March 28, 1961 A. FOWLER ET AL 2,976,753

PRESS UNLOADER INCLUDING MAGNETIC LIFT MEANS AND MAGNETIC DELIVERY ROLLERS

Filed June 5, 1956 2 Sheets-Sheet 1

FIG.1

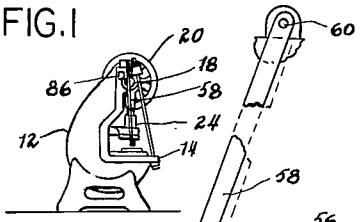


FIG.2

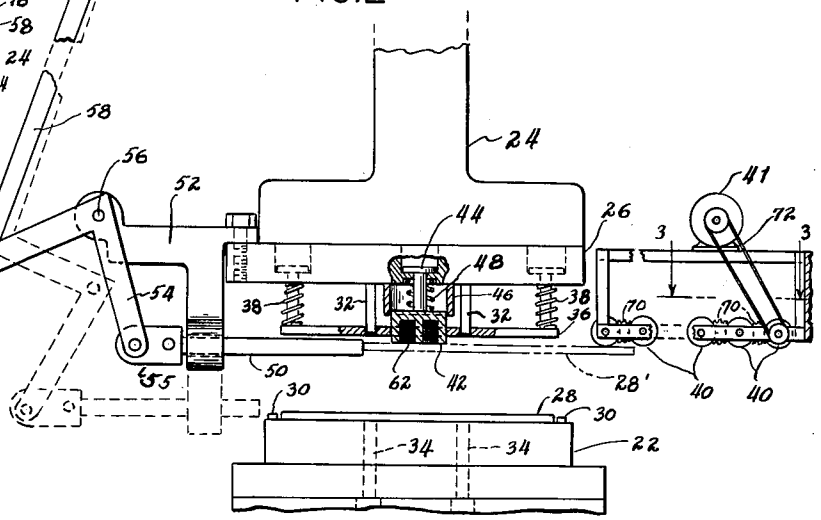


FIG.3

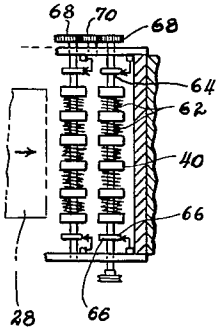


FIG.4

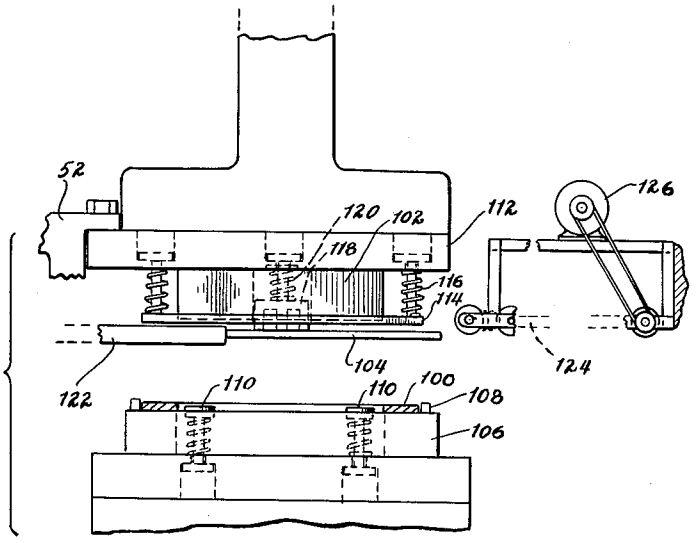
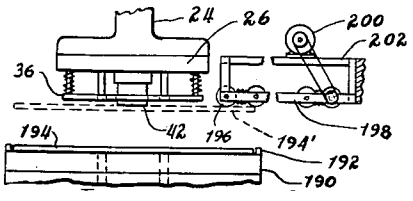


FIG.7



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Filed June 5, 1956 2 Sheets-Sheet 2

FIG.5

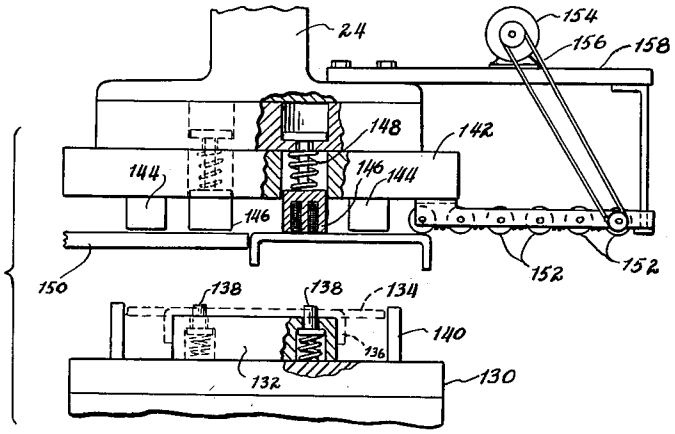


FIG.6

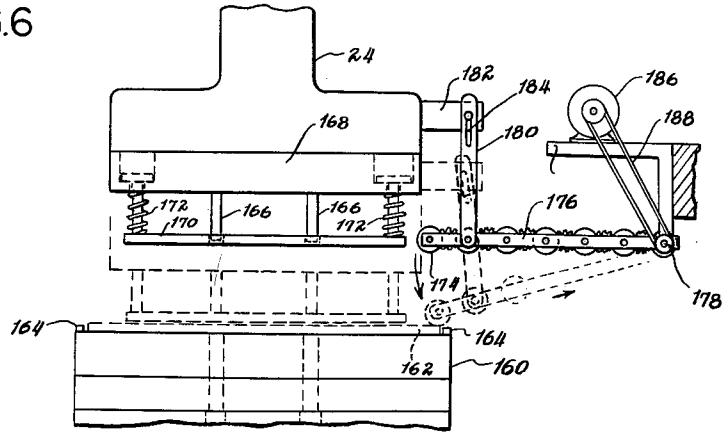
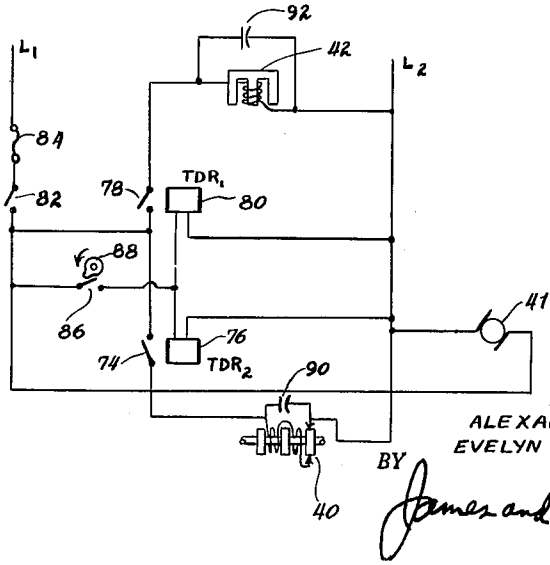


FIG.8



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PRESS UNLOADER INCLUDING MAGNETIC LIFT MEANS AND MAGNETIC DELIVERY ROLLERS

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6 Claims. (Cl. 83—82)

This invention relates to power presses working on ferrous metal, and more particularly to auxiliary apparatus for unloading from the press the material already worked on.

The primary object of the present invention is to generally improve power press operation, and more particularly to improve the operation of unloading or clearing the press after each cycle of operation, preparatory to the next. A more specific object is to provide apparatus which operates automatically, in properly timed relation to the press, to unload the same after each press operation. A further object is to devise apparatus suitable for different kinds of press work, such as punching or drawing.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, our invention resides in the auxiliary apparatus elements, and their relation one to another and to the punch press, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

Fig. 1 is a side elevation of a typical punch press with which the present invention may be employed;

Fig. 2 is a partially sectioned front elevation of the die and unloading apparatus;

Fig. 3 is a plan view of a part of the unloading apparatus;

Fig. 4 is a front elevation similar to Fig. 2, but showing a modification in which the scrap instead of the work is unloaded;

Fig. 5 is a partially sectioned front elevation similar to Fig. 2, but showing a modification in which the roller track is carried by the press ram;

Fig. 6 is a front elevation similar to Fig. 2, but showing a modification in which the roller track oscillates and acts also as a lift magnet;

Fig. 7 is a front elevation which combines some of the features of Figs. 2 and 6; and

Fig. 8 is a schematic wiring diagram explanatory of the electrical circuit of the apparatus.

Referring to the drawing, and more particularly to Fig. 1, we there show a typical power driven press having a rigid C frame 12 carrying a bed 14 and having upright ways to reciprocally guide a ram 24 reciprocated by a suitable eccentric on a main shaft 18 carrying a weighty flywheel 20. The main shaft is driven by a motor through suitable reduction gearing and a single revolution clutch. The press further comprises a suitable release mechanism for engaging the clutch and causing the press to turn through one revolution or cycle, whereupon it is again stopped. The release means may be a foot treadle, or hand lever, or in many instances spaced-apart left and right buttons both of which must be pressed, thereby insuring that the hands of the operator have been removed from the press before it is operated. These things are all conventional.

Referring now to Fig. 2 of the drawing, the stationary bed carries a stationary bottom die 22, while the reciprocable ram 24 carries a movable top die 26. The

press and die operate on a blank of ferrous metal in sheet form, indicated at 28, and this blank may be positioned by suitable stops or locating means 30. In the particular case here shown the top die 26 functions primarily as a punch holder, and carries a number of punches for operating on the blank 28. Two such punches are indicated at 32, and the scrap metal excised by these punches moves down through the openings 34 in bottom die 22, and eventually falls gravitationally through the bed of the press into a suitable scrap box. The blank 28 tends to stay with the punches 32, and the top die 26 is accordingly provided with a resiliently actuated stripper plate 36, urged downward by compression springs 38.

In accordance with one aspect of the present invention, the press is provided with a track of magnetic feed rollers 40, and these are driven by a motor 41 which rotates the feed rollers in proper direction to feed the metal blank out of the press, as indicated in broken lines at 28'. In accordance with another aspect of the invention the top die 26 has associated with it a magnetic lift means 42 to lift the blank 28 with the top die when it rises. Ordinarily the action of the stripper plate 36 would be to leave the blank resting on the bottom die 22, but with the provision of the lift magnet 42 the blank rises with the top die.

The magnet 42 is itself vertically yieldable when the die is closed, in order not to interfere with the operation of the die, and in the present case the magnet 42 is carried by a pin 44 and may, if desired, be additionally guided by a guide 46. The magnet may fall gravitationally as the ram rises, or, if desired, a spring 48 may be provided. It will be understood from inspection of the drawing that the magnet descends far enough to clear the blank from the stripper 36, which in turn clears the blank from the punches 32, so that the latter will not prevent sideward movement of the blank.

In addition to the foregoing, the auxiliary apparatus comprises a horizontally movable pusher 50 which, in the present case, is carried by the die 26, as by means of a suitable guide bracket 52. The pusher is disposed at proper height to engage the edge of the blank when the ram rises. The pusher then serves to slide the blank sideward until the right edge of the blank reaches the magnetic roller track 40. The pusher 50 may be operated in any desired fashion, for example, pneumatically, electrically, or hydraulically, but in the present case is operated mechanically by means of an angle lever 54 pivoted at 56, and operated by a generally upright link 58. The connection between arm 54 and pusher 50 includes a short horizontal link 55 for angularity (or an upright slotted connection could be used). The upper end of the link is stationarily mounted at 60, and thus the pusher is operated as the ram rises.

The magnet 42 is an electro magnet, and may be conventional in construction. In the present case a coil 62 is received in an annular space in a soft iron core 42. When the magnet is in contact with the blank 28 the magnetic flux path is completed through the blank 28.

The magnetic rollers 40 may be of conventional construction, and one arrangement is schematically indicated in Fig. 3, in which each roller 40 has a series of coils 62. The coils are energized through suitable slip ring connections 64 and 66. The rollers are all inter-connected to rotate in unison. This may be done by belts, sprocket chains or the like, but in the present case gearing is used, each roller carrying a gear 68, and these being connected by idlers 70. This has the advantage that the rollers turn in the same direction, as they should, and also the gears 68 and 70 may be smaller in diameter than the rollers.

Motor 41 may be connected to any desired one of the rollers, as by means of a pulley and belt drive shown at 72 in Fig. 2. It will be understood that the showing of the magnetic rollers in Fig. 3 is schematic rather than

structural. The rollers are shown to be electro magnetic, and in such case the rollers may be energized intermittently, first, to conserve power, and, second, to facilitate dropping the blank when it has been rolled out of the press. However, the rollers may be energized continuously, in which case the blank may be dropped gravitationally when it reaches the last roller, which roller may be designed to have insufficient magnetic attraction to itself hold the blank. With continuous magnetization it also is possible to employ permanent magnet rollers, instead of electro magnetic rollers as here shown.

The wiring for the press unloader apparatus is shown in Fig. 8 of the drawing. Power is supplied through the lines L1 and L2. The lift magnet is indicated at **42**, and the magnetic rollers at **40**. The latter may be connected across the line by means of the contact **74** of a time delay relay **76**. The lift magnet **42** may be connected across the line by means of the contact **78** of a time delay relay **80**. The motor **41** which drives the rollers is connected directly across the line, and runs continuously when the main switch **82** is closed. A conventional fuse or circuit breaker is provided at **84**.

The time delay relays are energized by means of a contact **86** operated by a cam **88** driven by the main shaft of the press. Reverting to Fig. 1, the contact is housed at **86** and is driven by the main shaft **18**. This establishes a desired time relationship, and in the present case both relays are closed at the same time, although relay **76** for the rollers could be closed somewhat later. The relay time delay is differently adjusted for the relays, the lift magnet **42** being de-energized when the ram rises and the blank has been taken over by the roller track. The latter remains energized long enough to deliver the blank from the press a desired distance, at which point the blanks may be dropped.

The roller magnets **40** may be shunted by a condenser **90**, and the lift magnet **42** may be shunted by a condenser **92**, for obvious reasons of power factor correction, reduction of arcing at relay contacts **74** and **78**, etc. Also it produces a decaying oscillatory discharge through the coil, which has a de-magnetizing effect on the work.

Referring now to Fig. 4, we there show a modification in which the unloading apparatus is used to unload the scrap rather than the blank. The blank **100** has a very large hole punched therethrough by means of a punch **102**, to make, for example, a window fan baffle. The scrap is itself a relatively large piece of metal **104**. In the present arrangement the blank **100** is located on bottom die **106** by stops **108**. The bottom die is provided with strippers or ejectors **110** to force the scrap **104** up out of the bottom die. The top die **112** carries a stripper plate **114** operated by springs **116** to strip the blank **100** from the punch **102**, letting it remain on the bottom die as the punch rises.

In addition, the top die **112** carries a lift magnet **118**, which may yield upwardly, as previously described, in order not to interfere with the punch operation. The magnet later may fall gravitationally or may be aided by a compression spring **120**. The magnet then supports the scrap **104** at a height somewhat lower than that of the stripper plate **114**. This exposes its edge to the action of a horizontally movable pusher **122**, which again may be operated in any desired fashion, as by a piston and cylinder, or by linkage described in connection with Figs. 1 and 2. The pusher moves the scrap over to a track of magnetic rollers indicated at **124**, and these are driven by a motor **126**. It will be understood that the wiring or control circuit for the parts shown in Fig. 4 may be the same as that already described in connection with the Fig. 8 of the drawing.

Fig. 5 shows another modified form of the invention. One difference is that the work is being formed or drawn or bent. Another difference is that the magnetic roller track and its driving motor are carried by the press ram **24**. The bottom die **130** carries a part **132** around which a blank **134** is pushed or drawn, as shown at **136**. There are resilient strippers **138** to help free the formed blank from the bottom die **132**. The latter also has stops **140** to initially locate the blank **134**.

The top die **142** is carried by ram **24**. The working part of the die is indicated at **144**, and in the present case engages the ends of the blank and draws them downward around the lower die **132**. The top die has lift magnets **146** which are upwardly movable in order not to interfere with the forming operation. They move downward gravitationally, and if desired may be aided by compression springs **148**. In downward position the blank is below the die portion **144**, and is free to be moved sideward, as by means of the pusher **150**. This again may be operated by a piston and cylinder mechanism, or by linkage such as that shown in Fig. 2. The pusher is retracted during the forming operation, and is effective only when the ram rises. It operates to push the blank sideward to a track of magnetic rollers **152** driven by a motor **154** through a belt drive **156**. The rollers are suitably inter-connected to rotate in unison, as by means of gearing described in connection with Fig. 3. It will be noted that the roller track and its motor are carried on a frame **158**, which is mounted on the ram **24** and reciprocates with it.

We consider such an arrangement less preferable than a roller track which is stationarily mounted at desired elevation, as previously described in connection with Figs. 2 and 4, because ordinarily it is undesirable to reciprocate a large mass when there is no need for it. However, Fig. 5 illustrates the possibility. The electrical circuit for the apparatus shown in Fig. 5 may be the same as that already described in connection with Fig. 8.

Still another form of our invention is illustrated in Fig. 6. In this case no separate lift magnet is employed. Instead the first of the roller track magnets may itself function as a lift magnet. Specifically, the bottom die **160** is generally like that shown in Fig. 2, and receives a blank **162** located by stops **164**. The blank is operated on by punches **166** carried by a punch holder or top die **168**, which in turn is mounted on the ram **24**. The top die includes a stripper plate **170**, which is yieldable upward against compression springs **172**.

In this case the initial blank **162** is larger in area than that shown in Fig. 2, and there is an outward area exposed for engagement by the end roller **174** of a roller track **176**. The latter is stationarily pivoted at its outer end **178**, while its inner end is supported by a link **180** connected at **182** to the ram **24**. There is preferably a lost motion slot at **184**.

It will be evident that with this arrangement the inner end of the roller track rises and falls with the ram, and when the ram is in down position the roller track engages the blank **162**. When the ram rises the roller track lifts the right end of blank **162** so that it can move over the stop **164**, whereupon the rotation of the rollers moves the blank sidewardly along the bottom of the roller track, much as previously described. The rollers may be geared together and driven by a motor **186**, substantially as previously described. The pulley drive **188** extends to a lower pulley which is coaxial with the pivot **178** about which the roller track oscillates, for in that case there is no lengthening or shortening of the belt. The arrangement of Fig. 6 dispenses not only with the lift magnet, but also with the pusher mechanism.

The electrical circuit for the apparatus shown in Fig. 6 is the same as the lower half of what is shown in Fig. 8. On examination of Fig. 8 it will be seen that one may omit the lift magnet **42** and its relay **80** without disturbing the lower half of the circuit including the cam operated contact **86**, the relay **76**, the roller magnet **40**, and the motor **41**. These parts are all retained and used for the apparatus shown in Fig. 6, while eliminating the lift magnet **42** and its relay **80**.

The pusher mechanism may be eliminated whenever

one deals with a blank large enough to have an overhang, without necessarily making the roller track oscillatable, or making it act also as a lift magnet. Such an arrangement is shown in Fig. 7 of the drawing, which generally resembles Fig. 2 in that ram **24** carries a top die **26** having a stripper plate **36** and a lift magnet **42**, all as previously described in connection with Fig. 2. However, the bottom die **190** is larger in area, and stops **192** are spaced apart to receive a blank **194** which extends outward from the top die **26**. Thus one (or more) roller **196** of roller track **198** is disposed over the right end of blank **194**, but the roller **196** is cleared by the top die **26** and ram **24** during the operation of the press. Roller track **198** is driven by motor **200**, and both are mounted on a stationary frame **202**.

The punches carried by the top die perforate the blank **194** to produce the desired holes. As the ram rises the blank is stripped from the punches by the stripper plate **36**, but the magnet **42** holds the blank, and the latter rises with the magnet, as shown at **194'**. As the ram rises the blank engages the roller (or rollers) **196**, and preferably at about this time the lift magnet **42** is de-energized, whereupon the blank is fed outward by the roller track.

The electrical circuit for the apparatus shown in Fig. 7 may be identical with that shown in Fig. 8.

It is believed that the construction and operation of our improved press unloader, as well as the advantages thereof, will be apparent from the foregoing detailed description. It will also be understood that the various features shown are illustrative, and may be combined in different ways. For example, the stationary roller tracks shown in Figs. 2 and 4 may be used when drawing instead of punching a blank, as shown in Fig. 5, and, conversely, the ram carried roller track of Fig. 5 may be used when punching a blank instead of drawing a blank. A roller track which acts also as a lift magnet, as shown in Fig. 6, may be used while reciprocating the entire roller track, as shown in Fig. 5, instead of one end only, as shown in Fig. 6. A pusher may be eliminated whenever the blank has an adequate overhang, whether the roller track be fully reciprocable, as shown in Fig. 5, or oscillated, as shown in Fig. 6, or stationary, as shown in Fig. 7.

In the drawings we show conventional strippers, and lift magnets in addition. When the lift magnets are spring pressed they may themselves be used as strippers, and the latter eliminated. This applies to Figs. 2, 4, 5 and 7. Viewed differently, the strippers may be magnetized, in order to hold, as well as strip.

It will therefore be apparent that while we have shown and described our invention in several preferred forms, changes may be made in the structures shown, without departing from the scope of the invention as sought to be defined in the following claims.

We claim:

1. In a metal fabricating system in which a punch press has a stationary bed carrying a stationary bottom die and has a vertically reciprocable ram carrying a movable top die, and in which the press and die operate on ferrous metal, the combination with the said press and die, of a magnetic feed roller located laterally of and close to the top die in its upper position, and means including electromagnetic means associated with the top die to lift said ferrous material with the top die so that a portion of said ferrous metal substantially engages said magnetic feed roller, means to de-energize said electromagnetic means when a portion of said ferrous metal substantially engages said magnetic feed roller, and a motor for rotating said feed roller in order to feed the ferrous material laterally out of the press and die.

2. In a metal fabricating system in which a punch press has a stationary bed carrying a stationary bottom die and has a vertically reciprocable ram carrying a movable top die, and in which the press and die operate on ferrous material, the combination with the said press and die, of a magnetic means associated with the top die to lift ferrous material with the top die, a magnetic feed roller located laterally of and immediately adjacent the top die in its upper position, said roller being exposed at the bottom in order to receive and support the said ferrous material beneath the roller, and a motor for rotating said feed roller in proper direction to feed the ferrous material laterally out of the press and die.

3. In a metal fabricating system in which a punch press has a stationary bed carrying a stationary bottom die and has a reciprocable ram carrying a movable top die, and in which the press and die operate on ferrous material in sheet form, the combination with the said press and die, of a magnetic means associated with the top die to lift ferrous sheet material with the top die, a track of magnetic feed rollers located side by side laterally of the top die with the first roller immediately adjacent the top die in its upper position, said rollers being exposed at the bottom in order to receive and support the said ferrous material beneath the track of rollers, and a motor for rotating said feed rollers in proper direction to feed the ferrous sheet material laterally out of the press and die.

4. In a metal fabricating system in which a punch press has a stationary bed carrying a stationary bottom die and has a reciprocable ram carrying a movable top die, and in which the press and die operate on ferrous material, the combination with said press and die, of a lift magnet carried by the top die for holding the material near the top die, said lift magnet being vertically yieldable when the die is closed in order to avoid interference with the die operation, a track of magnetic feed rollers disposed side by side at one side of the top die with the first roller immediately adjacent the top die in its upper position, said rollers being exposed at the bottom in order to receive and support the ferrous material beneath the track of rollers, and a motor for rotating said rollers in proper direction to feed the ferrous material laterally out of the die.

5. In a metal fabricating system in which a punch press has a stationary bed carrying a stationary bottom die and has a reciprocable ram carrying a movable top die, and in which the press and die operate on ferrous material, the combination with said press and die, of a lift magnet carried by the top die for holding the material near the top die, said lift magnet being vertically yieldable when the die is closed in order to avoid interference with the die operation, a track of magnetic feed rollers disposed side by side at one side of the top die with the first roller immediately adjacent the top die in its upper position, said rollers being exposed at the bottom in order to receive and support the ferrous material beneath the track of rollers, switch means automatically operated by said punch press to deenergize said lift magnet when said rollers receive said ferrous material, and a motor for rotating said rollers in proper direction to feed the ferrous material laterally out of the die.

6. In a metal fabricating system in which a punch press has a stationary bed carrying a stationary bottom die and has a reciprocable ram carrying a movable top die, and in which the press and die operate on ferrous material in sheet form, the combination with said press and die, of a lift magnet carried by the top die for holding the material near the top die, said lift magnet being vertically yieldable when the die is closed in order to avoid interference with the die operation, a track of magnetic feed rollers disposed side by side at one side of the top die with the first roller immediately adjacent the top die in its upper position, said rollers being exposed at the bottom in order to receive and support the ferrous material beneath the track of rollers, a motor for rotating said rollers in proper direction to feed the ferrous sheet material laterally out of the die, a hori-

zontally movable pusher, and means controlled by the press to move said pusher against the sheet material when the ram rises in order to move the sheet material sidewardly to the bottom of said track of feed rollers.

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