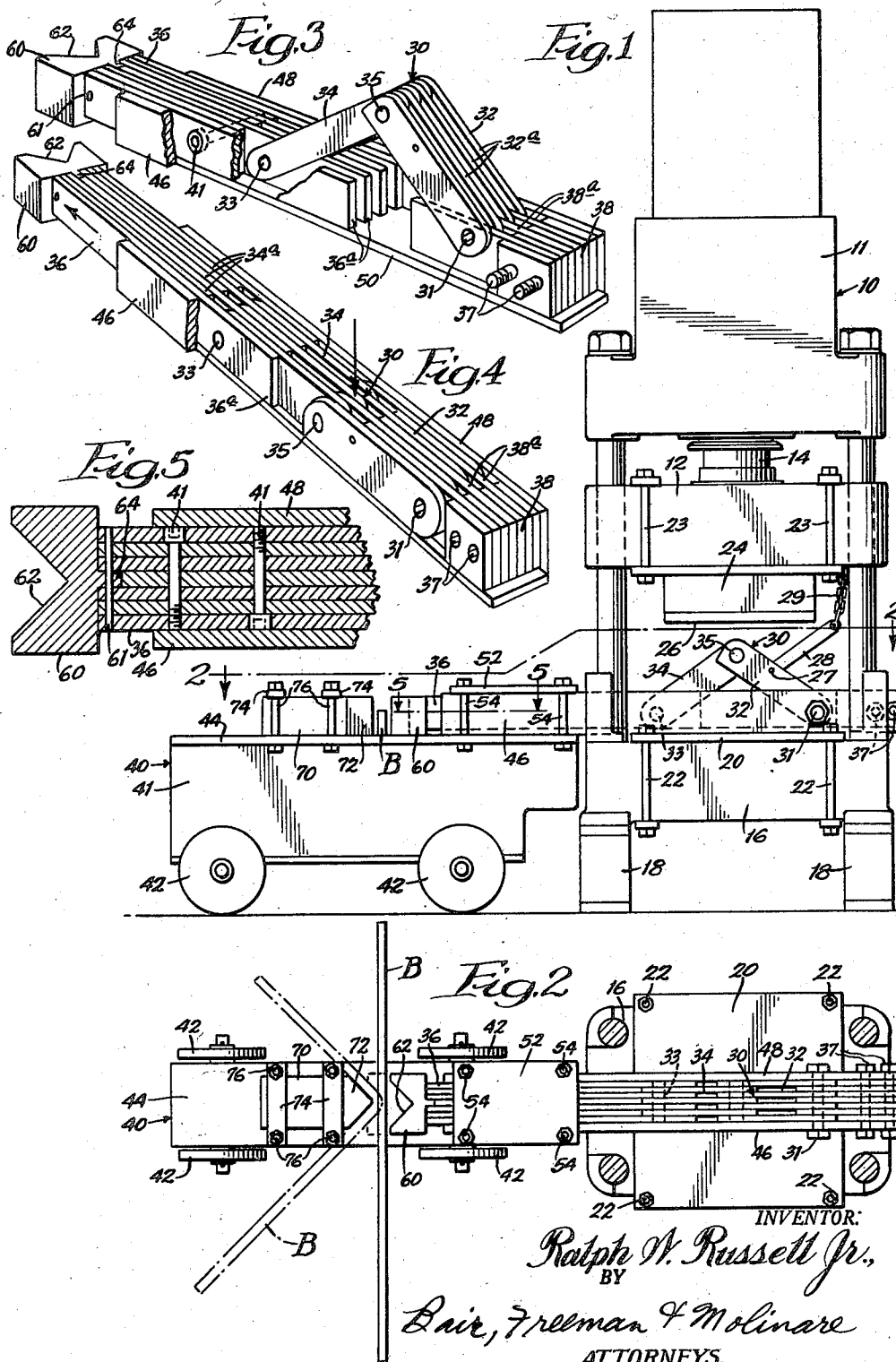


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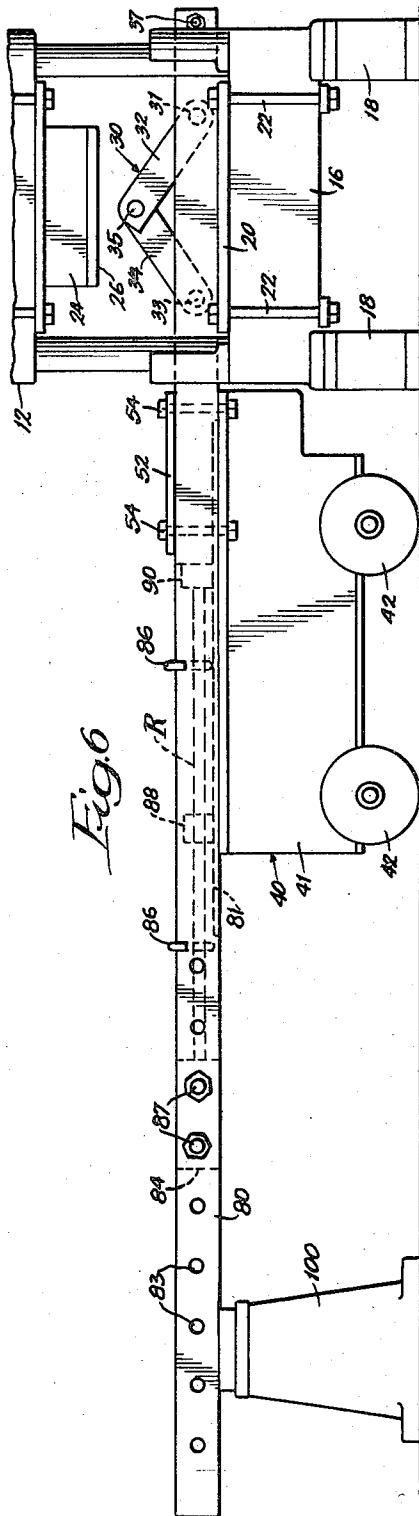
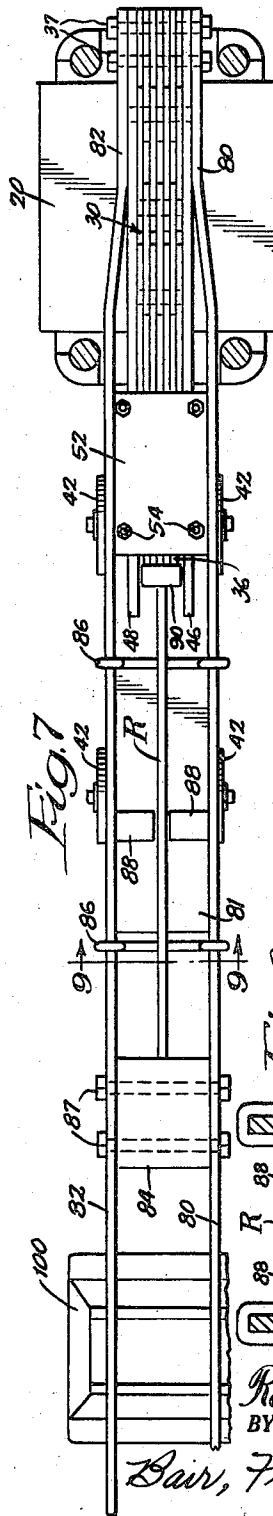
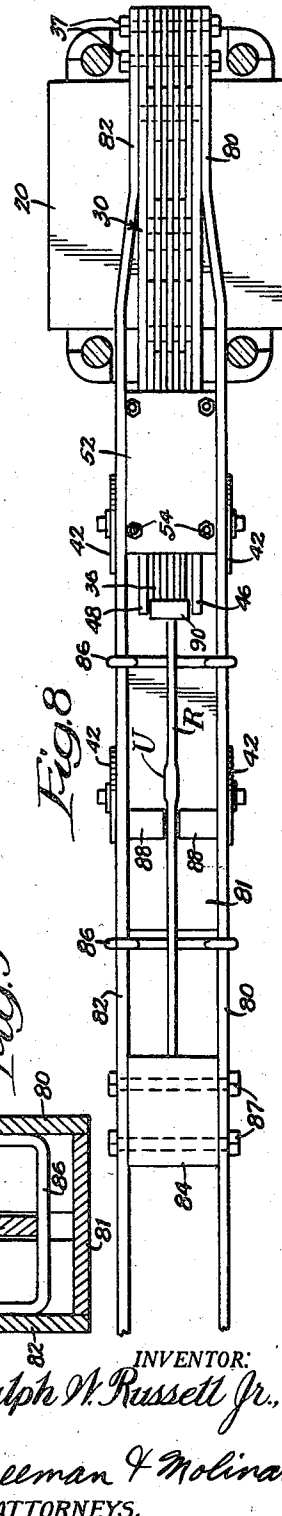
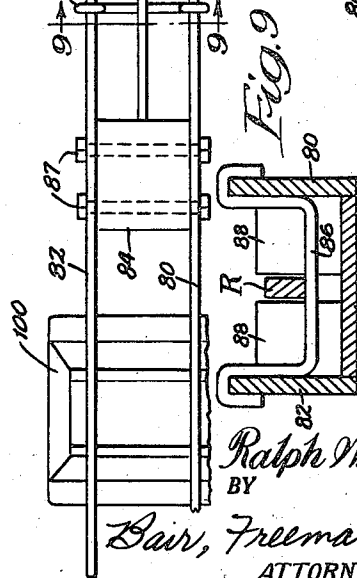
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ADAPTOR FOR VERTICAL BENDING PRESS

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2 Sheets-Sheet 2



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ADAPTOR FOR VERTICAL BENDING PRESS

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2 Claims. (Cl. 153—21)

This invention relates to an adaptor for a vertical platen press which renders the press suitable for use on work of extreme length. The use of such presses is severely limited because the opening between the movable and stationary platens is relatively small. For example, a conventional one hundred ton straightening and bending press has an opening of about thirty inches and a stroke of eighteen inches. A press of this size is satisfactory for bending stock of, say, twenty-four inches in length, but if the stock is much longer interference with the platen is encountered as the free ends move together during the bending operation. In upsetting stock to increase its cross-sectional area, the length of stock cannot exceed the size of the press opening. Consequently, it has been customary to form long pieces of stock by hand forging.

It is a primary object of this invention to provide an apparatus for adapting vertical platen presses with relatively small openings to fabricate work of almost any length.

Another object is to provide an adaptor of this kind which is mounted on a carriage and may be conveniently moved into cooperating position with the press to render the press suitable for forming operations on long stock.

Another object is to provide an adaptor which converts the vertical force imposed by the platens of the press to a horizontal force without imposing any substantial thrust load on the press.

According to one modification of the invention the adaptor comprises a carriage supporting a horizontally-reciprocal ram, a toggle mechanism adapted to be disposed between the platens of the press for actuating the ram, and a pair of cooperating work-engaging members, one fixed to the ram and the other rigidly secured to the carriage.

Another object of the invention is to provide an adaptor of the type described which is capable of increasing the mechanical advantage of the press.

A further object is to provide an efficient and practical adaptor of simple construction which may be used for a variety of operations, including shearing, bending, upsetting and punching with cooperating dies.

These and other objects and advantages of my invention will become apparent from the following description when read in conjunction with the accompanying drawings, in which:

Figure 1 is an elevational view of a conventional platen press showing an adaptor, constructed in accordance with the invention, in cooperating relationship with the press;

Figure 2 is a sectional view taken along line 2—2 of Figure 1 illustrating a bending operation;

Figure 3 is a perspective view of the toggle joint and ram assembly adapted to rest on the stationary platen of the press. The toggle is shown in elevated position;

Figure 4 is a view similar to Figure 3 wherein the toggle is collapsed and the ram is moved longitudinally outwardly;

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Figure 5 is a sectional view taken along line 5—5 of Figure 1;

Figure 6 is a view similar to Figure 1, of a modified form of the invention which is suitable for handling extra long work pieces;

Figures 7 and 8 are plan views of the adaptor shown in Figure 6, illustrating an upsetting operation; and

Figure 9 is a sectional view taken along the line 9—9 of Figure 7.

Referring now to Figures 1 through 5, which serve to illustrate one form of the invention, the conventional press for which my adaptor is especially suitable for use is designated generally by the numeral 10. It has an upper movable platen 12 connected to a hydraulic ram 14 mounted in the head 11, and a lower stationary platen 16. The mechanism for providing hydraulic fluid under pressure is housed in the head 11 and is of conventional construction. The press is suitably supported by base members 18 which rest upon the floor. The lower platen 16 may be covered to protect it from wear by means of a suitable plate 20 which is bolted thereto by means of four bolts 22. The upper movable platen 12 of the standard press is also modified to some extent by securing a bearing member 24, having a bearing plate 26, to the underside of the platen 12 by means of suitable bolts 23. The bearing plate 26 serves as a sliding bearing surface for the toggle mechanism 30, as explained hereinbelow.

The adaptor proper may be mounted on a carriage, designated generally by the numeral 40, consisting of a body 41, which may be made conveniently from spaced I-beams, supported by wheels 42. A bed 44, consisting of a heavy metal plate, is suitably secured to the top of the body 41 to provide a suitable supporting surface for work-engaging members mounted thereon. Mounted on the right end of the carriage 40 (as viewed in Figure 1) is a pair of longitudinally-extending parallel tension members which take the form of elongated plates or bars 46 and 48. The tension members 46 and 48 extend cantilever-fashion for some distance beyond the end of the carriage 41, and are fastened to the bed 44 by welds along their length and by means of a cover plate 52 and suitable bolts 54. The tension members are adapted to rest upon the plate 20 covering the stationary platen 16 of the hydraulic press 10. These tension members must be made of relatively stout material since they are called upon to bear the extreme loads imposed upon the adaptor in forming parts in the work-engaging members mounted on the bed 44 of the carriage. A base plate 50 may be welded between the tension members 46 and 48 to space the members and to provide sliding support for the ram member 36. The tension members 46 and 48 are rigidly secured to a spacer block 38 disposed between the members near the outer extremities thereof. A pair of heavy bolts 37 are employed for this purpose. The bed 44 of the carriage is approximately even in height with the plate 20 covering the stationary platen 16 so that the tension members of the adaptor will slide over the surface of the plate 20 when the carriage is pushed into cooperating position with the hydraulic press.

A toggle joint 30, consisting of a pair of arms 32 and 34 pivotally connected at 35, is disposed within the space between the tension members 46 and 48. The outer extremity of the arm 32 is pivotally connected to the block 38 and to the tension members by means of a bolt 31. The outer extremity of the other arm 34 of the joint is pivotally connected to ram member 36 by means of a pin 33. The ends of the pin are flush with or recessed in the sides of the ram so as not to interfere with its sliding action. The upper joined ends of the arms 32 and 34 above the pin 35 are rounded so as to provide a smooth surface for engaging the bearing plate 26 fixed to the upper movable platen of the press. The

ram member 36 is adapted to extend beyond the end of the tension members 46 and 48 above the carriage bed 44 and carries a work-engaging head 60.

It will be noted that the ram member 36, the toggle arms 32, 34 and the spacer block 38 are all fabricated from a plurality of spaced bars which are interleaved with the element to which they are pivotally connected. The spaced alternate bars 36a, which comprise the ram, interleaf with the bars 34a which make up the arm 34. Likewise, the spaced bars 32a, forming the arm 32, interleaf with the alternate projecting bars 33a comprising the spacer block 38. The spaces between bars 36a of the ram and 38a of the block are filled in beyond the connecting pivot points, to form solid parts. The bars 36a and the alternate filler bars are secured together by means of pins 41 having recessed heads. The inner ends of the bars 36a extend inwardly for some distance past pin 33 to provide a large contact area with the plate 50 to minimize the pressure thereon. This construction illustrates one way of fabricating these parts but it will be understood that the arms of the toggle mechanism and the ram and spacer block may be made of solid pieces, such as castings or forgings.

The movable, or female, work-engaging die member 60 illustrated in the drawing has a cut-out portion 62 adapted to form a piece of stock to the desired angle. A tongue 64 projects from the rear of the die member and is adapted to fit between the central bars 36a of the ram. A pin 61 extends through the tongue 64 and the end of the ram to hold the work-engaging member 60 in place. A cooperating work-engaging male die member 72 is fixed securely to the bed 44 in line with member 60 by means of a couple of bars 74 which are bolted to the bed with bolts 76.

It will be noted that the outer arm 32 of the toggle mechanism has a link 28 pivotally secured thereto, as indicated at 27 (Figure 1). The outer end of the link 28 connects with the movable upper platen by means of a chain 29 or other suitable flexible connection to lift the toggle mechanism as the platen 12 rises.

In operation, the tension members and the toggle mechanism contained therein are disposed between the movable and stationary platens of the press 10 by pushing the carriage 40 into proper position. As the movable platen 12 descends, a vertical force is applied directly to the knee of the toggle joint 30 causing the ram 36 to move longitudinally between the tension members 46 and 48. The base plate 50 is well lubricated so that friction between the plate and the ram is minimized. The area of the ram engaging the plate 50 should be sufficiently large so that the pressure loading on the plate is small to further minimize friction. The bearing plate 26 is also well lubricated to permit the toggle knee to slide thereover. Where forces in the range of one hundred tons are used, it is essential to keep friction to a minimum for smooth operation.

A piece of bar stock B to be bent at an angle of 90° in the dies 60 and 72 is shown in Figure 2. As the ram moves forward, the movable female die 60 attached to the end of the ram 36 conforms the bar B to the male die member 72 which is anchored securely to the bed 44 of the carriage. The formed bar B is shown in broken lines in Figure 2. It will be seen that the size of the press in no way restricts the size of the work that can be handled on this adaptor. The length of the parts being operated upon is limited primarily by the size of the room in which the press and adaptor are located. After the part has been formed, the movable platen is reversed and as it rises, the link connection 28, 29 lifts the toggle mechanism 30 to retract the ram and permit insertion between the dies of another piece of stock.

It will be understood that the angle forming dies shown in the drawing are used for purposes of illustration only. Any type of die or work-engaging member may be used

in this apparatus. In fact, it is suitable for use in any application where very high forces must be applied to the particular part being processed. The use of the toggle joint 30 increases the mechanical advantage provided by the hydraulic ram of the press so that tremendous forces may be obtained.

In Figures 6 through 9 I have shown another form of the invention which is adapted for processing pieces of stock of extreme length. In this modification the tension members 46 and 48 are extended with extra long tension members 80 and 82. Members 80 and 82 are spaced sufficiently to straddle the plate 52 and ram 36 at the left end (as viewed in Figure 6) while the opposite ends are bolted to block 38 on either side of tension members 46 and 48 with bolts 37. The outer (left) ends of tension members 80 and 82, which extend far beyond the end of carriage 40, are held in spaced relation by a block 84 and bolts 86 and are vertically supported by means of a suitable pedestal 100 which has a base resting on the floor. If desired, the tension members 80 and 82 may replace members 46 and 48 rather than supplement them. The construction shown permits rapid conversion of the apparatus for use with long stock, and for this reason is preferred.

It will be noted that the tension members 80 and 82 have a plurality of pairs of longitudinally-spaced opposed openings 83 which permit the block 84 to be inserted at a plurality of locations along the length of the tension members. This permits adjusting the length of the apparatus to suit the particular stock being processed. The apparatus shown in Figures 6 through 9 is set up for upsetting a piece of bar stock R to increase its cross-sectional area. The stock R is supported by means of brackets 86 which hang over the top edges of the tension members 80 and 82. The stock must be heated, of course, in the area where its cross section is to be increased. The hangers 86 serve to elevate the stock above the plate 81 so that heat is not conducted away by the relatively cool plate. The end of the ram 36 is equipped with a block 90 which bears against the end of the stock R. The other end of the stock bears against the block 84. Thus all the load is borne by the tension members directly. The bed of the carriage is not used to anchor the stationary member as in the construction of Figures 1-5. When the movable platen of the press is closed, the toggle joint 30 moves the ram to compress the stock R. Suitable blocks 88 may be placed on either side of the stock R at or near the point at which the cross-sectional area will be increased. The blocks prevent the stock from buckling. In Figures 6 and 7 the ram is shown in retracted position. In Figure 8 the ram is shown in extended position and it will be noted that the heated portion of the rod has thickened, due to the compressive force applied, to increase the cross-sectional area, as indicated at U. It will be apparent that the apparatus is adaptable to handle stocks of any practical size merely by adjusting the distance between the end of the ram and the position of the block 84. Suitable confining dies for upsetting to accurate shape may be employed if desired.

Although a toggle joint has been illustrated as a suitable means for translating vertical force to horizontal force in the ram, it will be apparent that other suitable mechanical or hydraulic means may be provided for accomplishing the same result. It is important, however, that the tension members be provided to tie the force-converting means to the carriage or stationary work support. Thus, the only force which must be withstood by the press is the vertical force applied by the downwardly moving platen, for which it is designed. All of the thrust forces are taken by the adaptor itself, through the tension members. Consequently, it is not absolutely necessary to anchor the adaptor to the press. The tension members and the parts assembled thereto merely rest upon the lower platen. For this reason the

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carriage may be quickly moved out of position when it is desired to use the press in conventional manner. If the moving parts are stiff, it may be desirable to secure the tension members to the stationary platen to prevent shifting of the adaptor with respect to the press. For example, the adaptor may lift from the lower platen when the toggle is retracted if it is not fastened down. But this does not place on the press any substantial load for which it was not designed.

Other modifications of the invention will be apparent to those who are skilled in the art without departing from the true spirit and scope of my invention. It is, therefore, not my intention to limit the invention other than as necessitated by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A mobile adaptor for a vertical platen press having an upper movable platen and a lower stationary platen comprising a wheeled carriage having a bed approximately even in height with the surface of said stationary platen, a pair of laterally spaced tension members secured to said bed and extending cantilever-fashion beyond the end of said carriage for vertical support by said stationary platen, a bearing plate disposed between said tension members, a ram adapted to slide longitudinally between said tension members and on top of said plate, a pair of arms disposed between said tension members

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and forming a toggle joint, one arm of said pair being pivotally connected to one end of said ram and the other arm of said pair being pivotally connected to said tension members, a flexible connection between said toggle joint and said movable platen for lifting said toggle when the platen is retracted, a movable work-engaging member fixed to the opposite end of said ram, and a stationary work-engaging member fixed to said carriage and adapted to cooperate with said movable work-engaging member.

2. The adaptor of claim 1 wherein said toggle arms and said ram comprise a plurality of spaced plates, the plates of the arms being interleaved with each other, the outer extremity of said one arm being interleaved with the plates of the ram, and the outer extremity of said other arm being interleaved with plates comprising a supporting block secured between said tension members.

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