May 14, 1929. G. LANGFORD 1,712,506

MEANS FOR REFORMING WORN ANGLE BARS

Filed July 16, 1926 5 Sheets-Sheet 1

Fig. 1.

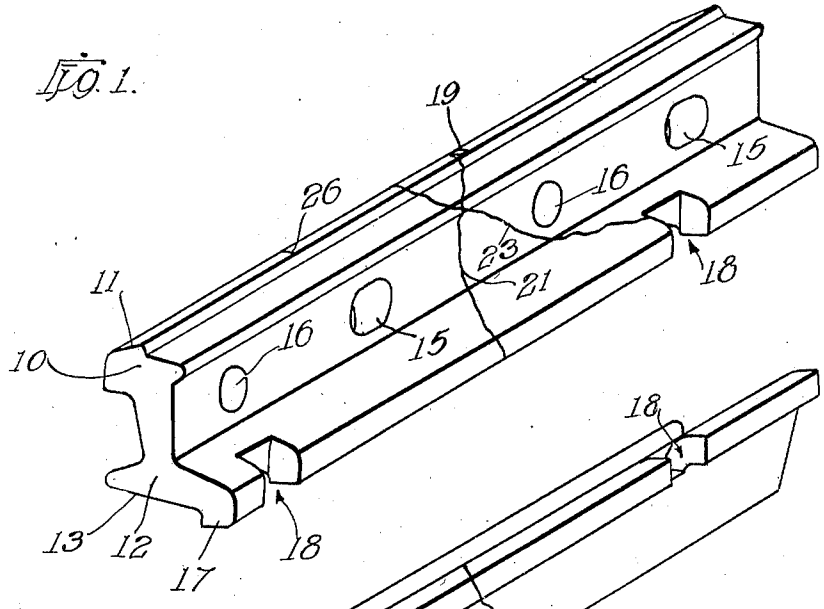
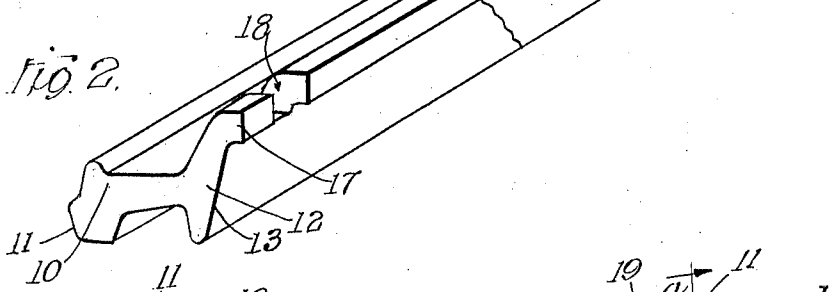


Fig. 2.



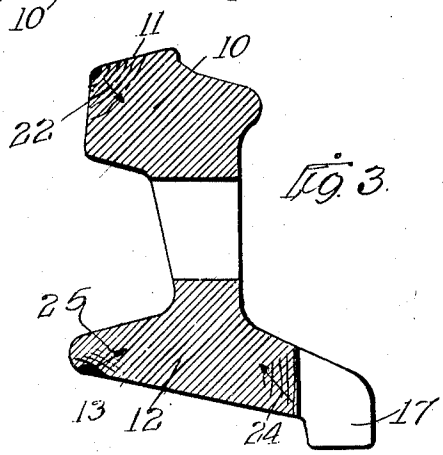


Fig. 3.

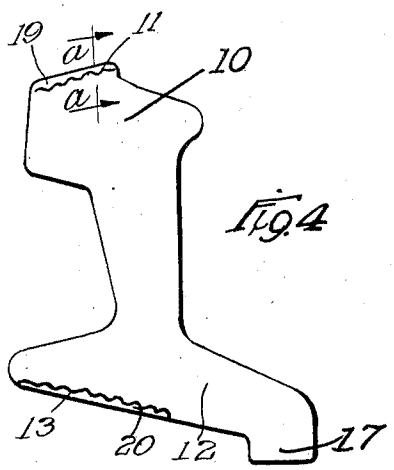


Fig. 4

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May 14, 1929. G. LANGFORD 1,712,506

MEANS FOR REFORMING WORN ANGLE BARS

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Fig. 5.

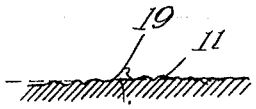


Fig. 6.

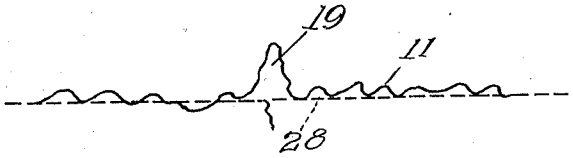


Fig. 7.

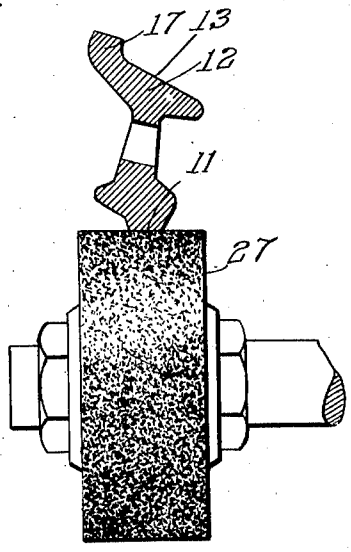
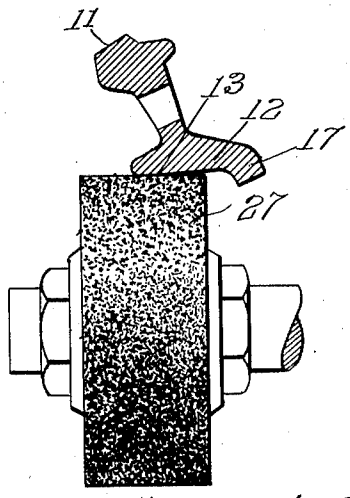


Fig. 8.



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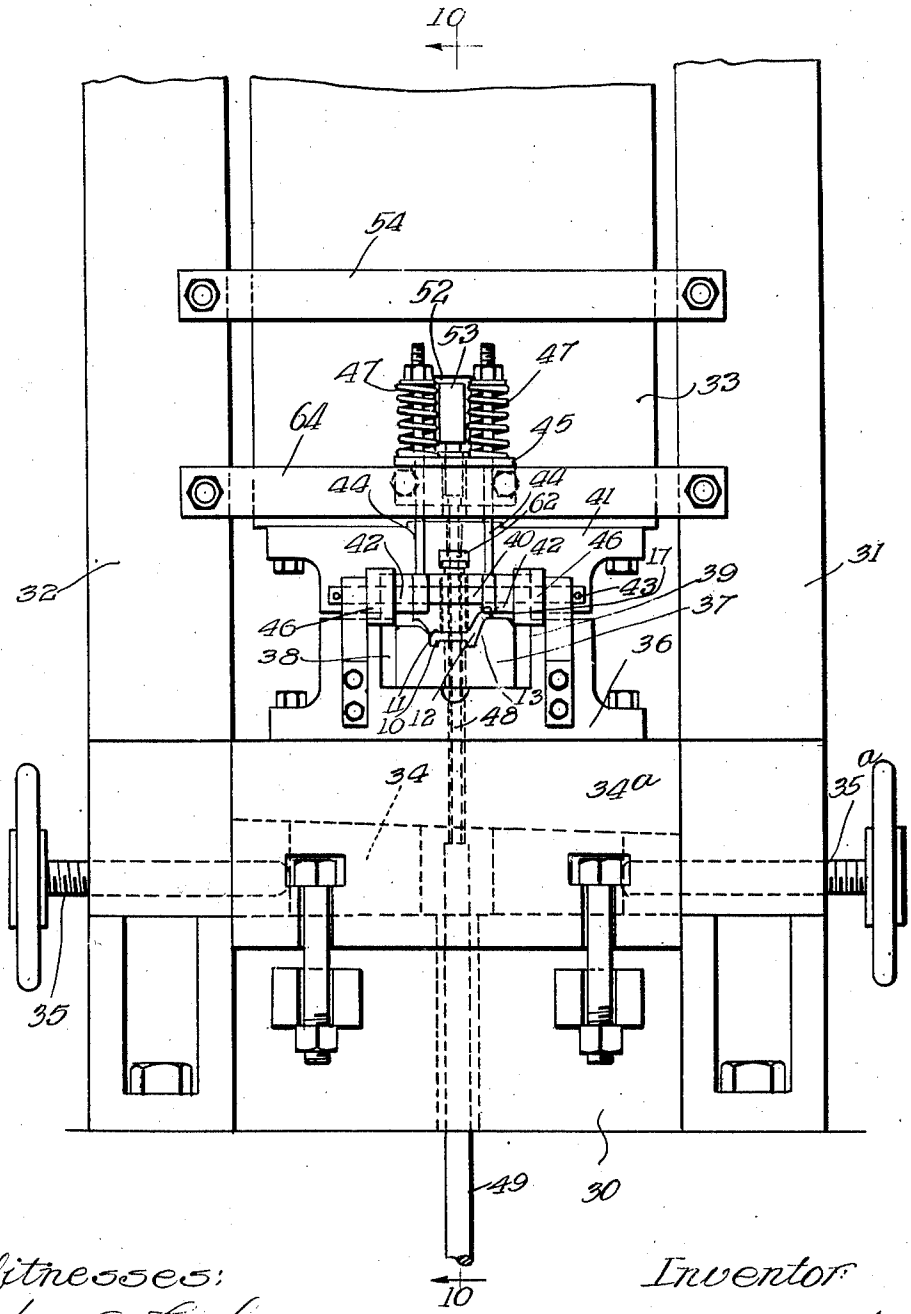
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May 14, 1929. G. LANGFORD 1,712,506

MEANS FOR REFORMING WORN ANGLE BARS

Filed July 16, 1926 5 Sheets-Sheet 3

Fig. 9.



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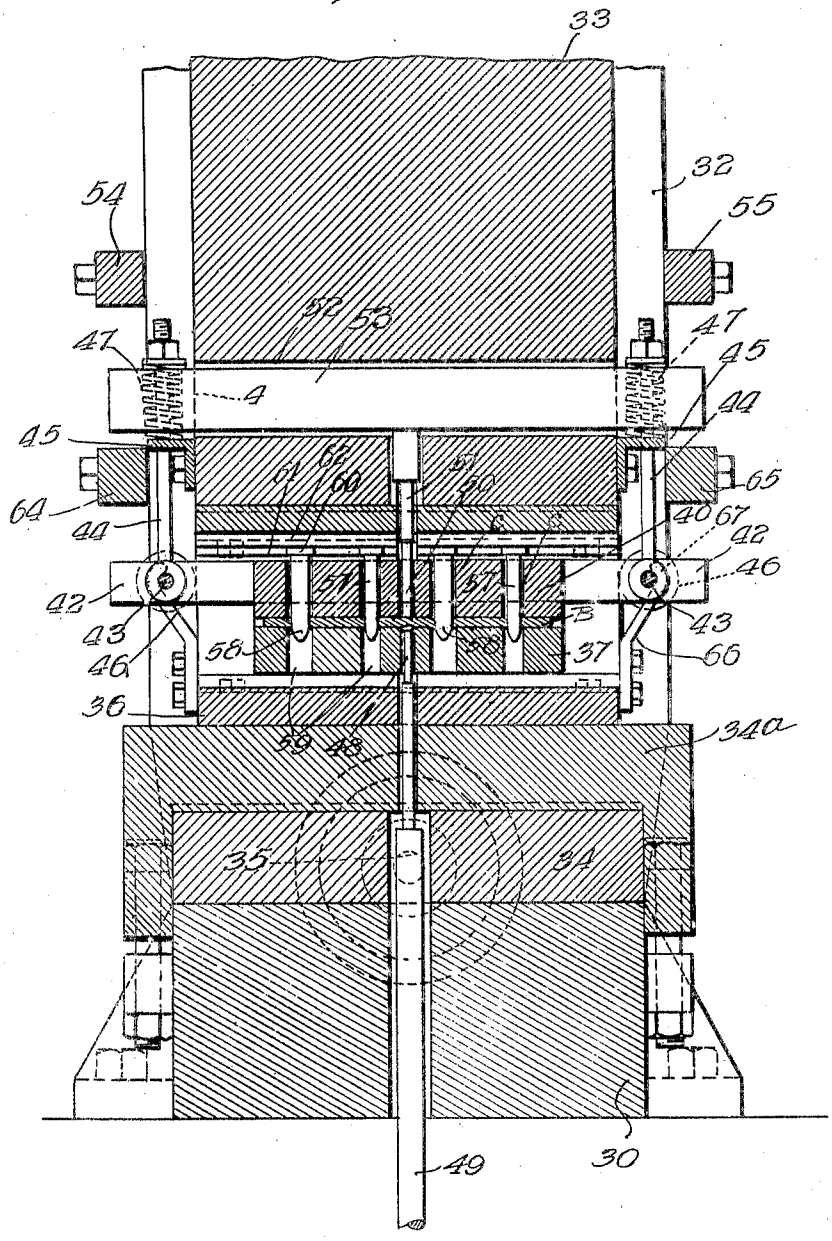
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MEANS FOR REFORMING WORN ANGLE BARS

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Fig. 10.



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May 14, 1929. G. LANGFORD 1,712,506

MEANS FOR REFORMING WORN ANGLE BARS

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Fig. 11.

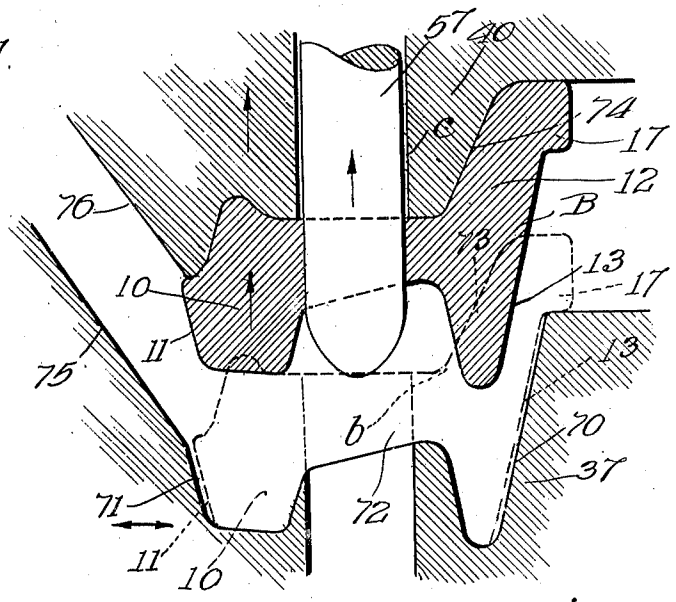


Fig. 12

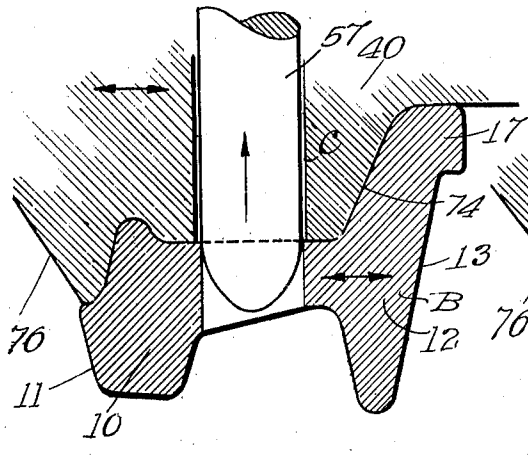
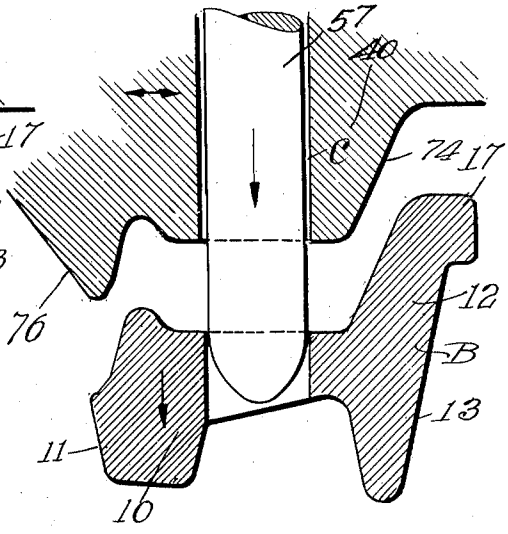


Fig. 13



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UNITED STATES PATENT OFFICE.

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MEANS FOR REFORMING WORN ANGLE BARS.

Application filed July 16, 1926. Serial No. 122,864.

The present invention relates generally to the reconstruction of worn angle bars. It has particular reference to a process of treating the worn bars to remedy various defects therein and to disclose hidden flaws or defects which, if unknown, would impair the utility of a reconstructed bar. It also has particular reference to apparatus used in the reconstruction, which performs part of the general process, and which, in itself, involves novel features particularly related to the process.

The type of bar referred to is that more commonly known as fish-plates for rail joints. Each rail joint is commonly supplied with two such plates or bars, each presenting wedge surfaces to the head and flange of the rail. Both plates are bolted together through the rail web. The construction is such that the rails and plates have registering holes for the clamping bolts.

In spite of the use of such plates the joint cannot be made as rigid as any portion of a single rail. No portion of the rail is perfectly rigid and the heavy loads, concentrated at single travelling points, cause the rail to flex. The ends of the rail are most subject to flexing, and the sudden transfer of a load by the passage of a car wheel from one rail to another causes rapid and violent relative motion of abutting rail ends past each other. This motion causes the fish plates to oscillate to a slight extent, rubbing on the moving rails.

The rubbing of the parts wears down the wedging surfaces, necessitating tightening of the clamping bolts. The strains on the plate also tend to open up cracks, seams, flaws or other defects causing breakage of the plates. Hence it is dangerous to have hidden defects in the plates. The rail ends ordinarily are spaced apart, and the parts of the plate overlying the space are not worn away, leaving a projecting ridge or lip in the otherwise worn surfaces. The wearing away, the cracking, the lip formation, and defects of corrosion, are all conducive to impairing the proper functions of the plates and necessitate their replacement.

These worn plates however, contain substantially all the initial metal and retain their general initial form. The apparent defects are practically superficial so that the worn plate provides a skeleton and also a mass of metal for rebuilding it into a useful form.

The general object of the present invention is to provide a process of reconditioning and reforming worn plates.

A particular object of the invention is to reduce the worn and corroded surfaces to an even clean metal surface prior to reforming.

A further object of the invention is to grind away parts of the worn plates in search of hidden defects such as seams, cracks and flaws.

Still another object is to remove metal in the vicinity of such defects and to replace it, if necessary, by welding in a new supply, closing the defect.

Still another object is to subject the resurfaced or repaired plate to a hot die pressing operation to spread out the metal into the form required for new plates.

Still another object of the invention is to provide for maintaining, or enlarging, the bolt holes of the plates during the die stamping operation.

A further object is to provide a press particularly adapted for the peculiar operations employed in reforming the plates.

Another important object of the invention is to provide a die movable in one direction by applied pressure so arranged that it exerts pressure laterally with respect to the applied pressure.

A particular object is to provide stripping mechanism for removing the reformed plate from the dies and hole-forming pins.

Other and ancillary objects and advantages of the invention will be apparent from the following description of the invention as set forth in connection with the accompanying drawings in which

Figs. 1 and 2 are perspective views of worn angle bars or plates;

Fig. 3 is a cross section of a worn bar through a bolt hole;

Fig. 4 is an end view of a worn bar;

Fig. 5 represents a fragmentary longitudinal cross sectional view of a worn rail as taken on the line a—a of Fig. 4;

Fig. 6 is an enlarged view of Fig. 5 showing the level to which the surface is reduced in the process;

Figs. 7 and 8 show respectively the manner in which the head and flange wedge sur-

faces are ground down to the level indicated in Fig. 6;

Fig. 9 is a front elevation of a die stamping machine which reforms the bar.

Fig. 10 is a cross section of the machine on the line 10—10 of Fig. 9;

Figs. 11, 12 and 13 show successive positions in stripping the reformed bar from the forming parts of the machine.

It is to be understood that the invention is susceptible to various modifications and departures differing from the steps and apparatus herein disclosed. Consequently, the detailed description hereinafter following, and given only by way of explanation, is not to be construed as a limitation of the invention short of the scope of the appended claims.

The following description is directed to the method of treating the type of bar shown in Figs. 1 to 4, inclusive. The bar has a rail-head-engaging portion 10 with a wedge surface 11 and a rail-flange-engaging portion 12 having a wedge surface 13, it being understood that the wedge surfaces 11 and 13 are to be considered as such, by reference of one to the other. The body or web section of the bar is designated as 14 and is provided with bolt holes. In the present instance a four-hole bar is illustrated, alternate holes 15 being elliptical and the other holes 16 being round. The rail-flange-engaging portion 12 has a downwardly extending flange 17, both parts being cut away to provide spike-slots 18.

Such a rail, when in the condition herein referred to as "worn," has the wedge surfaces 11 and 13 worn down irregularly and also pitted by corrosion. This is generally indicated in Figs. 4, 5 and 6, the wavy line being designated by the numeral indicating the surface, namely 11 and 13. The portions designated 19 and 20 are respectively the lips in surfaces 11 and 13, which remain as unworn portions by reason of their having been placed over the gap between abutting rail ends. This irregularity of the surface renders it difficult to place a heated worn rail directly in forming dies to spread the metal to the desired form.

It is essential that the finished wedge surfaces be perfectly smooth with precise angles and proper distances between them so as to make full contact with the corresponding surfaces of the rail and to permit drawing up the bars. In order better to produce the smooth surface, the bar is ground prior to reforming. This procedure assures that the worn plate fits in the die properly prior to the reforming. While it removes a certain amount of metal which might otherwise enter into the reformed bar, it has the advantage of presenting a clean metal surface free from pits and irregularities. Such a surface presentation is desired because it will immediately indicate flaws or cracks which otherwise would remain hidden.

The reforming of plates is an economical procedure and should, of course, produce reliable reformed bars. If the process were so conducted that hidden defects could not be observed or deflected, the merits of reforming operations would be questionable. It has been found that a considerable proportion of "worn" plates or bars contain cracks. Bars with cracks visible to the eye have been discarded as scrap and not reformed. However, plates with hidden cracks might be reformed and thereby contaminate the whole lot. A hidden crack may be large or small, but in either case it is subject to extension in use, and this results in breaking the bar. The larger the crack the earlier the bar will break. Incipient cracks are difficult to detect in the "worn" bars, but on grinding away the metal to present a smooth surface they become readily visible.

The most common crack has been found near the lip 19 and this extends in use substantially as indicated by the line 21, Fig. 1. It is shown in its incipient stage by the arrow 22 in Fig. 3. Another type of crack is one extending from a spike slot 18 diagonally of the bar as indicated by line 23, Fig. 1. In its incipient stage it is shown at 24, Fig. 3. Still another type is shown at 25 in its incipient stage in the rail-flange-engaging portion. The cracks, however, are subject to occurrence anywhere as for example at 26, Fig. 1.

The present process aims to repair bars having apparent and hidden cracks, in the second instance, by exposing them, and in both instances by destroying them, either by slight metal removal, or by a more extended metal removal with the subsequent supply of new metal welded in. In Figs. 7 and 8 there is shown a grinding wheel 27 as it is positioned with reference to the wedge surfaces 11 and 13 to smooth them down to the level 28, Fig. 6. Incipient cracks disclosed in the fresh metal surfaces can be ground out clean, this being the case if they are very small. If they are very large, it is desirable to grind them out until the crack is removed or its surface well cleaned, and then to fill the gap thus made with metal welded to the body. By this grinding process the bars are prepared for inspection and repair, and the repaired bars are made reliable upon reforming between dies. This process not only saves bars known to be cracked which would otherwise be scrapped, but it also exposes hidden defects which might otherwise escape notice, thereby permitting them to be repaired and the bars to be reliably reformed.

The machine in which the prepared bar is die pressed is adapted to expand the worn bar to fill a die by spreading the residual

metal. A particular feature of the machine is the application of pressure in one direction to expand the bar in a substantially right angular direction. Another feature of the machine is the provision of means for determining the accurate form, size, and location of the holes in the bar. Still another feature is a die-stripping mechanism.

The spreading of the bar between two dies normally tends to distort the holes both in size and in relative location. When the extent of required deformation increases, a greater pressure is applied on the bar by the dies. This tends to close the holes. However, a considerable tolerance in size of holes is allowed in bars, so that slight closing, or even slight shifting of location, can be permitted. Sometimes larger holes are desired in the bars than were originally provided, and in such cases the tendency to close or shift the holes is undesirable. Furthermore, the closing of holes uses a certain amount of metal which could more beneficially be directed away from the holes toward the wedge surfaces. Consequently, the machine embodies pins which act as a part of the die in forming or preserving bolt holes of the desired size and at the desired location.

The use of pins adds greatly to the tendency of the bars to adhere to the die having the pins. The machine therefore embodies stripping means, and preferably employs pins movable relative to the dies as a part of the stripping means.

The dies are embodied in a machine comprising a base 30, two uprights 31 and 32, and a vertically movable crosshead 33. Upon the base there is a horizontally slidable wedge 34 fixedly positioned between adjusting screws 35 and 35a. A wedge-shaped bolster plate 34a is employed to engage the wedge 34 for vertical adjustment thereby. Upon the bolster plate, a die holder 36 is fixedly mounted. A lower die 37 is locked in the die holder between a plate or block 38 and a longitudinal wedge 39.

The parts above described are considered as fixed, and another die 40 is movable toward it, being carried by the cross-head 33. A die holder 41 is bolted to the cross-head, but the upper die 40 is not fixedly mounted in said holder. The upper die 40 is narrower than the lower die 37 and is positioned between two stripping bars 42 rigidly secured to the die. The bars have ends extending beyond the uprights 32 of the machine as shown in Fig. 10. The die 40 is held resiliently against the bottom of the die holder by a spring suspension of the stripping bars 42. A suitable means for so suspending the die comprises a cross rod 43 between adjacent ends of bars 42 forming a rectangular frame. Each rod 43 is suspended by a pair of hangers 44 vertically movable through a guide in the form of a shelf 45 carried by the crosshead 33. Rollers 46 are mounted on the rods 43 to bear against the die holder. Between the shelf and the headed end of each hanger, there is a coiled spring 47 surrounding the shaft of the hanger.

The machine is also provided with knockout means to free the work piece from the dies. The lower die has a knock out pin 48 operated by a rod 49 passing downwardly through the die holder and the base. The upper die has a similar knockout pin 50 operated by a rod 51 passing upwardly into the cross head to a transverse hole 52 therein. Through the hole 52 a bar 53, joined to the operating rod 51, has its ends projecting from the crosshead so as to be struck by parallel cross bars 54 and 55. As the die travels up, the knockout pin becomes stationary, freeing the work piece from the die.

The above described knockout mechanism is satisfactory for that character of work in which no special provision is made for reforming the bars with the holes arranged according to specifications. As above mentioned, pins are employed for accurately producing the holes. But the use of pins renders useless the knockout mechanism above described, because the bars adhere tenaciously to the pins. In order to overcome this difficulty the pins are so arranged and operated that they form a part of the stripping or knockout mechanism and therefore they perform a double function.

A four hole bar B is shown in the press between dies 37 and 40. Round pins 57 and oval pins 58 are shown piercing the bar B. The pins are associated with the upper die and move downwardly with it entering holes 59 in the lower die. All the pins are round pointed to aid in forming the holes in the bar. The pins are mounted so as to be movable relative to the upper die, and in the present construction are carried directly by the crosshead. Each pin has a head 60 thereon which rests in a slot 61 formed in the upper part of the die holder 41. A removable bar 62 holds the pin heads down in the slot.

Relative movement of the pins and the die 40 is produced by arresting the upward motion of the die while permitting the pins to be carried by the crosshead. This is readily obtained by providing a stop for the resiliently mounted die. The stop comprises bars 64 and 65 on opposite sides of the uprights 33 in the path of the ends of stripping bars 42 carrying the die 40.

The stripping action is shown in Figs. 11 to 13. The work piece may adhere tenaciously to the pins and also adheres to die 40. Upon upward movement of the crosshead the bar B, the upper die 40, and the pins, move together, stripping the bar B from the lower die 37. When the stripping bars 42 strike the stop bars 64 and 65 the die 40

comes to rest and the pins continue as shown in Fig. 12 until the pins and bar B separate. The bar may drop or it may still adhere to the upper die. It has been found that when the bar is ribbed longitudinally its adherence to the upper die is greatly increased. Upon downward movement of the crosshead the pins entering the holes in the bar do so against resistance and will free the bar from the upper die as shown in Fig. 13.

The continued association of the hot bar B with the upper die in the stripping process above described, tends to overheat the die. To prevent this an additional means is employed which performs the stripping action earlier in the upward stroke. In the present instance the device is arranged to hold the dies substantially together while the pins are withdrawn. Spring latches 66, four in number, are arranged to hold the upper die impositively while the crosshead and pins move upwardly. Each latch comprises a resiliently projecting hook 67, semi-circular in shape to engage a rod 43. The latches are mounted on the lower die holder 36. The release of the latch is effected by the springs 47 reaching their limit of compression so that a positive pull by the crosshead draws the rods 43 away from the latches. The action of stripping is the same as above described except that it occurs earlier in the stroke. There is an additional advantage, however, in this form. It will be recalled that it is the relative movement of the pins downwardly relative to the die 40 which releases the bar B from the upper die 40. With the spring latch stripper, this relative movement is obtained by the spring return of the die, upon release, past the upwardly moving pins. Thus the bars B are stripped prior to the completion of the upward stroke and a more efficiently timed operation can be effected.

In using the spring latches as the stripping means, it has been found that they are not so positive in action as the first described stripper including the stop bars 64 and 65. In consequence, the latch is used in conjunction with the stop bars, so that when a bar B is not stripped during the quick return of the upper die, it will be stripped by the other stop means. In case the holes in the bar are so large that the desired friction of the pins reentering the bar does not free the bar from the upper die, the knock-out pin 51 can be made to free it by providing a suitable abutment for the bars 42. Thus some one of the stripping devices will free the work from the dies, the last to operate being most positive and the first to operate being the least positive. It is mentioned particularly that the single knockout pin is insufficient in area to overcome adherence to the pins when such adherence is great; but this is immaterial since the pin stripping mechanism becomes more positive in action by reason of greater friction, the greater the adherence to the pins. Consequently, when there has been failure of either of the pin stripping mechanisms, it is due largely to the fact that the pins were not necessary for that particular bar. In this case the knock-out pin 51 performs its function as if the pins were not employed. It is to be understood that the latch device and the positive stop device might be used independently, but by using them together a more reliable operation is effected.

Another feature of the die press is the conversion of vertical die pressure to lateral pressure. This is explained partially by reference to Figs. 11 to 13, inclusive. The bar B is so positioned between the dies that the wedge surfaces converge downwardly. The object of the die-pressing is to reform the bar by spacing the wedge surfaces 11 and 13 further apart at the proper angle. The dies of course determine the limits. This requires a lateral spreading, while the die holder 41 exerts only vertical pressure.

The construction above described is conducive to giving the upper die 40 some slight play laterally parallel to the bars 54, 64 and rods 43. This is desirable and contributes largely to the conversion of vertical pressure to lateral pressure. Another contributory factor is the form of the bar, and still another is the design of the registering surfaces of the upper and lower dies. The relations will be clear from the following combined description of the parts and of the operation.

Since lateral motion of the die 40 is desired, and since the pins 57 and 58 are rigidly related to the cross head, the holes in die 40 through which the pins move are provided with a clearance *c*, thus permitting slight relative motion.

In Fig. 11 the lower die 37 is shown containing a worn bar therein represented in dotted lines by the letter *b*. There are shown spaces 70 and 71 representing the deficiency in size of the bar which is to be remedied by reforming. The spaces 70 and 71 are of course exaggerated for facilitating the explanation. The hole 72 is similarly shown enlarged by wear. It will be observed that the bar has an upstanding flange presenting an inclined surface 73. As the upper die descends its side 74 strikes the surface 73 throwing the die to the left, which is permitted by the play. The pins 57 and 58 hold the bar B stationary. The die in moving to the left also engages the rest of the metal and carries it to the left and downward, thus exerting an angular thrust thereon to spread the metal to the left. The lower and upper dies are constructed with upwardly inclined registering surfaces 75 and 76, which are substantially symmetrical, with respect to a vertical axis, with the in-

clined surfaces 73 and 74. Thus when the dies strike they are somewhat laterally offset and the surfaces 75 and 76 come again into alinement as the stroke is completed, imparting a right hand thrust to the upper die, thus filling the gap 70. By this construction it will be seen that the metal is given in addition to the vertical squeeze, a left hand squeeze and also a right hand squeeze, one being induced by the yieldable work and the other by the die. These squeezing actions tend to fill the die parts to reform the metal, and also cause the large hole 72 to be reduced and limited in size and location by the pins 57 and 58. The side thrust of the die is especially important in reforming the flange-engaging portion of the bar. It will be observed that this portion is substantially vertical in the dies and that the gap 70 is relatively long. Mere vertical pressure from the upper die cannot be wholly depended upon for this part of the reformation. Hence the lateral thrust plays a most important part in the reforming operation.

While the present invention has particular utility in improving the reformation of the flange engaging portion 12 of the bar, which has heretofore probably been the most difficult portion to reform properly and accurately, it is to be understood that the relative lateral movement of the dies with the angularly disposed die forming surfaces between which the angular portion of the bar or other stock is disposed and die formed may be used, and the advantages thereof obtained with other angular portions than the particular flange engaging portion 12. For example, the angular head portion or any other angular portion of the bar may be reformed in this manner. The angular portion might be oblique, at substantially right angles or at substantially any other angle. In operation, the flange or other angular portion of the bar is thus spread or displaced slightly to fill the space 70, which results in accurately reforming this portion of the bar. The two dies have movement toward and away from each other and have die forming surfaces cooperable in substantially the direction of movement of said dies toward each other, one of the dies has a die forming wall angularly disposed relative the first die forming surfaces, the other die has a die forming wall also angularly disposed with reference to said die forming surfaces and adapted for the reception of the angular portion of the stock between it and the first angularly disposed die forming wall and the dies have relative lateral movement with means for causing relative lateral movement of the dies to bring the angularly disposed die forming walls together substantially laterally upon the angular portion of the stock. More specifically, one die has means forming a recess and the other die has a portion co-operable with the bottom of the recess, the dies being adapted to receive stock with an angular portion of the stock between them with the angular portion extending along the side of the entering die and between said side and the adjacent side of the receiving die and the dies having relative lateral movement with means for causing relative lateral movement of the dies to bring the sides of the entering and receiving dies together substantially laterally upon the angular portion of the stock. These are important aspects of the present invention. Further aspects reside in the provision with the foregoing of the relative lateral offsetting of the dies and the bringing of the dies into alignment, the co-operation of the dies, one with the other, for producing the relative lateral movement, the initial setting movement and the bolt hole forming provision with the relative lateral die forming movement of the dies.

I claim:—

1. A die-press for reforming worn angle bars comprising in combination, two relatively movable dies, pins associated with one die for accurately forming holes in the bars, said pins being movable axially relative to the die, resilient means arranged between the pins and the die, means for moving the die and pins together, the die being moved impositively through said resilient means, retaining means for the die, whereby moving the pins withdraws them from a pressed bar held by the retained die, and means for releasing the die from said retaining means after a predetermined travel of the pins, whereby the resilient means moves the die in the direction of the moving pins.

2. A die-press for reforming worn angle bars comprising in combination, two relatively movable dies, pins associated with one die for accurately forming holes in the bars, said pins being movable axially relative to the die, resilient means arranged between the pins and the die, means for moving the die and pins together, the die being moved impositively through said resilient means, retaining means for the die, whereby moving the pins withdraws them from a pressed bar held by the retained die, means for releasing the die from said retaining means after a predetermined travel of the pins, whereby the resilient means moves the die in the direction of the moving pins, and positive stop means for the moving die to limit its motion during the motion of the pins, said stop means acting against the resilient means.

3. A die-press for reforming worn angle bars comprising in combination, a fixedly mounted lower die, an upper die, a vertically movable member associated with the upper die, a resilient suspension mounting the

die on the under side of said member for relative vertical motion, pins carried by said member and projecting through holes in the die, and stop means to hold the die against motion with said pins on withdrawing the vertically movable member from the lower die.

4. A machine of the character described having two relatively movable dies, pins mounted for movement through one die in the direction of die movement, a resilient mounting between said die and the pins, a resilient impositive latch for holding one die near the other die against said resilient means on withdrawal of the pins, means positively to act on said die to release it from the latch, whereby the released die moves relative to said pins, to effect stripping the work from the die by said pins.

5. A machine having two dies movable relatively to each other and a punch pin associated with one die and reciprocally related to the second die, stripping mechanism comprising in combination, means to hold the two dies substantially together during withdrawal of the reciprocal pin from the dies, resilient means to move the first die on to the pin during the withdrawal stroke, whereby the pin on entering the die may strip the work from the die, and positive stop means for the first die adapted to hold said die stationary during the completion of the withdrawal stroke of the pin and for a part of the advance stroke of the pin, whereby the pin on the advance stroke enters the die and strips the work from the die which may not have been stripped by the two first named means.

6. In a die press, a means for converting pressure in one direction into pressure in a substantially right angular direction, comprising, in combination, a fixed die, a companion die loosely mounted for slight lateral movement, said dies being adapted to receive stock forming yielding means positioned in the path of the loose die adapted to off-set said die laterally in one direction, and fixed means positioned in the path of the off-set die to thrust said die in the opposite direction into true alinement with the fixed die, the side thrusts of the die serving to spread the material between the dies in the direction of said thrusts.

7. In a die press a means for converting pressure in one direction into pressure in a substantially right angular direction, comprising, in combination, a fixed die, a companion die, one of said dies being loosely mounted for slight lateral movement, means positioned to off-set the dies on relative approach, and other means positioned to aline the offset dies.

8. In a die press a means for converting pressure in one direction into pressure in a substantially right angular direction, comprising, in combination, a fixed die, a companion die, one of said dies being loosely mounted for slight lateral movement, said dies being adapted to receive stock forming yieldable means positioned to offset the dies on relative approach, and other means positioned to aline the offset dies, said alining action taking place against said yieldable means.

9. In a die press a means for converting pressure in one direction into pressure in a substantially right angular direction, comprising, in combination, a fixed die, a companion die, one of said dies being loosely mounted for slight lateral movement, said dies having associated cooperating parts adapted to compel alinement on die-closure, and means adapted to offset the dies on die approach, whereby a lateral thrust is produced in one direction followed by a thrust in the reverse direction.

10. In a die press a means for converting pressure in one direction into pressure in a substantially right angular direction, comprising, in combination, a fixed die, a companion die, one of said dies being loosely mounted for slight lateral movement, said dies being adapted in form to act upon a work piece presenting a surface angular to the direction of die approach, whereby said surface acts to off-set the loose die laterally, and means positioned to move the offset die into alinement against said work piece whereby to apply lateral pressure on said surface.

11. In a die press a means for converting pressure in one direction into pressure in a substantially right angular direction, comprising, in combination, a fixed die, a companion die, one of said dies being loosely mounted for slight lateral movement, a pin associated with the loose die, said loose die having a recess therein for said pin providing a clearance to accommodate the lateral movement of said die, means positioned to offset the dies on relative approach, and other means positioned to aline the offset dies, said pin serving to hold a work piece fixed with respect to the fixed die, whereby said loose die squeezes the work piece first laterally in one direction and then in the opposite direction.

12. In a die press a means for converting pressure in one direction into pressure in a substantially right angular direction, comprising, in combination, a fixed die, a companion die, one of said dies being loosely mounted for slight lateral movement, said dies being adapted in form to act upon a work piece presenting a surface angular to the direction of die approach, a pin associated with the loose die, said loose die having a recess therein for said pin providing clearance to accommodate the lateral movement of said die, the pin serving to hold the work

piece fixed with the fixed die, and said surface of the work piece serving to offset the loose die laterally, whereby to squeeze the work piece in the direction of the offsetting thrust, and means adapted to aline the off-set dies, whereby to impart a thrust in the other direction to squeeze the metal in the direction of the second thrust.

13. In combination, a pair of forming dies for reforming a worn rail joint bar, pins for conforming the bolt holes to predetermined size and spacing cooperating with said dies, means for inserting the pins in the bolt holes and closing the dies upon the bar to be reformed, said means being adapted for withdrawing the pins from the bar while the bar is in contact with one of said dies, said means also moving the pins and one of said dies in unison to withdraw the bar from the other die and cooperating means for effecting relative movement of the pins and pin die for effecting a relative thrust of the pins toward the bar to remove it from contact with the latter die.

14. In a die press, means for converting pressure in one direction into pressure in a substantially right angular direction, comprising, in combination, two dies having relative movement one toward and away from the other, one of said dies being mounted for slight lateral movement, means positioned to off-set the dies on relative approach, and means for aligning the off-set dies.

15. In a die press for reforming stock with an angular portion, two dies having movement toward and away from each other and having die forming surfaces cooperable in substantially the direction of movement of said dies toward each other, one of said dies having a die forming wall angularly disposed relative said first die forming surfaces, the other die having a die forming wall also angularly disposed with reference to said die forming surfaces and adapted for the reception of the angular portion of the stock between it and said first angularly disposed die forming wall, said dies having relative lateral movement and means for causing relative lateral movement of the dies to bring said angularly disposed die forming walls together substantially laterally upon the angular portion of the stock.

16. In a die press for reforming stock with an angular portion, two dies having movement toward and away from each other and having die forming surfaces cooperable in substantially the direction of movement of said dies toward each each other, one of said dies having a die forming wall angularly disposed relative said first die forming surfaces, the other die having a die forming wall also angularly disposed with reference to said die forming surfaces and adapted for the reception of the angular portion of the stock between it and said first angularly disposed die forming wall, said dies having relative lateral movement and means for causing relative lateral movement of the dies to bring said angularly disposed die forming walls together substantially laterally upon the angular portion of the stock, one of said dies being offset laterally with respect to the other die and the relative lateral movement of said dies bringing the dies into alignment.

17. In a die press for reforming stock with an angular portion, two dies having movement toward and away from each other and having die forming surfaces cooperable in substantially the direction of movement of said dies toward each other, one of said dies having a die forming wall angularly disposed relative said first die forming surfaces, the other die having a die forming wall also angularly disposed with reference to said die forming surfaces and adapted for the reception of the angular portion of the stock between it and said first angularly disposed die forming wall, said dies having relative lateral movement and means for causing relative lateral movement of the dies to bring said angularly disposed die forming walls together substantially laterally upon the angular portion of the stock, said dies having cooperation one with the other and said cooperation of said dies producing the relative lateral movement thereof.

18. In a die press for reforming stock with an angular portion, two dies having movement toward and away from each other and having die forming surfaces cooperable in substantially the direction of movement of said dies toward each other, one of said dies having a die forming wall angularly disposed relative said first die forming surfaces, the other die having a die forming wall also angularly disposed with reference to said die forming surfaces and adapted for the reception of the angular portion of the stock between it and said first angularly disposed die forming wall, said dies having relative lateral movement and means for causing relative lateral movement of the dies to bring said angularly disposed die forming walls together substantially laterally upon the angular portion of the stock, one of said dies being cooperable with the stock to produce an initial setting movement laterally substantially opposite the relative lateral die forming movement of said dies.

19. In a die press for reforming stock with an angular portion, two dies having movement toward and away from each other and having die forming surfaces cooperable in substantially the direction of movement of said dies toward each other, one of said dies having a die forming wall angularly disposed relative said first die forming surfaces, the other die having a die forming

wall also angularly disposed with reference to said die forming surfaces and adapted for the reception of the angular portion of the stock between it and said first angularly disposed die forming wall, said dies having relative lateral movement and means for causing relative lateral movement of the dies to bring said angularly disposed die forming walls together substantially laterally upon the angular portion of the stock, and pin means cooperable with an opening in the stock in the die forming operation of said dies.

20. In a die press for reforming stock with an angular portion, two dies having movement toward and away from each other and having die forming surfaces cooperable in substantially the direction of movement of said dies toward each other, one of said dies having a die forming wall angularly disposed relative said first die forming surfaces, the other die having a die forming wall also angularly disposed with reference to said die forming surfaces and adapted for the reception of the angular portion of the stock between it and said first angularly disposed die forming wall, said dies having relative lateral movement and means for causing relative lateral movement of the dies to bring said angularly disposed die forming walls together substantially laterally upon the angular portion of the stock, and pins on one of said dies movable into and adapted to conform bolt holes in the stock in the die forming operation of said dies.

21. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other die having a portion cooperable with the bottom of the recess, said dies being adapted to receive stock with an angular portion between them with the angular portion of the stock extending along the side of said entering die and between said side and the adjacent side of the receiving die, said dies also having relative lateral movement and means for causing relative lateral movement of the dies to bring the sides of the entering and receiving dies together substantially laterally upon the angular portion of the stock.

22. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other die having a portion cooperable with the bottom of the recess, said dies being adapted to receive stock with an angular portion between them with the angular portion of the stock extending along the side of said entering die and between said side and the adjacent side of the receiving die, said dies also having relative lateral movement and means for causing relative lateral movement of the dies to bring the sides of the entering and receiving dies together substantially laterally upon the angular portion of the stock, one of said dies being offset laterally with respect to the other dies and the relative lateral movement of said dies bringing the dies into alignment.

23. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other die having a portion cooperable with the bottom of the recess, said dies being adapted to receive stock with an angular portion between them with the angular portion of the stock extending along the side of said entering die and between said side and the adjacent side of the receiving die, said dies also having relative lateral movement and means for causing relative lateral movement of the dies to bring the sides of the entering and receiving dies together substantially laterally upon the angular portion of the stock, said dies having cooperation one with the other and said cooperation of said dies producing the relative lateral movement thereof.

24. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other die having a portion cooperable with the bottom of a recess, said dies being adapted to receive stock with an angular portion between them with the angular portion of the stock extending along the side of said entering die and between said side and the adjacent side of the receiving die, said dies also having relative lateral movement and means for causing relative lateral movement of the dies to bring the sides of the entering and receiving dies together substantially laterally upon the angular portion of the stock, one of said dies being cooperable with the stock to produce an initial setting movement laterally substantially opposite the relative lateral die forming movement of said dies.

25. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other die having a portion cooperable with the bottom of the recess, said dies being adapted to receive stock with an angular portion between them with the angular portion of the stock extending along the side of said entering die and between said side and the adjacent side of the receiving die, said dies also having relative lateral movement and means for causing relative lateral movement of the dies to bring the sides of the entering and receiving

dies together substantially laterally upon the angular portion of the stock, and pin means cooperable with an opening in the stock in the die forming operation of said dies.

26. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other die having a portion cooperable with the bottom of the recess, said dies being adapted to receive stock with an angular portion between them with the angular portion of the stock extending along the side of said entering die and between said side and the adjacent side of the receiving die, said dies also having relative lateral movement and means for causing relative lateral movement of the dies to bring the sides of the entering and receiving dies together substantially laterally upon the angular portion of the stock, and pins on one of said dies movable into and adapted to conform bolt holes in the stock in the die operation of said dies.

27. In a die press for reforming angle bars for rail joints, two dies having relative movement toward and away from each other, one having a die cavity and the other a male die for cooperation therewith, said dies also having relative lateral movement, and means for causing relative lateral movement of the dies in contact with the work in a direction to force the flange of the bar into close contact with the cooperating wall of the die cavity to accurately form the fishing surface of the flange.

28. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other having means entering said recess as the dies are moved toward each other to closed position, said dies also having relative lateral movement, and means for causing relative lateral movement in a direction to force the angular portion of the stock into close contact with a cooperating die wall.

29. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other having means entering said recess as the dies are moved toward each other to closed position, said dies also having relative lateral movement and engageable one with the other for causing relative lateral movement of the dies in a direction to force the angular portion of the stock into close contact with a cooperating die wall.

30. In a die press for reforming stock with an angular portion, two dies having relative movement toward and away from each other, one die having means forming a recess and the other die having means entering said recess, said dies also having relative lateral movement, the angular portion of the stock effecting relative lateral movement of the dies as they approach each other, and means for aligning the dies against the resistance of said angular portion as the dies move into full closed position.

In witness whereof, I hereunto subscribe my name this 13th day of July, 1926.

GEORGE LANGFORD.