member at substantially the same height as the upper surface of the die member so that when the blank to be formed is placed on the die member with the end portion of the blank projecting beyond the corresponding end surface of the die member in abutting relation with the tapered surface of the shoe member, the roll descending from its position above the die member at the beginning of the platen reciprocation strikes the pivotal member and forces the undercut surface of the shoe member downwardly onto the projecting end portion of the blank to form a flange on said end portion between the shoe member and the die member and thereby lock the blank in place against relative movement with respect to the die member and then thereafter engage the roll with the secured blank and roll the blank to the desired shape.

7. A blank gripping apparatus for a draw rolling mill wherein a die member is secured on a platen for reciprocation therewith on the bed of the mill and a pressure roll is disposed above the die member for vertical reciprocation with respect to the die member sequentially with the platen reciprocation, said die member and said pressure roll being adapted to form a blank therebetween when the roll is in its lowered position, said apparatus comprising a transverse horizontal shaft rotatably disposed on the platen, a pivotal member secured on said shaft and extending toward the die member, a shoe member removably secured on the end of the pivotal member and having an undercut surface and a substantially tapered surface in the end surface thereof adjacent the die member, the length of said shoe member being determined by the thickness of the blank to be formed corresponding substantially to the distance between the die member and the shoe member, resilient means disposed between the platen and the pivotal member to urge said pivotal member upwardly with respect to the platen, stop means on the platen to limit the upward pivot of said pivotal member and thereby normally maintain the tapered surface of said shoe member at substantially the same height as the upper surface of the die member so that when the blank to be formed is placed on the die member with the end portion of the blank projecting beyond the corresponding end surface of the die member in abutting relation with the tapered surface of the shoe member, the roll descending from its position above the die member at the beginning of the platen reciprocation strikes the pivotal member and forces the undercut surface of the shoe member downwardly onto the projecting end portion of the blank against the upward force exerted by the resilient means to form a flange on said end portion between the shoe member and the die member and thereby lock the blank in place against relative movement with respect to the die member and then thereafter engage the roll with the secured blank and roll the blank to the desired form, a downwardly extending arm secured on the shaft and pivoting as a unit with said pivotal member, and a stop disposed on the bed of the mill and engaged by said arm after said blank has been formed to automatically urge the pivotal member upwardly and release the blank for removal from the die.

8. In a draw rolling mill, a bed, a platen reciprocally disposed on the bed, a die member secured on the platen and supporting a blank to be formed with an end portion of the blank projecting beyond the corresponding end surface of the die member, means to reciprocate the platen, a pressure roll disposed above the die member, means to lower the pressure roll from its position above the die member sequentially with the platen reciprocations to form the blank between the roll and the die member, a pivotal member pivotally mounted on the platen and extending in the direction of the corresponding end of the die member, a shoe member removably secured to the end of said pivotal member and having a recess in the end surface thereof receiving the projecting end portion of the blank, resilient means disposed between the pivotal member and the platen to urge said pivotal member upwardly with respect to the platen, and stop means provided on the platen to limit the pivotal movement of said pivotal member and thereby normally maintain said recess at the same height as the blank, the roll as it descends from its position above the die member at the beginning of the platen reciprocation strikes the pivotal member and forces the same downwardly against the upward force exerted by the resilient means to bend the end portion of the blank into engagement with the end surface of the die member and thereby lock the blank in place between the shoe member and the die member and then thereafter engage the roll with the secured blank and roll the blank to the desired shape.

9. In a draw rolling mill, a bed, a platen reciprocally disposed on the bed, a die member secured on the platen and supporting a blank with an end portion of the blank projecting beyond the corresponding end surface of the die member, means to reciprocate the platen, a pressure roll disposed above the die member, means to lower the pressure roll from its position above the die member sequentially with the platen reciprocations to form a blank between the roll and the die member, a pivotal member pivotally mounted on the platen and extending toward the die member, a shoe member removably secured on the end of said pivotal member and having a recess in the end surface thereof adjacent the die member, resilient means disposed between the pivotal member and the platen to urge the pivotal member upwardly with respect to the platen, stop means provided on the platen to limit the upward pivotal movement of said pivotal member and thereby normally maintain said recess at substantially the same height as the upper surface of the die member, an arm connected to the pivotal member to pivot therewith as a unit and extending downwardly therefrom, a stop member provided on the bed of the mill, the roll as it descends from its position above the die member at the beginning of the platen reciprocation strikes the pivotal member and forces the same downwardly against the upward force exerted by the resilient means to form a flange on the end portion of the blank between the shoe member and the end of the die member and thereby lock the blank in place against relative movement with respect to the die member and then thereafter engage the roll with the locked blank and roll the blank to the desired form, said downwardly extending arm engaging said stop member after said blank is formed to pivot the pivotal member upwardly from its locked position and thereby permit easy removal of the blank from the mill after the same has been formed, and a plurality of shims adapted to be applied between the shoe and pivotal members to vary the distance between the die member and the shoe member and thereby accommodate blanks of varying thickness.

10. In a draw rolling mill, a die supporting means, a die secured to said means and supporting a blank to be formed with an end portion of the blank projecting beyond the corresponding edge of the die, a pressure roll adapted to roll said blank to the shape desired, means to effect relative reciprocating motion between the roll and the die supporting means, a pivotal member pivotally mounted on the platen and extending in the direction of the corresponding end of the die member, a shoe member removably secured to the end of said pivotal member and having a recess in the end surface thereof receiving the projecting end portion of the blank, a hooked lip formed at the lower edge of said recess, resilient means holding said shoe member normally in a raised position disengaged from the blank and with the recessed end at substantially the same height as the blank, a downwardly extending arm pivotally mounted on the platen to pivot as a unit with the pivotal member, a stop member provided on the bed of the mill, and means cooperating with the horizontal reciprocating means to place the pressure roll into engagement with said pivotal member at the start of the working stroke to initially force the recessed shoe member downwardly against the upward force exerted by the resilient means to form a flange on the end

portion of the blank between the shoe member and the end of the die member with the extreme end of the flange engaging said hooked lip and being bent thereby away from the end of the die member to lock the blank in place against relative movement with respect to the die member and thereafter engage the roll with the locked blank and roll the blank to the desired shape, said downwardly extending arm engaging said stop member after said blank is formed to pivot the shoe member upwardly from its locked position with said hooked lip serving to eject the blank end upwardly from its position over the end of the die member and thereby permit easy removal of the blank from the mill.

No references cited.