Oct. 17, 1939. T. NORTON 2,176,543

SHUTTLE FEED FOR PRESSES

Filed Nov. 19, 1936 4 Sheets-Sheet 1

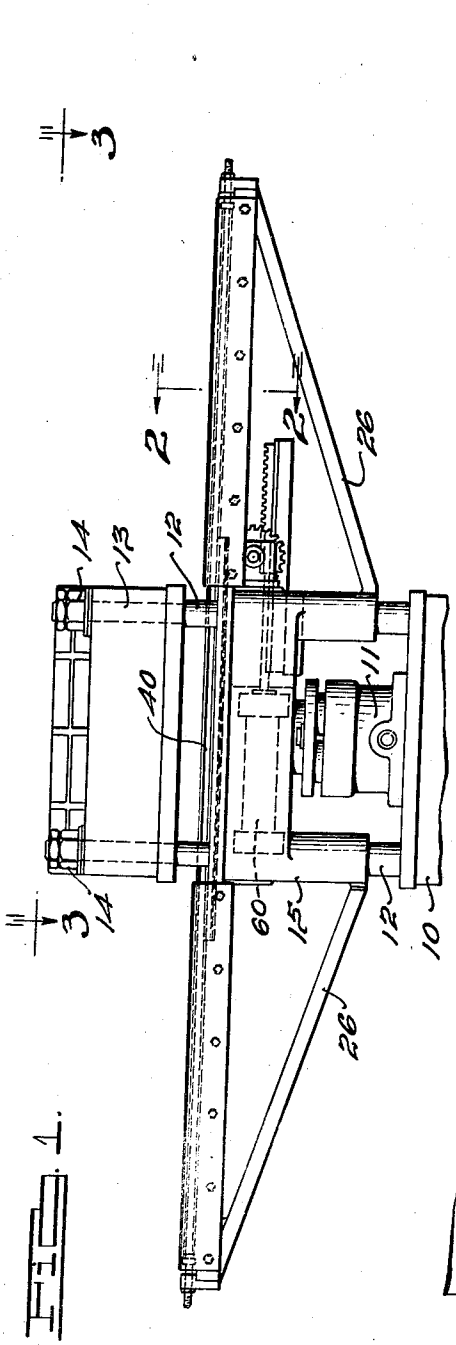


Fig. 1.

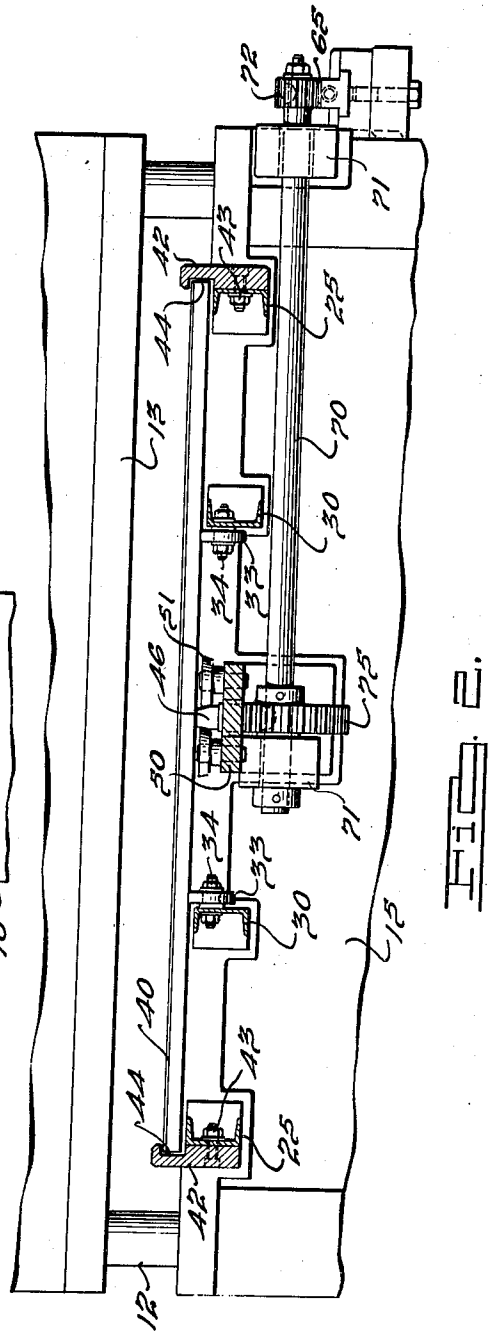


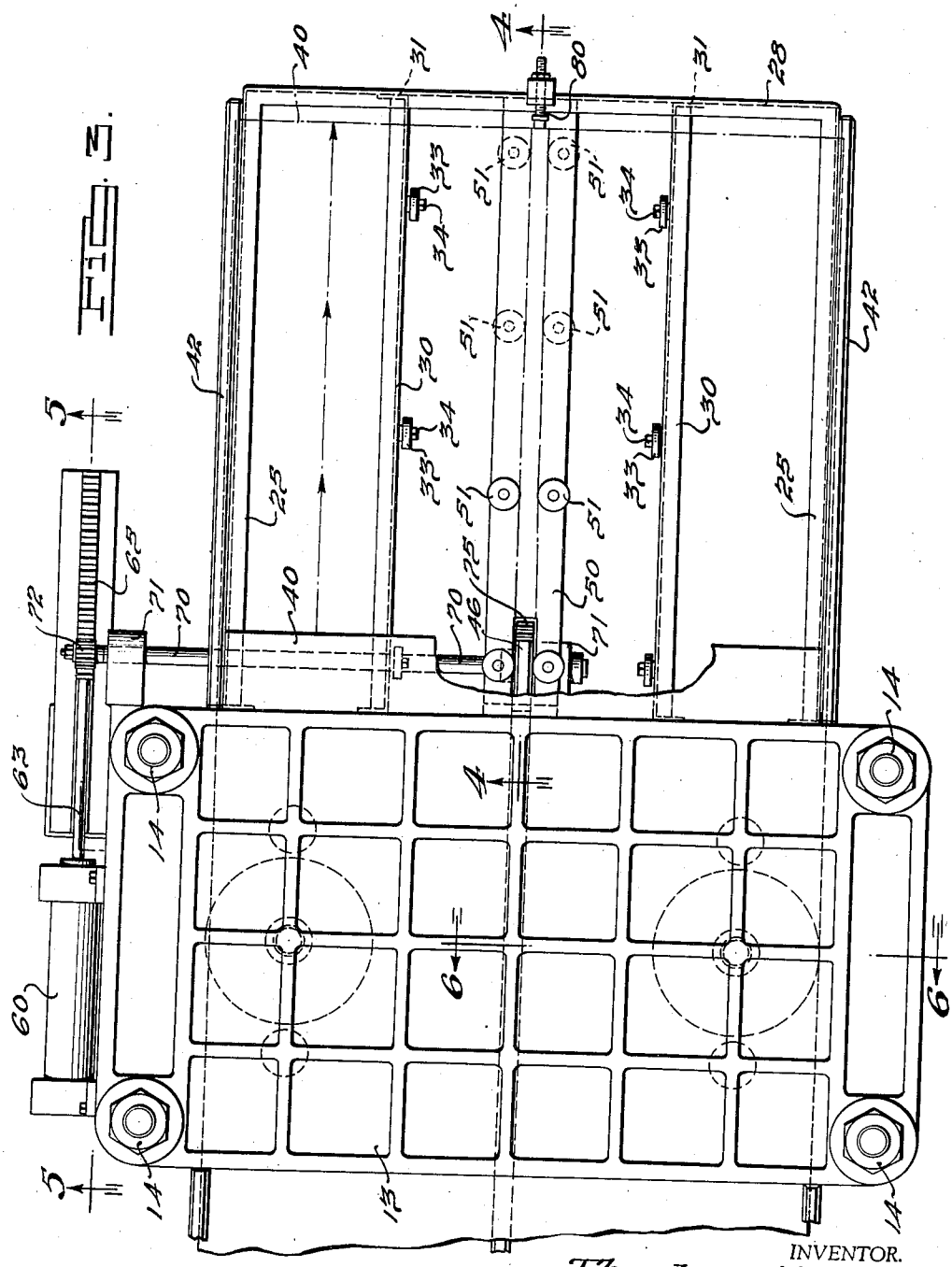
Fig. 2.

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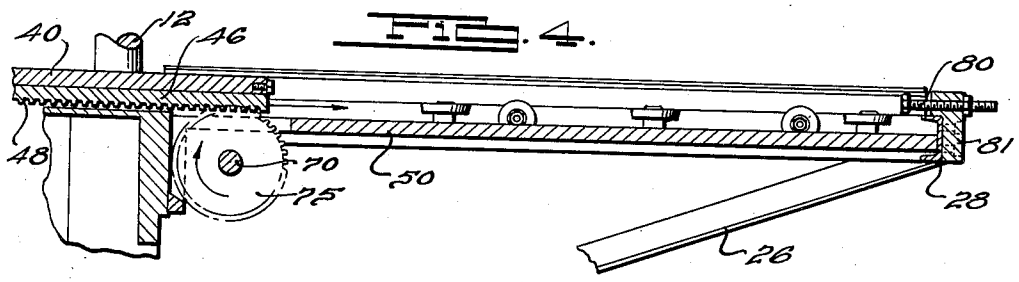
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SHUTTLE FEED FOR PRESSES

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FIG. 4.



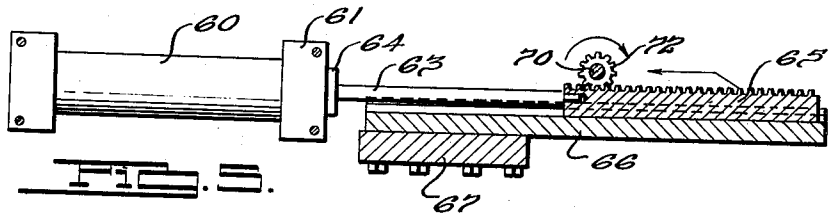


FIG. 5.

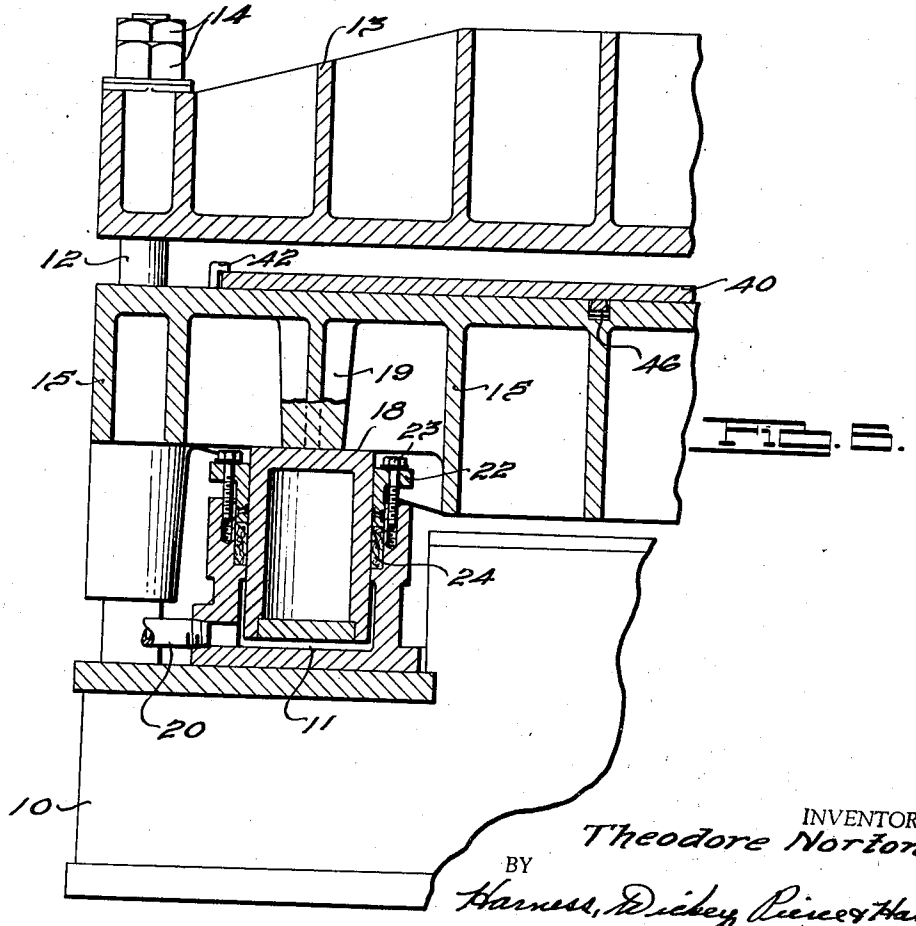


FIG. 6.

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SHUTTLE FEED FOR PRESSES

Filed Nov. 19, 1936 4 Sheets-Sheet 4

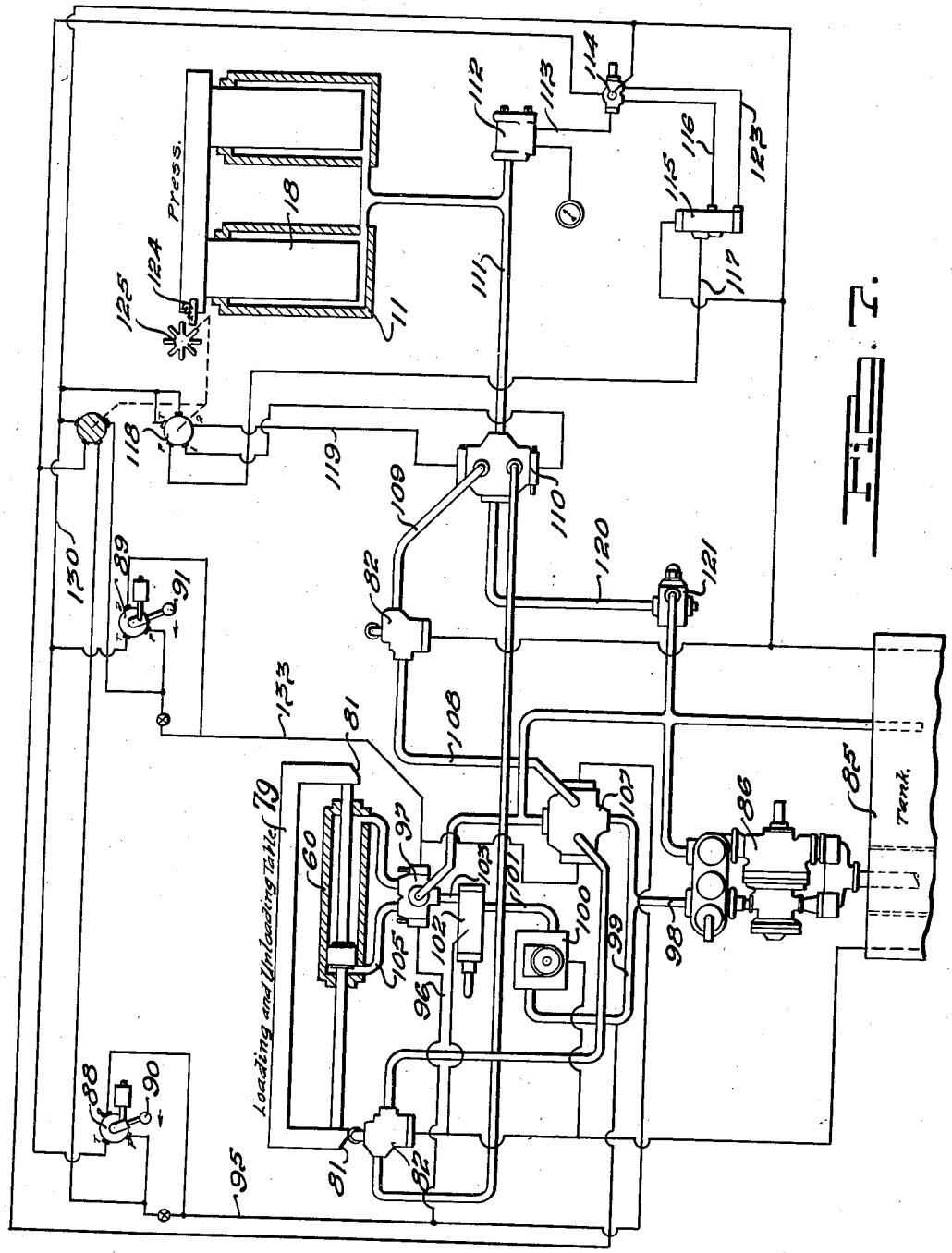


Fig. 4.

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UNITED STATES PATENT OFFICE

2,176,543

SHUTTLE FEED FOR PRESSES

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Application November 19, 1936, Serial No. 111,657

11 Claims. (Cl. 164—21)

This invention relates to an attachment primarily designed for use in connection with die presses and is particularly concerned with a feed mechanism for supplying articles to the die press in a rapid and orderly manner.

While it will become readily apparent from the following specification that the present invention will find broad and practical utility in many and various different fields, the aparatus is primarily designed for use in connection with a press for performing operations upon inner trim panels during various steps in the course of their manufacture.

While the apparatus of the present invention is susceptible of use on many and different kinds of presses, it is primarily designed for use in connection with a press having a vertically movable ram which carries a die, which die is adapted to cooperate with a plane surfaced bed in order to perform the operation required. The present invention contemplates the provision of a bed for a press of this general type, which bed is readily movable or shiftable with respect to the press as a whole in order that articles to be operated upon may be conveniently mounted upon the bed and after being so mounted, the bed may be bodily shifted into position beneath the ram of the press.

The present invention contemplates the provision of novel and particularly effective and satisfactory means for mounting the bed portion of a press of this type in order that the bed as a whole may easily be moved from operative position beneath the die into an inoperative position adjacent the die.

Still further the present invention contemplates the provision of a bed for a press of this type, which is not only reciprocably mounted but which bed has an area substantially twice that of the ram of the press in order that an article to be operated upon by the press may be conveniently mounted upon the bed and then shifted into position beneath the die of the press. While the ram of the press descends to operate upon the article thus positioned within the press, an additional article may be positioned upon the exposed half of the bed of the press, thus making possible extremely rapid operation of the apparatus as a whole.

It is a primary object of this invention to provide a feed mechanism of the general type described above, which may be utilized as one unit in an assembly line in which a plurality of operations are successively performed upon a series of articles being manufactured. In such installations as this, it is essential that the operation of the press be controlled synchronously with respect to the remainder of the units in the assembly line and to achieve this end, the present invention contemplates the provision of novel, simple, and particularly improved hydraulic means for causing not only operation of the press proper but shifting of the bed thereof, which movements are effected synchronously with the remainder of the units in the assembly line in which the press is disposed.

Still further the present invention contemplates the provision of a construction of this generic type in which an extremely simple and satisfactory mounting for the shiftable bed portion of the press is provided, in order that this bed portion may be conveniently and rapidly shifted and yet at the same time provide an exceptionally strong and rigid support for the work being operated upon by the vertically movable die of the press.

Still further it is an object of the present invention to provide novel and effective means whereby the movement of the bed of the press may be either controlled synchronously with the units in the assembly line with which it is associated or may be independently manually actuated.

Still another object of the present invention consists in the provision of means for mounting a reciprocable bed of the type outlined above such that its vertical position and its position within the press is accurately controlled at all times.

Many other and further objects, advantages, and features of the present invention will become clearly apparent from the following specification when considered in connection with the accompanying drawings forming a part thereof.

In the drawings,

Figure 1 is a fragmentary, side elevational view of a blanking press with the improved feed mechanism mounted in cooperative relation therewith;

Fig. 2 is an enlarged sectional view taken substantially on the line 2—2 of Fig. 1, illustrating the manner in which the shiftable bed of the press is mounted;

Fig. 3 is an enlarged fragmentary plan view taken substantially on the line 3—3 of Fig. 1, illustrating in detail the support for the shiftable bed of the press;

Fig. 4 is a fragmentary sectional view taken substantially on the line 4—4 of Fig. 3, illustrating in detail the actuating mechanism for effecting shifting movements of the bed of the press;

Fig. 5 is a fragmentary sectional view taken substantially on the line 5—5 of Fig. 3, illustrating in detail the rack mechanism utilized for actuating the bed;

Fig. 6 is a fragmentary vertical sectional view taken substantially on the line 6—6 of Fig. 3, illustrating in detail one of the cylinders for effecting vertical movement of the ram of the press, and

Fig. 7 is a more or less diagrammatic plan view of one form of control mechanism for effecting synchronous and timed operation of the improved mechanism.

It will become readily apparent from the following detailed description that the improved shuttle feed mechanism herein described is susceptible of use upon many and various different kinds of presses and the particular form of press illustrated in the accompanying drawings and described below is merely illustrative of one specific type of die press which has been found particularly adaptable for use in connection with the present invention.

This press includes a base frame 10 which adjacent the corners thereof serves to support a plurality of hydraulic cylinders 11. Extending upwardly from each of the corners of the base frame 10 are cylindrical posts 12, to the upper extremities of which is bolted a stationary ram 13 by means of nuts 14. It will be apparent that the posts 12 are rigidly secured to the base 10 and consequently the position of the ram 13 is fixed with respect to the base 10. The posts 12 serve to provide means for vertically guiding a bed frame 15 for the press, which is preferably constructed of a casting to provide an extremely strong and rigid structure, which casting has apertures adjacent the corners thereof adapted to receive and slide upon the posts 12.

The cylinders 11 each has a piston 18 therein, the outer end of each piston being adapted to abut against a suitable projection 19 formed upon the under surface of the bed frame of the press. Fluid is supplied to the cylinder 11 by means of a conduit 20, the supply of this fluid being controlled by the apparatus illustrated diagrammatically in Figure 7 and described in detail below.

It will be seen that as fluid is simultaneously introduced into the cylinders 11, this fluid will effect an upward movement of the bed frame 15 of the press and finally effect a positive engagement of the bed of the press with the stationary ram 13. As is conventional in constructions of this general character, the cylinder is provided with a packing gland, including a collar 22, secured in position by means of a series of cap screws 23 and serving to retain in position a body of packing 24 in order to effectively seal the piston and cylinder and preclude the escape of fluid.

All of the improved mechanism of the present invention is rigidly mounted with respect to this vertically movable bed frame of the press and is adapted to move vertically therewith when fluid is introduced into the cylinders 11. The bed frame of the press has on each of the opposite sides thereof a pair of outwardly extending channel members 25, which are supported in horizontal position by means of diagonally downwardly extending bases 25 welded thereto and welded to the bed supporting frame 15. These outwardly extending channel member have their outer ends interconnected by means of a channel member 28 to provide a relatively strong substantially rectangular frame work approximately the same size as the bed of the press on each of two opposite sides of the press. In addition to the channel members 25, this frame may include similar steel braces 30 of channel section disposed inwardly of the frame members 25 and substantially parallel thereto. The inner ends of these braces may be firmly secured in position upon the bed frame of the press and the outer ends may be welded to the channel member 28 at the points 31.

These brace members 30 have at suitable intervals therealong freely rotatable rollers 33 secured thereto by means of bolts 34. These rollers 33 are preferably so constructed and arranged that the upper peripheral surfaces thereof all lie in substantially the same plane and also lie in substantially the same plane as the upper surface of the bed supporting frame 15 which is disposed beneath the ram 13 of the press.

A slidable steel bed 40, having an area substantially twice that of the ram and bed supporting frame of the press, is carried by the supporting frame construction described above and is adapted for movement in a horizontal plane, which movement is facilitated by means of the rollers 33 upon which this bed rests. Suitable guide members 42 are secured to the outer surfaces of the channel members 25 by means of bolts 43, which guide members each have horizontally extending recesses or grooves 44 therein adapted to receive the lateral edges of the bed 40 and guide the same during horizontal movement, as hereinafter described in detail. These guide members also serve to preclude movement of the bed 40 upwardly away from the bed supporting frame of the press.

In order to further guide the bed 40 during horizontal movement, this bed plate has a metal strip 46 secured rigidly to the under side thereof, which strip is substantially trapezoidal in cross section and is adapted to be received within a dovetail recess formed in the bed supporting frame of the press. This construction likewise serves to guide the bed plate 40 during horizontal movement and virtually precludes vertical movement of the bed plate with respect to the bed supporting frame. The strip 46 has the under surface thereof preformed to provide a series of teeth constituting a rack 48, which, as will hereinafter be clearly seen, is utilized to effect longitudinal movement of the bed plate with respect to the press.

In order to additionally guide the bed plate 40 during its horizontal movement, a base member 50 has its inner end secured to the bed supporting frame 15 and its outer end rigidly secured to the channel member 28 and extends throughout the length of each of the frames in a position substantially uniformly spaced between the frame members 25. This member 50 serves to support a plurality of rollers 51 rotatable upon vertical axes, which rollers have frusto conical surfaces and are adapted to engage the lateral sides of the dovetail strip 46. It will be readily appreciated that these rollers 51 serve, in combination with the means described in detail above, to facilitate movement of the bed plate 40 in a predetermined plane and to preclude displacement of the bed plate from such plane.

While many and various suitable means may be provided for effecting positive longitudinal movement of the bed plate 40 with respect to the bed of the press, the present invention contem-

plates particularly novel and effective means for accomplishing this end.

A hydraulic cylinder 60 is rigidly bolted to the side of the bed frame 15 by means of suitable integrally formed brackets 61. Means such as are conventional in constructions of this general kind are provided for introducing fluid to either end of the cylinder, as may be desired, and at the same time bleeding fluid from the opposite end of the cylinder as it is discharged therefrom. The piston within the cylinder 60 has a piston rod 63 rigidly secured thereto, which passes outwardly from the cylinder through a conventional packing joint 64. This piston rod has rigidly connected thereto a rack member 65 having a plurality of teeth on the upper surface thereof and which is mounted for reciprocable movement upon a suitable table or shelf 66 carried by means of a bracket 67, which bracket may be directly secured to the bed frame 15 of the press. A horizontal shaft 70 is journaled for rotation in suitable bearings 71 carried by the bed frame of the press and this shaft 70 has secured at its outer end a spur gear 72 which is adapted to mesh with the rack 65. This shaft, at its inner end, has rigidly secured thereto a spur gear 75 which is of considerably larger diameter than the gear 72 and which is adapted to mesh with the rack 46 which, as has been explained above, is rigidly secured to the under side of the bed plate 40.

From the construction described above, it will be readily apparent that the introduction of fluid into the cylinder 60 will cause a movement of the piston therein and a consequent similar movement of the piston rod 63 and rod 65. Movement of this rack past the spur gear 72 will inherently produce a rotation of the shaft 70 and consequent rotation of the gear 75, which, as has been explained above, is secured to the inner end of the shaft. Inasmuch as the gear 75 is in mesh with the rack 46, it will be clear that rotation of the gear 75 will cause a horizontal movement of the bed plate 40 with respect to the press, and due to the fact that the gear 72 is considerably smaller than the gear 75, this movement will be of substantially greater magnitude than the movement of the piston rod 65.

It will be readily understood that these gear sizes may be proportioned so that as the piston within the cylinder 60 moves throughout the entire length of its stroke, it will serve to effect a movement of the bed plate 40 throughout a predetermined range such as may be desired. In order to accurately control the position of the bed plate at each of its extremes of movement, it has been found particularly desirable to install stop members which may consist of bolts 80 passing through brackets 81 secured to the transversely extending channel frame member 28 in substantially the central portion thereof. It will be readily appreciated that these bolts may be conveniently adjusted to engage the marginal edge of the bed plate 40 and limit movement thereof within a predetermined range.

From the foregoing it will be readily understood that a suitable die may be carried by the stationary ram 13 of the press and that an article to be operated upon by said die may be placed upon the exposed half of the bed plate 40. Fluid may then be supplied to the cylinder 60, causing a horizontal movement of the bed plate from one extreme position to the other, in such a manner that the half thereof on which the article is disposed will move inwardly underneath the ram of the press and the opposite half of the bed plate will be moved out from underneath the ram of the press and be exposed on the opposite side. Fluid pressure may then be supplied to the cylinders 11, causing an upward movement of the entire bed frame work and consequent engagement of the die carried by the ram with the work carried by the movable bed plate 40. While this operation is taking place, a second article, adapted for similar treatment, may be placed upon the half of the bed plate which is exposed, and upon the completion of the stroke of the press, the bed plate may be again shifted and the article which has been operated may be removed from the exposed portion of the bed plate and a new untreated article installed thereon while the press acts upon the article carried by the opposite half of the bed plate.

While it will be readily appreciated from the foregoing that the supply of fluid to the various cylinders disclosed in Figures 1 to 6 of the drawings may be supplied thereto by any suitable manually controlled means, it has been found particularly desirable to utilize automatic controls for accomplishing this end.

One form of fluid distribution system particularly adaptable for controlling apparatus of this general character is illustrated in more or less diagrammatic form in Figure 7 of the drawings. In this diagrammatic showing, the cylinder 60, which effects transverse movement of the bed plate 40, is shown toward the left hand side of the sheet. The piston within this cylinder serves to operate a member 79, which has cam surfaces 81 at each of its opposite ends, which cams are adapted to engage and operate valves 82 in the manner hereinafter described in detail. In the disclosure of this diagrammatic view, it will be understood that the double lined conduits shown are of sufficient cross-sectional strength to carry hydraulic fluid, such for example as oil, to the various cylinders, in order to effect actuation of the apparatus as a whole, while the single lines represent pilot conduits which may be extremely small in cross section but which serve to carry sufficient fluid to operate the various valves and provide means for controlling the apparatus generally.

The hydraulic fluid to the apparatus is supplied from a tank 85 by means of a conventional pump structure 86. The apparatus for controlling the operation of the press includes starting valves 88 and 89, respectively, which may be actuated manually by operating handles 90 and 31 or by means of pilot pressure as hereinafter described.

The apparatus operates substantially as follows:

It may be assumed for purposes of illustration that the bed plate of the press is in the extreme left hand position, and it will therefore be seen that the valve 82 is depressed by means of the cam 81, thus retaining this valve in open position. In order to start the apparatus, the lever 90 is pushed in the direction indicated by the arrow to shift the valve 88 to a position where pilot pressure will be supplied through the pilot conduits 95 and 96 to a four-way valve 97 controlling supply of fluid under pressure to the cylinder 60. It will be seen that this fluid under pressure will pass from the pump 86, through a conduit 98, into a conduit 99, and to a feed control valve 100. This feed control valve 100 serves not only to protect but to control the supply of fluid passing from the conduit 99 into a conduit 101, which conducts the fluid to a reducing valve

102, which serves to protect the actuating cylinder 60 from excessive pressure during the pressing stroke. The valves 101 and 102 may be accurately adjusted to control the rate and pressure at which fluid is supplied to the cylinder, thus accurately controlling the rate of movement and the rate of movement of the work table, and also the pressure which is supplied to the cylinder 60.

As has been explained above, the pilot pressure transmitted through the conduit 96 has shifted the valve 97 to a position where fluid fed into this valve through a conduit 103 from the reducing valve 102 will be directed through a conduit 105 into the left hand end of the cylinder 60, consequently causing a movement of the piston therein from left to right, as viewed in the drawings. The rate of this movement, as has been explained above, may accurately be controlled by the valves 102 and 100.

It of course will be understood that while the parts were in their initial position, an article to be operated upon by the press would be placed upon the exposed portions of the movable bed 40 and when this article was properly seated in position, the handle 90 would be manually moved in order to feed the article so positioned in underneath the stationary ram of the press. When the bed 40 of the press has reached its predetermined position beneath the ram of the press, the piston within the cylinder 60 will be moved to substantially its extreme right hand position of movement and the cam surface 80 will engage the right hand valve 82, opening this valve, which will permit fluid from the conduit 98 to pass through the four-way valve 107, conduit 108, conduit 109, four-way valve 110, and conduit 111, into the cylinders 11, which serve, in cooperation with the pistons 18, to effect upward movement of the entire bed framework of the press, to force the work into engagement with the die carried by the stationary ram, as has been explained in detail above.

A valve 112 is in communication with the conduit 111, which serves to permit bleeding of the hydraulic fluid from the cylinders when a predetermined maximum pressure has been obtained, and, as is conventional in constructions of this kind, this valve may be accurately adjusted in accordance with the predetermined work resistance desired. Also in communication with the valve 112, by means of the pilot conduit 113, is a four-way valve 114, which serves upon attainment of predetermined maximum pressure to supply fluid to a time delay valve 115, starting the time delay in operation. After a predetermined interval of time has elapsed in accordance with the setting of the time delay 115, fluid transmitted to the time delay through a conduit 116 will be passed through the time delay valve to a pilot conduit 117 to a pilot valve 118. This pilot valve 118 is adjusted in such a position that fluid may flow therethrough to a pilot conduit 119, which conducts this fluid to the four-way valve 110 to actuate the same. It will therefore be clear that after the bed of the press has been retained in engagement with the ram under predetermined pressure for a predetermined time interval, the four-way valve 110 will be shifted, allowing the bed of the press to descend by gravity and the fluid therefrom to be bled backwardly through the conduit 111, valve 110, into a conduit 120, through a valve 121, and into the tank 85. Simultaneously, when the four-way valve 110 is shifted by the pilot pressure supplied through the conduit 119, as described above, the pump delivery is also directed to the tank through the valve 121. Also, as soon as the fluid starts bleeding from the cylinders 11, the pressure is automatically removed from the four-way valve 9, allowing a spring within this valve to shift it, so that the pilot pressure is directed through a conduit 123 to the time delay valve 115, resetting it to its original position.

When the pistons 18 within the cylinders reach their extreme downward position of movement, a flipper dog 124 engages a star wheel 125 and shifts the position of the pilot valve 118, so that the left hand starting valve 88 is now ineffective, but pilot pressure is available through a conduit 130 to the right hand starting valve 89.

During the operation of the press, an article may be loaded upon the exposed portion of the movable bed thereof while the press is acting upon the article which has been placed upon the opposite half of the bed, in order that as the mechanism starts its 2nd portion of its cycle of movement, a new article will be disposed in position to be operated upon when the apparatus operates.

As pilot pressure is supplied to the valve 89, as described above, this valve will be swung to a position where pilot pressure will be transmitted through a conduit 133 to the valve 97, shifting the position of this valve so that hydraulic fluid from the pump 98 will be supplied to the right hand end of the cylinder 60 and the movable bed of the press will be shifted in the opposite direction, the parts functioning in substantially the same manner as has been described above.

It will be readily understood that while but one specific embodiment of the present invention has been described in detail, many other and further embodiments thereof will be readily apparent to those skilled in the art.

What is claimed is:

1. A press including in combination a stationary die carrying member, a framework adapted for movement toward said die carrying member, a transversely shiftable work supporting bed mounted upon said framework, and hydraulic means for shifting said bed relative to said framework.

2. A shuttle feed for presses including a bed plate, said bed plate having an area substantially twice that of the area of said press, means for shifting said bed plate laterally to dispose either half or the other thereof within the press, whereby an article to be operated upon by said press may be mounted upon said bed plate during a pressing operation.

3. A press including in combination, a bed framework, a laterally shiftable bed plate carried upon said bed framework and having an area substantially twice that of the press, whereby an article to be operated upon said press may be mounted upon said bed plate during a pressing operation.

4. A press including in combination, a base frame, a plurality of posts extending upwardly from said base frame, a stationary ram rigidly mounted upon said posts, a bed frame movably mounted on said posts and adapted for movement toward said stationary ram, hydraulic means for moving said bed frame toward said ram, and a laterally shiftable bed plate for moving a workpiece into and out of the press carried by said bed frame and movable toward said ram therewith.

5. A press including in combination, a base frame, a plurality of posts extending upwardly from said base frame, a stationary ram rigidly

mounted upon said posts, a bed frame movably mounted on said posts and adapted for movement toward said stationary ram, hydraulic means for moving said bed frame toward said ram, a laterally shiftable bed plate for supporting a workpiece to be operated on carried by said bed frame and movable therewith toward and from said ram, and hydraulic means for shifting said bed plate laterally to move said workpiece into and out of the press.

6. In a press, a bed framework, a bed plate carried thereby, said bed framework having a dovetailed recess therein, a dovetailed member carried by said bed plate and received within said dovetailed recess, a series of teeth on said dovetailed member and a gear engageable with said teeth serving to effect shifting movement of said bed plate with respect to said bed frame.

7. In a press, a bed framework, a bed plate carried thereby, said bed framework having a dovetailed recess therein, a dovetailed member carried by said bed plate and received within said dovetailed recess, a series of teeth on said dovetailed member, a gear engageable with said teeth serving to effect shifting movement of said bed plate with respect to said bed frame, and hydraulic means for effecting rotation of said gear.

8. In a press having a stationary ram and a work supporting bed adapted for movement into engagement with said ram, a laterally shiftable work supporting member slidably mounted for movement on said bed, a rack carried by said member, a shaft journalled for rotation in said bed, a gear on said shaft meshing with said rack whereby rotation of said shaft serves to shift said work supporting member laterally with respect to said bed, and hydraulic means for effecting rotation of said shaft.

9. In a press having a stationary ram and a work supporting bed adapted for movement into engagement with said ram, a laterally shiftable work supporting member slidably mounted for movement on said bed, a rack carried by said member, a shaft journalled for rotation in said bed, a gear on said shaft meshing with said rack whereby rotation of said shaft serves to shift said work supporting member laterally with respect to said bed, a gear on the opposite end of said shaft, a rack slidably mounted in said bed meshing with said last mentioned gear, and a hydraulic operator for reciprocating said last mentioned rack to produce rotation of said shaft.

10. In a press having a stationary ram and a work supporting bed adapted for movement into engagement with said ram, a laterally shiftable work supporting member slidably mounted for movement on said bed, a rack carried by said member, a shaft journalled for rotation in said bed, a gear on said shaft meshing with said rack whereby rotation of said shaft serves to shift said work supporting member laterally with respect to said bed, a gear on the opposite end of said shaft, a rack slidably mounted in said bed meshing with said last mentioned gear, and a hydraulic operator for reciprocating said last mentioned rack to produce rotation of said shaft, said last mentioned gear being substantially smaller than said first mentioned gear whereby a predetermined movement of said last mentioned rack will produce a substantially greater movement of said work supporting member.

11. In a press having a bed frame, a work supporting plate carried by said bed frame, said plate being slidably mounted with respect to said supporting bed, a hydraulic cylinder for moving said plate with respect to said bed, valves for controlling the supply of fluid to said hydraulic cylinder and means carried by said plate serving to actuate said valves.

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