Aug. 17, 1926. 1,596,512

L. C. PRITNER ET AL

CUTTING PLATE

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Fig. 1.

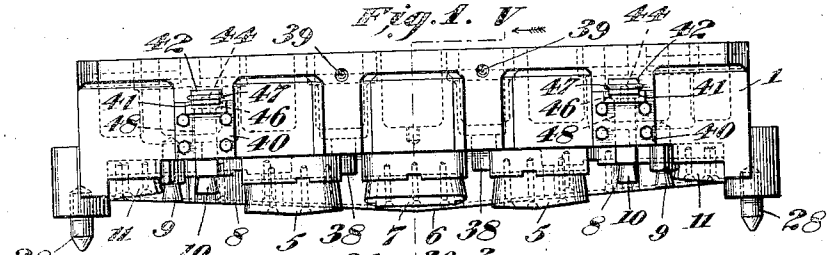


Fig. 2.

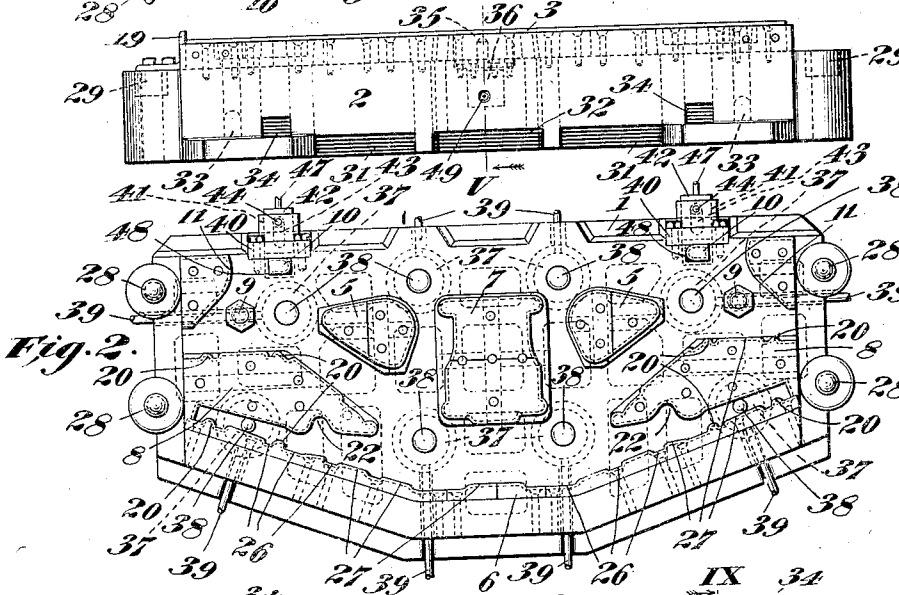
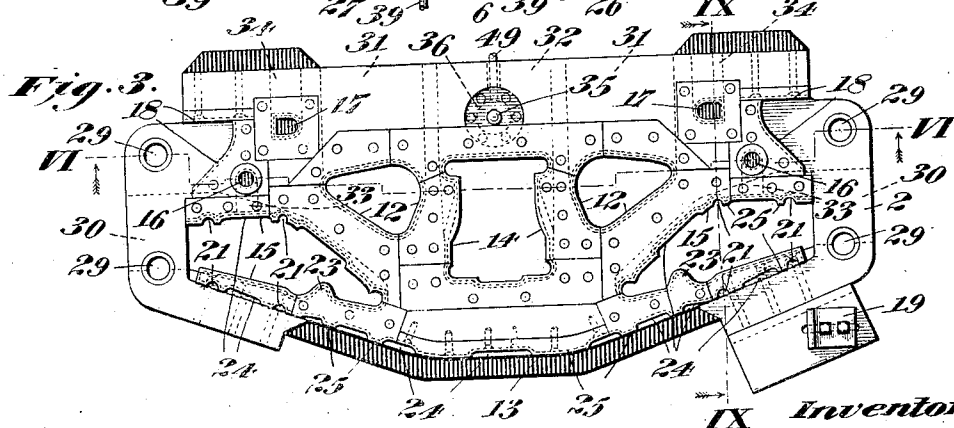


Fig. 3.



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Fig. 4.

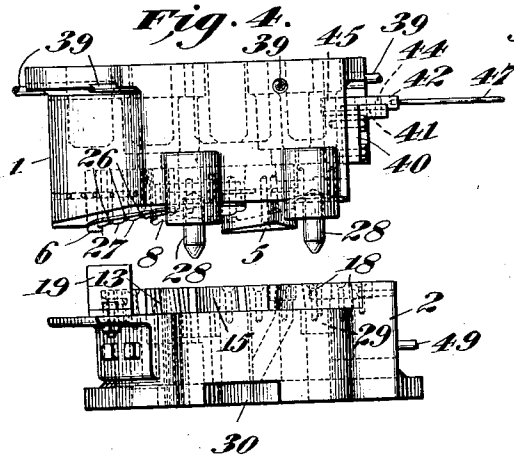


Fig. 5.

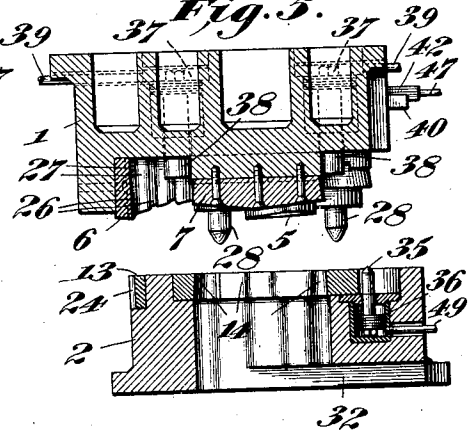


Fig. 6.

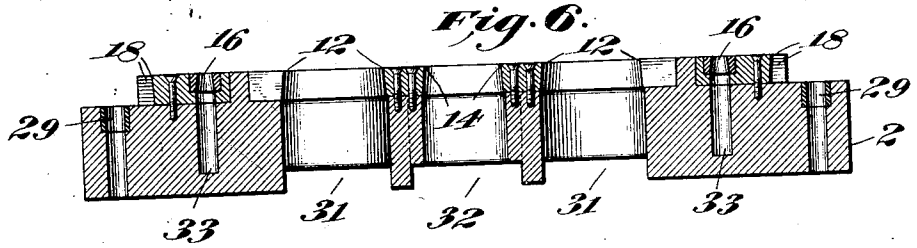


Fig. 7.

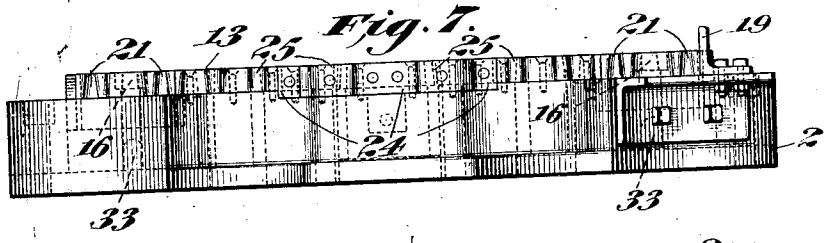


Fig. 8.

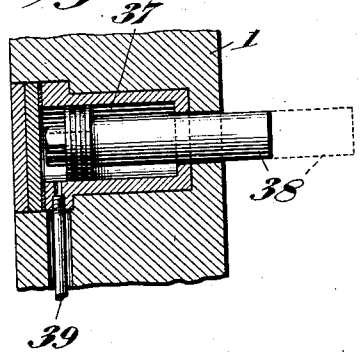
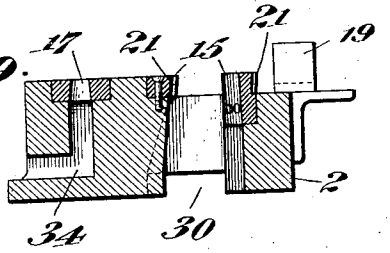


Fig. 9.



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Fig. 10.

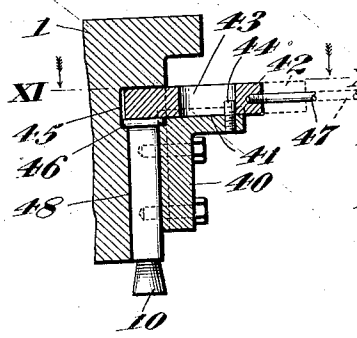


Fig. 11.

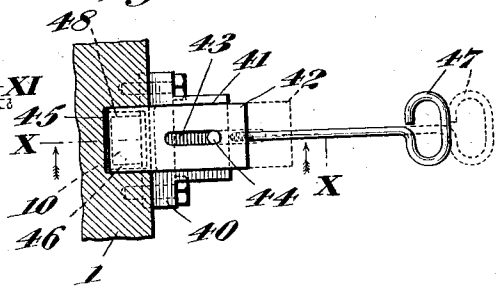
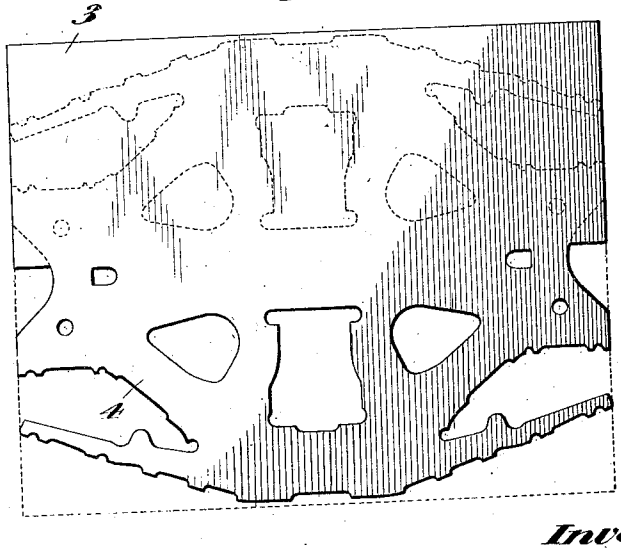


Fig. 12.



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UNITED STATES PATENT OFFICE.

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CUTTING PLATE.

Application filed August 15, 1922. Serial No. 581,930.

Our invention relates to a method of cutting metal and to the apparatus and dies therefor, which comprise portions of the operations and apparatus for shaping a metal plate with particular reference to forming a railway truck side frame of the type generally disclosed in the G. A. Anderson Patent 1,422,074, dated July 11, 1922.

The truck side frame referred to is formed of one metal plate, and all the members thereof are substantially integral, so that the entire truck side frame may be said to be composed of one piece of metal, shaped and formed in its various parts to provide the different members, each of which is adapted to perform its proper functions in use.

The present operation and apparatus, with the exception of providing the plain plate, may be called the primary one. The subsequent steps relate to forming the flanges on various edges of the plate, and then bending it about its intermediate portions until the two sides are at a small angle to each other with the edges of the flanges substantially opposite, this being done in such a manner as to allow the withdrawal of the top bending die, and after this is done the cut, flanged and partially bent plate is placed between a pair of pressing dies and the parts closed so they are opposite each other with certain of their flanges at an approximate predetermined distance apart, after which the contiguous flanges may be welded together as desired.

Our dies may be mounted in any kind of a press, hydraulically operated or otherwise, and provided with beds or platens on which the dies may be attached in such a way as to register accurately with each other during their relative movement.

The present apparatus comprises, among other mechanisms, a pair of dies, the bottom one being preferably known as the female die and the top one the male die, although these are not altogether strictly male and female, as either one or both may have such portions. The male die may preferably be provided with a number of hard steel cutting edges, each arranged at an angle with the metal to be cut, providing a rake or draft to more easily make a shearing cut, and these various steel cutting edges may be of shape and contour to provide openings of the shapes and sizes desired in the plate and to provide the central bolster opening, side openings and other openings between what is eventually the inclined side of the bottom arch member and the integrally formed tie bar member, and also to cut the margins to the conformations desired and to provide holes for welding and for journal box bolts.

The knives are also of such contour as to provide projecting portions at intervals on certain of the plate edges which are eventually to form the flanges with their projecting portions welded together.

In order that the operation may proceed with ease and without any unnecessary expenditure of power, certain of the knives of the top die may lead and operate in advance of the others, so that the operation of cutting all the openings and portions will not be simultaneous, but will be done gradually and in a manner successively.

It should be noted that we prefer to arrange the rake or slope of the cutting knives of the top die in such a way that this rake will substantially extend in both directions from the center, whereby the plate is held centrally and accurately without any tendency to shift, and the cutting knives are also arranged at slightly different elevations so that to a certain extent they will act progressively and gradually in shearing the plate. Of course there are some portions being cut while other knives enter, but in general it may be stated the action is a progressive one. This requires a minimum amount of power and provides clean and workmanlike cuts accurately positioned.

We have also only shown the top knives as provided with a rake, but we may make the bottom knives with a rake and the top knives may be in a substantial plane, but we prefer the reverse, as the plate can be introduced and held on the bottom die more easily when this die is flat or its cutting edges in substantially one plane.

The bottom die is also provided with a plurality of cutting edges or shapes adapted to register with those of the top die, and these cutting edges may be of hard steel secured to the body of the die by tap bolts or otherwise as desired, and may be made sectional. These cutting edges are preferably arranged in a plane.

Central holes are cut in the blank or plate to receive two of the journal box bolts, and

the top knife or punch which forms these may be controlled by a suitable gag, which may be either operated during the first portion of the operation or the subsequent one.

In order to simplify the apparatus we prefer to cut half the rectangular plate at one stroke, and then turn the plate around and cut the other half with a second stroke of the same knives, and the present apparatus is so constructed and arranged.

In order that the cut and punched plate may be released from the cutting dies, we provide a number of plungers in the upper male die which are automatically operated by air or other fluid pressure, and as the pressure of the hydraulic or other press is released, these plungers automatically push the cut and flanged plate from the dies.

In order to accurately locate the plate we provide gauges or stops which are adapted to contact with the edges of the blank to hold it in position.

In order to permit the plate to be easily turned around in order to cut the other half after the first half has been cut, we provide a central rod at about the geometric center of the plate preferably having a conical point around which the plate may be rotated a half turn just prior to placing it in the second position. This rod is adapted to be moved against the plate or withdrawn by fluid pressure, and is consequently adapted to support the plate when desired.

In addition to having automatic pressure operated plungers for automatically stripping the main portions of the plate from the dies, we also provide other strippers which support and lift the integral tie bars from the dies so they are not distorted, all of which will be explained hereafter in more detail.

Having thus given a general description of our invention, we will now, in order to make the matter more clear, refer to the three annexed sheets of drawings, which form part of this specification and in which like characters refer to like parts:

Figure 1 is a front elevation of the top and bottom cutting dies; Figure 2 is a bottom plan view of the top cutting dies; Figure 3 is a top plan view of the bottom cutting dies; Figure 4 is an end elevation of the top and bottom cutting dies; Figure 5 is a vertical transverse sectional elevation of the top and bottom dies; the section being taken on the line V—V of Figure 1; Figure 6 is a longitudinal sectional elevation through the bottom cutting dies taken on the line VI—VI of Figure 3; Figure 7 is a front elevation of the bottom cutting dies; Figure 8 is a detail sectional elevation taken centrally through one of the stripping cylinders; Figure 9 is a transverse sectional elevation through the bottom cutting die taken on the line IX—IX of Figure 3; Figure 10 is a vertical section drawn on a larger scale of one of the punches 10 and the gag 42 taken on the line X—X of Figure 11; Figure 11 is a detail horizontal sectional elevation taken on the line XI—XI of Figure 10, and Figure 12 is a top plan view of a partially cut blank from which the truck side frame is made.

Referring now to the characters of reference on the drawings: 1 and 2 indicate the top and bottom dies generally and respectively, 3 is the rectangular plain plate from which the blank is cut, 4 is the blank cut from the plate, one-half being completely cut as indicated by full lines, while the dotted lines indicate how the remainder is to be cut. 5 are male knife blades for cutting the triangular shaped holes on either side of the bolster opening and as illustrated particularly in Figure 1; these knives are shown to lead or to be in advance of the other knives and are provided with sloping or raked cutting edges adapted to provide a shearing cut. 6 is a knife or shear blade arranged in the top die which cuts the bottom side of the frame to the form shown at the bottom of Figure 12, and this knife is sloping in both directions from the center, as illustrated, in order to make a gradual shearing cut. It will also be noted that this part is provided with indentations and projecting portions in order to provide corresponding portions on the cut blank, the projections being adapted to be welded together to produce a finished frame. This blade 6 in its operation begins to follow the blade 5, starting its cut at the center and cutting in each direction by reason of its double rake. 7 is the male knife in the top die which is adapted to cut the central bolster opening and this knife also has a somewhat tapered or raked cutting edge for reasons previously mentioned. 8 are the male knife blades which cut the openings or spaces between the pedestal tie bar and the outer ends of the bottom arch bar of the completed frame, in which spaces the journal boxes are ultimately adapted to fit. 9 are round punches adapted to make the small round holes in the sides of what is the the top arch bar member, these holes being used for welding reinforcing pieces within the ends of said member. 10 are square punches each with one round end for forming the holes for the journal box bolts near the ends of the arch bar member. 11 are knives for cutting out the notches at the ends of the intermediate portion which ultimately form the top arch bar member. 12 may be called the female knife blades for co-operating with the blades 5 for cutting the triangular shaped holes with round corners on each side of the central bolster openings. 13 is a knife blade for cutting the lower side of the truck frame in co-

operation with the blade 6 previously mentioned. 14 may be called the female set of dies or blades for cutting the bolster opening in co-operation with the male knife 7. 15 may be said to be the female knife blades for cutting the openings which will ultimately receive the journal boxes in co-operation with the male blades 8. 16 are the round dies for punching the round holes in the ends of the arch bars in co-operation with the knives 9. 17 are the female blades or dies adapted to make square holes each with one round end in the ends of the arch bar in co-operation with the punch 10, and 18 may be called the female knife blades adapted to cut out portions of the ends of the top arch bar member in co-operation with the male knives 11. 19 is a gauge or stop adjustably secured to the bottom die holder, whereby the plate may be held in correct position for cutting, and a number of these may be used as desired (not shown). 20 are substantially semi-circular portions of the male cutting blades 6 and 8, each of which is adapted to make one-half of the hole for the pedestal tie bar, and 21 are semi-circular female or die portions of the cutting blades 13 and 15 for co-oprating therewith to produce the results desired. The blade 8 is provided with a recess 22 which is adapted to co-operate with the projection 23 of the blade 13 to produce the projecting rounded portions of the pedestal tie bar. These projecting portions are used in a subsequent operation in order to co-operate with the bending dies and permit the bending of this narrow portion, which could not be otherwise accomplished. The knife blade 13 is provided with a plurality of recesses 24, which produce the notches or indentations and corresponding projections in the pedestal tie bars and bottom member, and 25 are the projections on the knife 13 which produce indentations in the same. Recesses 26 are provided in the blade 6 and projections 27 are also provided thereon which co-operate with the corresponding portions 24 and 25 of the blade 13 to produce the form desired. The top die is provided with dowel pins 28, which have conical lower ends, and these are adapted to fit in corresponding holes 29 in the bottom die in order that the two dies shall register accurately, and the holes 29 may be provided with hard steel bushings, as illustrated. The bottom die is provided with a channel 30 through which the scrap portions cut by the blades 8 and 15 may be removed, and is also provided with channels 31 through which the scrap portions cut by the blades 5 and 12 may be removed. This bottom die is also provided with another channel 32, through which the scrap formed by the blades 7 and 14 may be removed, and channels 33 for removing the scrap cut by the knives 9 and 16, and still other channels 34 through which the scrap cut by the knives 10 and 17 may be withdrawn.

In the mid section of the lower die and at one side of the center of said die, so as to correspond with the geometric center of the blank to be cut we provide a center pin 35 having a conical point, this being secured to a piston mounted in the cylinder 36, which may be supplied with fluid under pressure through the pipe connection 49 and a controlling valve (not shown). We also provide a plurality of stripping plungers 38 mounted in the top die in the fluid pressure cylinders 37, which are provided with fluid under constant pressure and adapted to push the cut plate from the male die when the top cutting die is withdrawn. The pressure in these cylinders is insufficient to withstand that of the press. The fluid pressure cylinders are provided with pipe connections 39, which lead to any source of fluid under pressure, preferably elastic fluid, such as air.

Referring now to the punches 10 which cut the rectangular holes for the journal box holes, each with preferably rounded end, these are provided with brackets 40 having slideways 41 therein, in which are mounted the slidable gags 42. These gags are each provided with a slot 43 and the pin 44, which is mounted in the bracket, projects within said slot. This determines the in and out movements of the gags 42. The top die 1 is provided with recesses 45 adapted to receive the inner ends of the gags, while the punch 10 is provided with a head 46 adapted to rest against the gag or be projected within the recess 45 when the gag is in its inner or outer position. The gag 42 is provided with a rod having a handle 47, whereby it may be placed in or out of operative position as desired. A groove 48 is provided within the top die for receiving the punches 10 and in which groove they are adapted to slide upward or downward. 49 is the fluid supply pipe for the pressure operated cylinder 36, which may be supplied with a three or four-way valve to move the piston rod 35 up or down as desired, this valve being of any of the usual types (not shown).

Having thus given a general description of our apparatus, we will now explain its operation: When the top and bottom dies are in relative open position as illustrated in Figure 1, a rectangular metal plate, such as 3, is introduced therebetween and set against the gauge 19 and other similar gauges (not shown), whereby it is accurately positioned. The platen on which the top die 1 is mounted is then caused to operate to bring the dies together, and the top die is projected against the plate and the

dies or knives 5 first begin to cut the triangular openings in each side of the bolster opening. The blade 6, which next comes into operation, cuts out the bottom portion and the pedestal tie bars, and then the blade 7 begins to operate for cutting the bolster opening, and this is promptly followed by the knives 8, which cuts the spaces for the journal box opening. At or about this time the punches 9 make holes near the top arch bar members, and if the gag 42 is in operative position, the rectangular openings, each with one round end, are formed in the upper portion of what becomes the arch bar member, through which one of the journal box bolts will ultimately pass. These holes cut by the punches 10 may be cut in the first part of the operation, or in the second as desired. By this time the knife blades 11 also cut out parts of the ends of the top arch bar, and each of these knives or plungers mentioned co-operates with a companion knife, knives or dies in the bottom die, as before explained, to make the various cuts. As the top die moves downward the stripper plungers 38 are pushed inwardly, as they are subject to comparatively small pressure as compared with that of the press in general, and when the top knives and punches have passed through the plate the top die is retracted, and the fluid pressure which is constantly acting on the stripper plungers 38 pushes or strips the now-cut plate from the top knives or dies. This cuts one-half the plate, and after this is done the valve-controlled passage 49 is opened, the plunger 35 is lifted, and the plate is supported at about its center on the piston rod 35. It is then turned half around and seated against the gauges again and the operation repeated to cut the other half as indicated by the dotted lines in Figure 12. After this is done the now completely cut and punched plate is removed from the press and another rectangular plate 3 substituted for it and the operation then proceeds as before.

Although we prefer to cut one-half the plate at one time, we wish it understood that we may cut less than one-half or may cut it all. It should also be noted that the half holes are cut in the pedestal tie bar, and when the parts are pressed together these form a complete hole, one-half of which is in each of the contiguous edges of the inwardly projecting flanges of the tie bar.

Although we have shown and described our invention in considerable detail, we do not wish to be limited to the exact and specific details thereof, as shown and described, but may use such modifications in, substitutions for, or equivalents thereof as are embraced within the scope of our invention, or as pointed out in the claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. The method of cutting a blank for a substantially integral truck side frame, which consists in taking a plain plate, introducing it between a pair of dies adapted to substantially simultaneously, but somewhat progressively, cut the bolster opening, the side openings, the journal box openings, the bottom and pedestal tie bar portions thereof, and means for stripping said plate from said dies, without undue distortion.

2. The method of cutting a blank for a substantially integral truck side frame, which consists in taking a plain plate, introducing about one half of it between a pair of cutting dies, the male die being provided with a plurality of cutting edges adapted to follow each other at one stroke of the cutting machine, then turning the plate and cutting the other half, and automatic means for stripping the cut plate from the male dies.

3. The method of cutting a blank for a substantially integral truck side frame, which consists in taking a plain rectangular plate, introducing about one-half of it between a pair of cutting dies, the edges of the female dies being substantially plane, and some of those of the male die being provided with raking or inclined edges adapted and so arranged with different amounts of projection as to produce a successive series of cuts, then raising the plate on a pivot, turning it half way round, and similarly cutting the other side, certain holes at the center of the plate being cut at one of the operations, but not at the other.

4. In an apparatus of the character described, a bottom shear knife provided with a plurality of openings therein surrounded by sectional cutting knives with their working edges in substantially one plane, a plurality of male knives corresponding to the other knives aforesaid, some of which are provided with raking cutting edges so arranged as to successively follow each other in operation.

5. In an apparatus of the character described, a bottom shear knife provided with a plurality of openings therein provided with and surrounded by sectional cutting knives with working edges in substantially one plane, a plurality of male knives corresponding to the other knives aforesaid, some of which are provided with raking cutting edges so arranged as to successively follow each other in operation, and means for maintaining the registry of said knives.

6. In an apparatus of the character described, a bottom female cutting die with openings therein corresponding to the bolster opening, side openings, journal box openings, journal box bolt holes, and cut-

away portions of the top arch bar of a truck side frame, a top die comprising a plurality of male cutting edges adapted to co-operate therewith, preferably formed with raking cutting edges, and means for relatively moving said dies.

7. In an apparatus of the character described, a bottom female cutting die with openings therein corresponding to the bolster opening, side openings, journal box openings, journal box bolt holes, and cut-away portions of the top arch bar of a truck side frame, a top die comprising a plurality of male cutting edges adapted to cooperate therewith, preferably formed with raking cutting edges, means for relatively moving said dies, and for automatically stripping the cut plate therefrom.

8. In an apparatus of the character described, the combination with the bottom die of a fluid pressure cylinder and piston therein below the blank to be cut, a piston rod adapted to be projected outwardly through the face of the die, and means for operating the piston, whereby a plate may be raised on said rod as a pivot and turned around.

9. In an apparatus of the character described, a bottom die provided with a plurality of cutting openings therein provided with and surrounded by cutting knives substantially arranged with their cutting edges in a plane, another die composed of a plurality of male cutting knives, some of which are provided with raking cutting edges adapted to progressively cut the plate outwardly in both directions from the center, whereby accuracy is assured and the cut is gradually made therefrom.

10. In an apparatus of the character described, a bottom die provided with a plurality of cutting openings therein provided with and surrounded by cutting knives substantially arranged with their cutting edges in a plane, another die composed of a plurality of male cutting knives, some of which are provided with raking cutting edges adapted to progressively cut the plate outwardly in both directions from the center, whereby accuracy is assured and the cut is gradually made therefrom, and means for insuring the registry of said dies.

In witness whereof we hereunto affix our signatures.

LINDSAY C. PRITNER.
HENRY C. DORRIS.