

Dec. 23, 1958

A. J. WACHT
TOGGLE PRESS

2,865,285

Filed Aug. 16, 1956

6 Sheets-Sheet 2

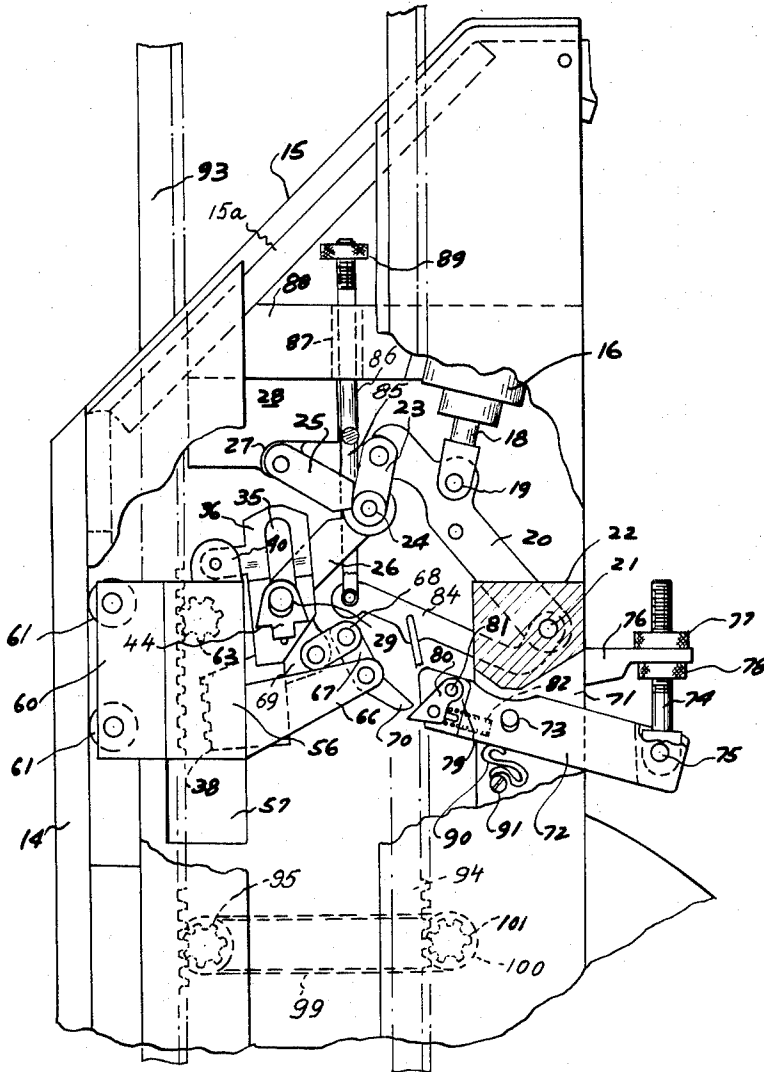


Fig. 3

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6 Sheets-Sheet 3

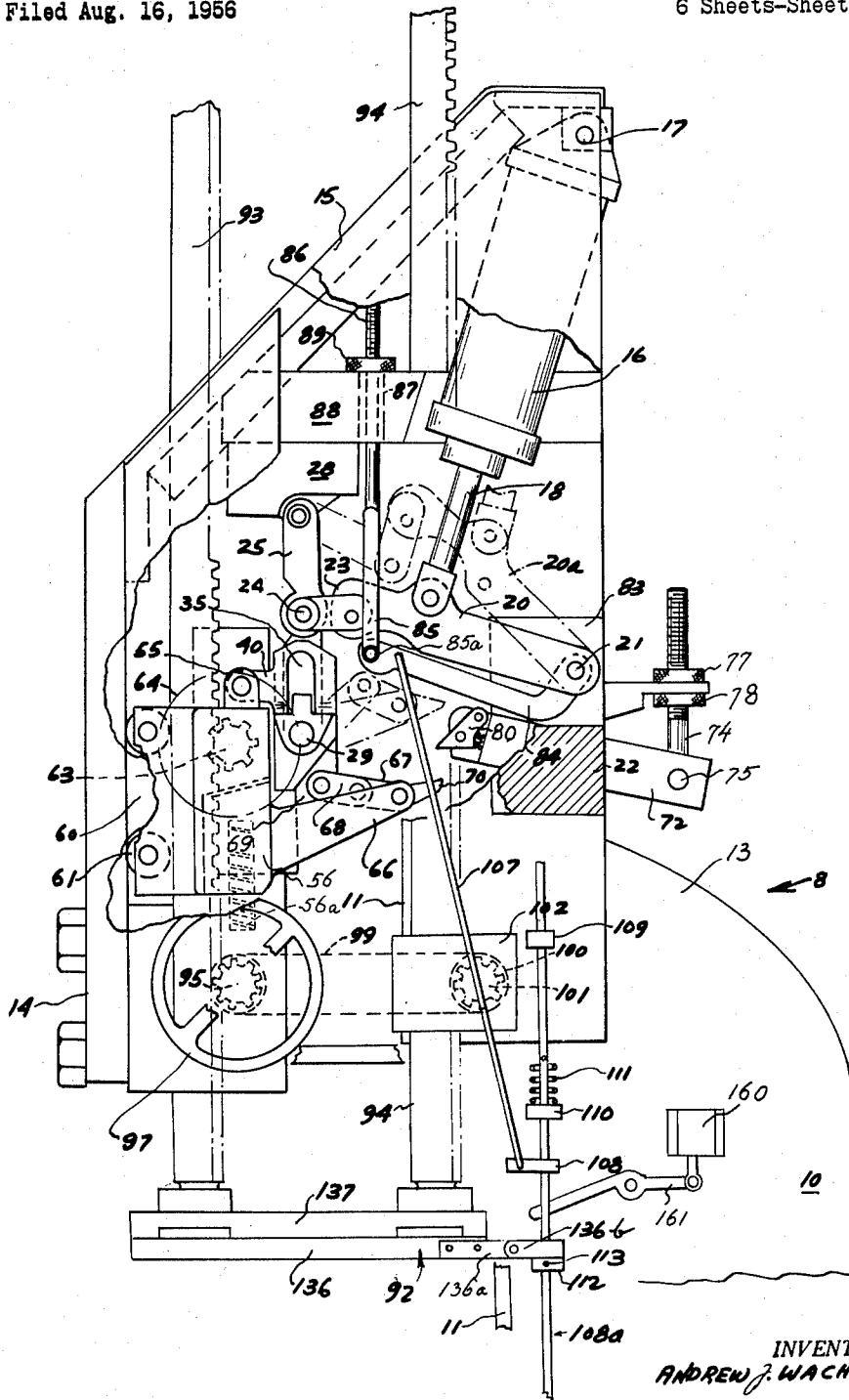


Fig. 4

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6 Sheets-Sheet 4

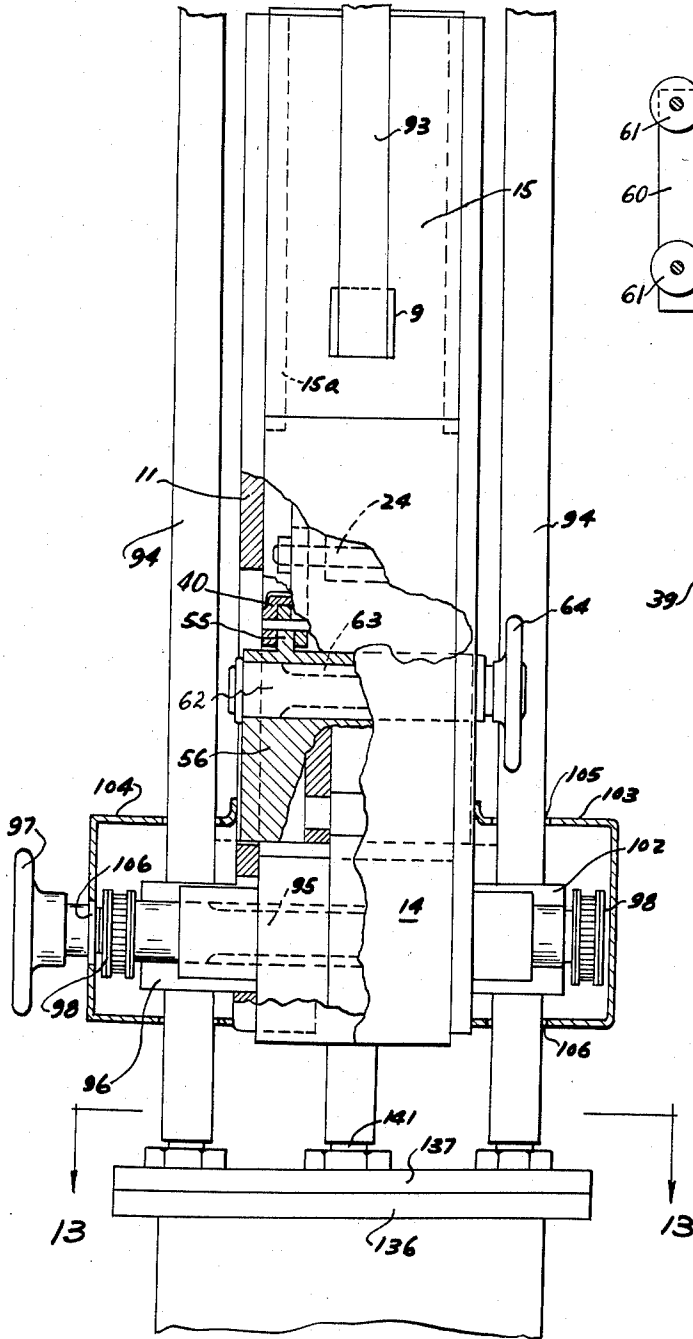


Fig. 5

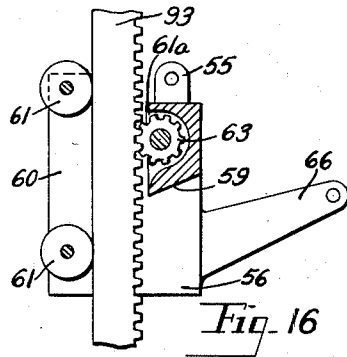


Fig. 16

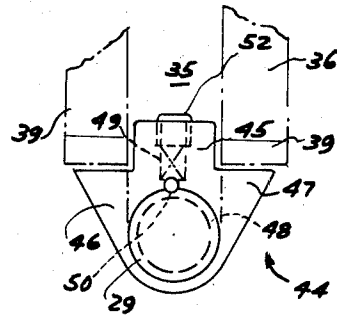


Fig. 8

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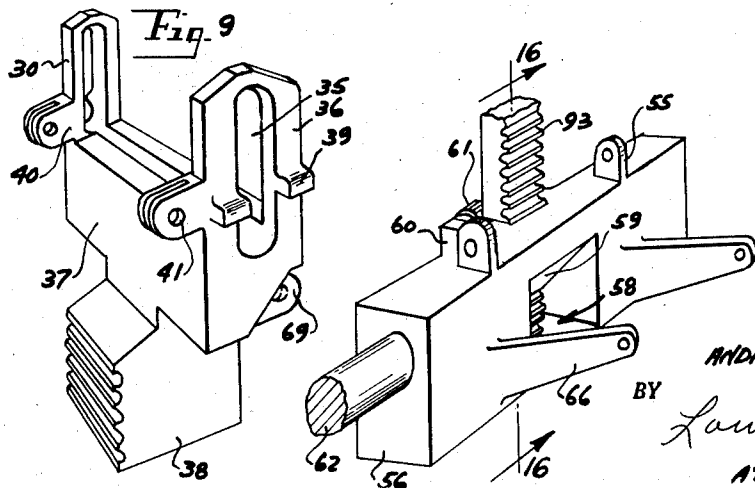
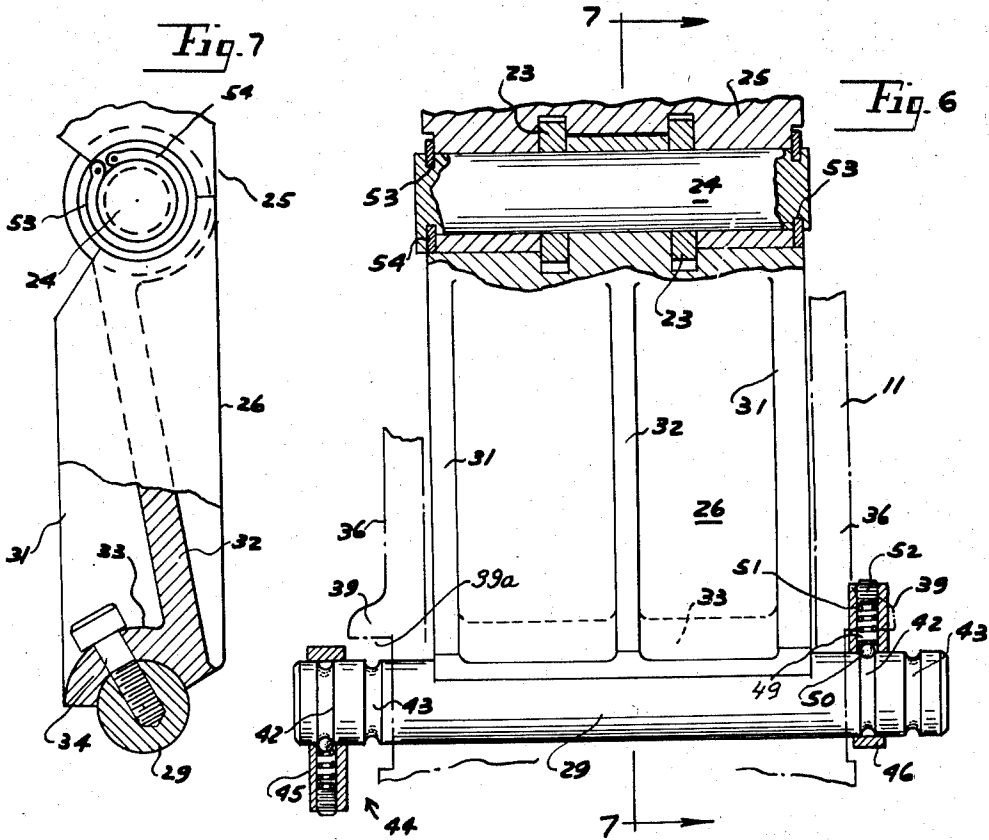
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6 Sheets-Sheet 6

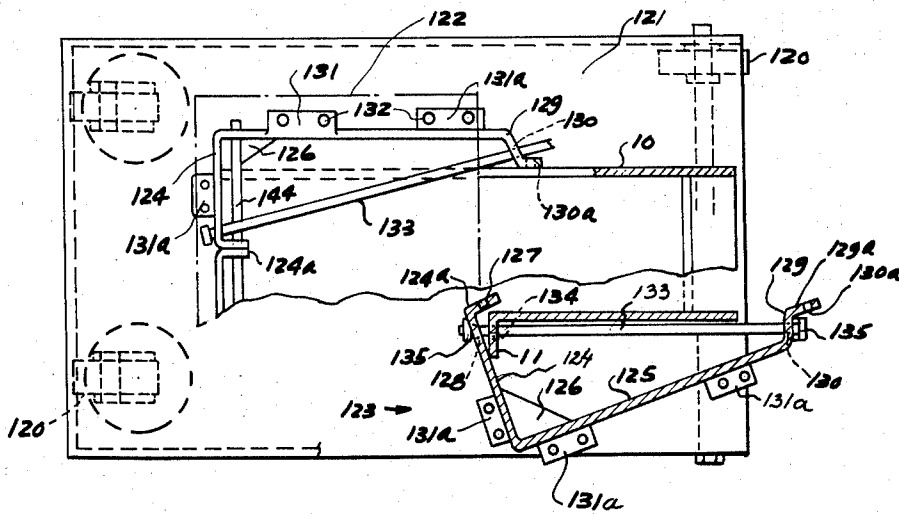


Fig. 11

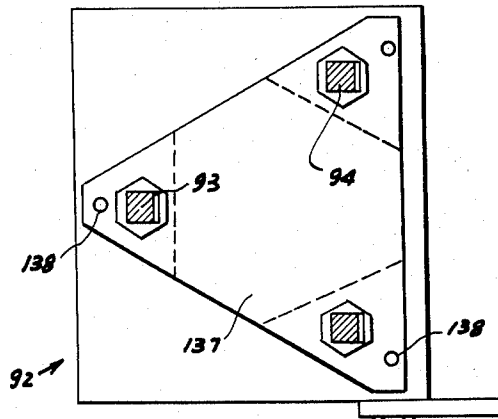


Fig. 13

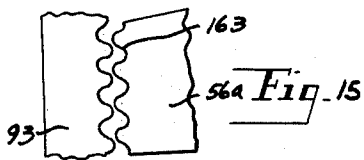


Fig. 15

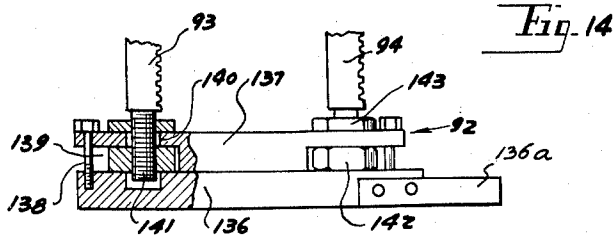


Fig. 14

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Application August 16, 1956, Serial No. 604,487

7 Claims. (Cl. 100—272)

My improvement pertains to a press in which the ram may be first manually adjusted to a suitable distance from the bolster plate of the press, but in which a toggle, operated by power means, is employed to actuate the ram in its operative stage to the limit of its movement.

The object of my improvement is to provide a press in which, by way of a preliminary operation, the ram may be quickly adjusted to any desired height with respect to the position of the bolster plate while the toggle is operatively disconnected, but in which the toggle is automatically brought into play on the downward stroke of the ram.

A further object of the improvement is to provide a press in which the means ordinarily used to support a bolster plate or an equivalent member may be dismantled and shifted out of place to permit positioning of the bolster plate or an equivalent member at a level of the base of the press or materially lower below the normal level of such a bolster plate.

I shall now describe my improvement with reference to the accompanying drawings in which:

Fig. 1 is a side elevational view of the press as mounted upon a wheeled platform;

Fig. 2 is a front elevational view of said press;

Fig. 3 is a side elevational view, partly in section, of the toggle mechanism and means operatively connected for the operation of the ram in a press in which the framework is slightly modified;

Fig. 4 is a side elevational view, partly in section, of the same toggle mechanism and elements operatively connected thereto, the view disclosing said mechanism and said elements in different operative positions;

Fig. 5 is a front elevational view of the upper portion of the framework of the press, as shown in Fig. 1, with parts broken off to disclose operative parts therein;

Fig. 6 is a front view of one link of a toggle;

Fig. 7 is a sectional view on line 7—7 of Fig. 6;

Fig. 8 is a side elevational view of a toggle-locking element;

Fig. 9 is an isometric view of a short rack adapted to co-operate with the toggle mechanism;

Fig. 10 is an isometric view of a member to which the rack shown in Fig. 9 is pivotally connected;

Fig. 11 is a top view of a vehicle on which the press shown in Fig. 1 is mounted, the view including dismantlable props for support of a bolster plate;

Fig. 12 is a fragmentary side elevational view of the press shown in Fig. 2, the view including the outlines of molds secured to members of the press and the outline of an object formed in said molds;

Fig. 13 is a sectional view on line 13—13 of Fig. 5;

Fig. 14 is a side elevational view of elements shown below said line 13—13 in Fig. 5.

Fig. 15 is a side elevational view of two racks employed to press;

Fig. 16 is a sectional view on line 16—16 of Fig. 10.

Similar numerals refer to similar parts throughout the several views.

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Prior to the detailed description of the operative elements of the press, I want to state that the toggle mechanism shown in the drawings may form a separate unit which when enclosed in a suitable housing, may be mounted upon a conventional arbor press for the operation of the ram of said press. However, for the sake of avoiding any confusion, the present specification is directed to a press in which the framework includes a space for said toggle mechanism.

The framework 8 of the press shown in Fig. 1, consists of a vertical stand of channel-like construction, including two flat walls 10, each including a laterally-extending flange 11, the walls being disposed parallel to each other and rising from a base 12. The stand resembles a crane by reason of an overhanging horizontal portion in which two arms 13 are connected at the front by a heavy plate 14. The two arms 13, each of which contains an open area 13a, and the front plate 14 form a housing for the operative elements of the press. The housing extends upwardly above the level of said arms 13 and includes, at the top, a wall 15 slanting downwardly from the back portion of the frame. The wall is provided with an aperture 9 to which I shall refer again.

I shall now refer to the drawings in Figs 3 and 4 in which the wall 15 is shown resting on rails 15a. Disposed within the upper end of the framework of the press is a cylinder 16 which at one end is pivotally hinged to said framework by means of a pin 17. The cylinder is connected to a source of a fluid medium serving for the operation of a reciprocating piston within said cylinder. While the piston itself is not shown, numeral 18 indicates a rod which at one end is connected to said piston and which projects outwardly therefrom. At its outer end the piston is pivotally connected, as shown at 19, to a lever 20 at a point intermediate the ends thereof. The lever itself is mounted pivotally upon a pin 21 within a vertical slot in a stationary block 22 within the rear portion of the frame.

At the opposite end, the lever is hinged, by means of a short link 23, to the knuckle pin 24 joining the two toggle arms 25 and 26, respectively. The arm 25 is pivotally secured, at its outer end, to a stationary block 28, while the outer end of the other arm 26 is secured to a transverse shaft 29. Said arm 26, best shown in Fig. 7, includes side flanges 31 and a centrally-located rib 32, the lower end of the arm being formed into an arcuate-shaped foot 33 for engagement with said shaft 29 to which said foot is secured by bolts 34.

The end portions of the shaft 29 fit into slots 35 in two parallel brackets 36 upon a cross-member 37 at the top of a short swing rack 38, shown in Fig. 9. Projecting from the outer side of each bracket are two shoulders 39, one shoulder being located on one side of said slot 35 and the other shoulder being located on the other side of the slot, each shoulder being defined by a horizontal flat bottom surface 39a. In addition, each bracket is provided with a slotted ear 40, the latter being provided with a bearing 41 to which I shall refer again. Returning to the shaft 29, I want to point out that each end portion of the shaft 29 projecting beyond the respective bracket has two annular grooves 42 and 43, as shown in Fig. 6, the grooves adjoining each other.

Located upon each end of the shaft 29 is a member, best shown in Fig. 8 and generally marked 44. The member has the form resembling an arrow-head, and includes a short stem 45 and a head 46 which has two outwardly-flaring wings 47, each of being defined, in part, by a straight line for abutment with the surface 39a of the respective shoulder 39 on bracket 36. The head 46 contains a circular aperture 48 of a diameter to fit over either end portion of the shaft 29, while the stem 45 contains a bore 49 opening radially into said aperture

48. A steel ball 50, dropped into the bore 49 as shown in Fig. 6, is of a size to fit into one of the annular grooves 42 or 43, while a coiled spring 51, retained in the bore by a threaded closure 52, serves to urge the ball in the respective groove 42 or 43, as the case may be.

At the top, said arm 26 is hinged to the upper arm 25 of the toggle by means of the already-identified pin 24, said pin serving also as a means for a pivoted connection with a link 23. At each end said pin 24 is provided with an annular groove 53 for reception of a retaining ring 54 shown in Figs. 6 and 7.

The ears 40 are pivotally connected to a pair of vertical ears 55 upon a horizontally-disposed beam 56 which is rectangular in vertical cross-section. The end portions of the beam fit into oblong vertical slots 57 in the side-walls of the housing at the upper end of the framework of the press, as shown in Figs. 1 and 3. One one side, facing said short rack 38, the beam has a recess 58 defined at the top by a downwardly-slanting roof 59, the recess being open downwardly. At the other side, opposite said recess, the beam is provided with two integrally-formed bars 60 which are disposed vertically in a spaced relation to each other. Mounted within the space between said bars are rollers 61. In addition thereto, the beam contains a horizontal recess 61a in the direction from one end to the other, and disposed within the recess 61a is a shaft 62, which intermediate its ends forms a pinion 63, the pinion being located opposite said rollers in a spaced relation thereto. Mounted upon the shaft 62, externally of the side wall 10 of the frame, is a wheel 64 for manual operation of the pinion 63. An isometric view of the beam is shown in Fig. 10, the beam being slightly modified from the one shown in Figs. 3 and 4, inasmuch as the bars 60 in the beam as shown in Fig. 10 rise above the body portion of the beam. However, the detail is of no consequence.

Projecting from the beam 56 in the direction of the rear, as shown in Fig. 3 of the frame are two arms 66, the two arms straddling the recess 58 within said beam 56, each arm being at its end connected by means of two short links 67 and 68 to a lug 69 below the respective bracket 36 at the top of the short rack 38. The two links 67 and 68 are disposed in an end-to-end relation, as best shown in Fig. 4. Link 67, which at one end is pivotally connected to link 68, is connected, midway its length, to the arm 66, and includes at the end remote from said link 68, a spur 70.

I shall now refer to the stationary block 22 which has already been identified in the course of this specification. Contained in a vertical slot 71 in said block, as shown in Fig. 3, is a bar 72 which is fulcrumed upon a transverse pin 73. At one end the bar extends out of the framework of the press and is pivotally connected to the lower end of a vertically-disposed bolt 74, as shown at 75. The bolt is threaded through a bracket 76 extending from the framework 8. Numerals 77 and 78 indicate a pair of adjusting nuts upon the bolt above the top surface of said bracket. At the opposite end the bar 72, in a recess 79, the bar contains a pawl 80 which at one end is pivotally secured in place by means of a pin 81, while the other end of the pawl projects outwardly under the tension of a coiled spring 82. A spring 90, secured to the block 22 by a screw 91, bears against the bar 72 from below.

Located in another vertical slot 83 in the same block 22, as shown in Fig. 4, and pivotally secured therein by means of a pin 21, is an arm 84 which, at the opposite end, is attached to the lower end of a vertical yoke 85. The yoke itself has the shape of an inverted letter U, including two arms, each of which has an eye at the lower end for reception of a removable cross-pin 85a. The yoke is suspended at the top from an integrally-formed rod 86 which passes through a bushing 87 in a transverse rail 88 in the upper portion of the frame-

work of the press. The upper end of the rod is threaded and provided with a nut 89.

I shall now refer to the ram of the press. The ram includes a horizontally-disposed member, generally marked 5 92, at the lower end of three vertical racks, one of which, marked 93, is disposed in the front portion of the press, the other two racks 94 being located rearwardly thereof. The relative positions of the racks are best shown in Fig. 13.

The member 92 consists of two plates, a bottom one 10 136, which is rectangular in shape, and the upper, triangular one 137. The two plates are held together by means of screws 138. The triangular top plate is under cut at each corner to leave a free space 139 between the 15 upper plate and each corner portion of the upper plate. In addition thereto, each corner portion of the upper plate contains an aperture 140 for reception of the lower end 141 of the respective rack. Furthermore, the lower end of each rack is threaded for application of two nuts by 20 means of which the racks are secured to said member 92. One of said nuts, 142, is applied to the rack within the free space 139, the others, 143, being applied to the rack on top of the upper plate. One of the objects of the two 25 nuts is to secure the racks 93 and 94 to the member 92. The other object is to permit minute vertical adjustment of each individual rack for best operative engagement of its teeth with the teeth of the respective pinions already named herein.

The rack 93 passes vertically through the space be- 30 tween two vertical bars 60 of the beam 56, the back surface of the rack bearing against the rollers 61, while the teeth of the rack are in engagement with the teeth of pinion 63. Within the lower portion of the housing enclosing the toggle mechanism, the rack is in engagement 35 with a pinion 95, the latter having the form of a fluted shaft which is supported in a suitable bearing 96.

Mounted upon one end portion of the shaft is a hand 40 wheel 97 and a sprocket wheel 98. A similar sprocket wheel is axially mounted upon the opposite end of the shaft. Two endless chains 99, one on each sprocket wheel, connect said wheels with similar sprocket wheels 100 at the opposite ends of a shaft fluted to form a 45 pinion 101. The shaft is journaled for rotation in bearings in blocks 102 within the above-said housing in the upper portion of the frame-work of the press. Meshed with the teeth of the pinion 101 are two above-mentioned racks 94.

It will be noted that attached to the framework 8, on 50 one side thereof, is an enclosure or guard 103, and that a similar guard 104 is attached to the other side of the framework. Each housing has an aperture 105 in its top wall and a vertically-alined aperture 106 in its bottom wall, the aperture serving to permit vertical movement of the respective racks through each housing. The 55 object of the guards is to cover the sprocket wheels 100 and the chains 99.

Pivotally connected, at one end, to the arm 84, as 60 shown in Fig. 4, is a rod 107 which, at its other or lower end, is connected to a clamp 108, the latter being affixed to a vertical rod 108a. The last-named rod is disposed 65 slidingly within two guides 109 and 110, respectively, both being mounted upon the upper portion of the framework. Coiled about the last-named rod 108a, and bearing from above against said guide 10, is a spring 111 which at one end is connected to said rod. A collar 112, 70 held in place upon said rod by a screw 113, bears normally against the underside of a bar 136a attached to plate 136, as shown in Fig. 4.

By way of a further description of this part of the press, 75 I wish to add that numeral 160 indicates a switch box in an electric circuit designed to control the operation of the piston in the pneumatic cylinder 16, and that numeral 161 indicates an arm operating a switch in said switch box, the arm being disposed in the path of the movement of the bar 136a extending from plate 136 of the

ram of the press. The bar includes a finger 136b which at one end is pivotally connected to said bar 136a and is held in horizontal alignment therewith by a spring which is not shown but which permits temporary deflection of the finger, under pressure, from its normal horizontal position. As the means for operation of the piston and electric control means for the operation of the piston are well known and form no part of this invention, no description thereof is given herein.

At this juncture I wish to refer to the drawings in Fig. 15 which disclose a length of a rack, such as rack 93, and a short rack 56a analogous to rack 38 shown in Fig. 3. It will be noted that the faces of the teeth in said racks, as seen in profile, are not flat, but curved. Specifically, the upper face 162 of each tooth of rack 93 is convex, while the corresponding or lower face 163 of a tooth in rack 56a, which tooth is to bear against said face 163, is concave. The object of this formation of the teeth is to secure more intimate engagement between the teeth of the short rack, such as rack 56, and the teeth of the vertically-sliding rack, such as rack 93.

I shall now refer to the base 12 of the framework and the means designed to support a bolster plate or other members towards which the ram is to exert pressure. As above stated, the press is mounted upon a vehicle. However, this is a feature which is merely optional so that the operation of the press is in no way dependent thereon.

The vehicle which supports the press includes a platform 121 mounted upon ground wheels 120. For normal operation of the press, the bolster plate 122 of the press is supported on two demountable props, each of which is generally marked by numeral 123. Each of the props is made of heavy plate stock bent into an L-shaped form including a short arm 124 and a long arm 125, the two arms being set at right angle to each other and being kept in said relation by an angle brace 126. The shorter arm 124 terminates with an integrally-formed hook or flange 124a extending parallel to the longer arm 125. The flange contains an aperture 127, while the arm itself contains, in the portion adjoining said flange, a pair of apertures 128. The longer arm 125 includes, at its outer end, a partly inwardly-bent tail end 129 which is provided with a pair of apertures 130 and a tab 129a which contains a hole 130a.

The props are designed for use in such a position that the planes of the plate stock are set at right angle to the platform 121. Extending from the upper edge of each prop are a plurality of tabs 131, each containing a plurality of holes for application of bolts by means of which the bolster plate may be secured to said props in its position on the top thereof, as shown in Fig. 1. Similar tabs 131a extend from the lower edge of each prop. Extending from the short arm 124 to the long arm 125 are two tie rods 133 which serve as a means for connection of the respective prop to the framework of the press. For this purpose, the outwardly-turned flange 11 from each wall 10 of the framework contains two apertures 134, and it is through these apertures that the tie rods extend from one arm 124 to the other arm 125. To prevent dislocation of the tie rod from the arms or either arm of the respective prop, its ends are preferably threaded and equipped with nuts 135.

It will be first assumed that the bolster plate is to be supported by said props 123. For this purpose, both of them are brought forwardly of the flanges 11 of the framework of the press. One of such props is already shown in a forwardly-shifted position in Fig. 11. The other prop, which is in its rearward position, is to be also shifted forwardly till the short flange 124a at one end of its arm 124 will be in parallel abutment with the similar flange 124a of the other arm 124 when apertures 127 in said flanges will be alined. Thereupon, a rod 144 may be thrust into said apertures to keep the props in place.

Another tie rod, which is not shown, may be used to

join the tail ends 129 of the props when they are in their rearward position. One of such props in said rearward position is shown in Fig. 1. The opposite rod is shown in such rearward position in Fig. 11.

When both props are in the forwardly-shifted position, tabs 131a are secured by screws to the platform 121, whereupon the bolster plate may be placed upon the props and secured to the props by means of screws which are to be applied to the plate through holes 132 in tabs 131.

When the press is to be used for purposes requiring no bolster plate, as, for instance, when molds are to be used for the purpose of forming a desired object, the props 123 may be shifted rearwardly, as exemplified by the prop shown in the lower right hand corner of Fig. 11. In such a case, the space normally occupied by the props may be used for the mounting of a mold 150 shown in dotted lines in Fig. 12. The complementary inner member 151 of the mold would be attached to the lower plate 136 of the ram of the press. Numeral 152 indicates an object formed by means of the molds.

Now, in order to describe the operation of the ram, it will be assumed that the piston rod 18 is in its withdrawn position as shown in Fig. 3, at which phase the short rack 38 is out of engagement with the long rack 93.

It will be further assumed that the beam 56 is located within the upper end of slots 57, in which position its weight may be balanced by coiled springs disposed within the vertical bores in the beam and bearing against the beam from below, the springs being based within the frame of the press below the lower end of said slots 57. One such coiled spring, marked 56a, is shown in Fig. 4.

Another pre-requisite for the operation of the ram is that the arrowhead members 44 be properly seated on the ends of shaft 29. Specifically, each member must be brought into engagement with a respective groove 42, with the stem 45 being turned up, while the wings 47 bear from below against the bottom surfaces 39a of shoulders 39 on brackets 36, as shown in Fig. 6.

Next, it will be assumed that the ram is to be brought down towards the bolster plate. Initially, this may be done by means of the hand wheel 97. As the wheel is rotated manually, the pinion 95, which is driven by said wheel and which is in mesh with the rack 93, will impart to said rack a longitudinal movement downwardly. As the shaft which supports said hand wheel 97 carries two sprocket wheels 98 which, by means of endless chains, are connected to similar sprocket wheels 100 on a parallel shaft, including a pinion 101, and as the latter is in mesh with two other racks 94, the ram, which is supported by all three racks, will move downwardly with said racks.

In the course of the downward movement of the ram, bar 136a will encounter the collar 112 on rod 108a and force said rod, by means of said collar, downwardly against the tension of spring 111. As clamp 108, which is secured to said rod 108a is connected to the lever 84, and as the latter is connected to the cross pin 85a of the yoke 85, the downward movement of the rod 108a will cause the cross pin 85a to bear from above against the links 67 and 68, and will cause said links to swing the short rack 38 into mesh with the rack 93 as shown in Fig. 4. Immediately thereafter, in the course of the downward movement of said rod 108a, the clamp 108, mounted on the rod, will depress an arm 161 which will close a switch 160 included in an electric circuit which controls the flow of the fluid medium operating the piston in the cylinder 16. As a result, the piston rod will be forced out of the cylinder from the position shown in solid lines in Fig. 3 to a position shown in solid lines in Fig. 4.

The piston rod, bearing against the lever 20, will cause the link 23 to bear against the knuckle joint of the toggle where the arms of the toggle are secured to each other by means of the pin 24.

The pressure of the link 23 against said joint will cause the arms 25 and 26 of the toggle to spread apart, in the course of which the lower arm 26, best shown in Fig. 6, will bear against the shaft 29, and by means thereof will swing the member shown in Fig. 9 from the pivotal connection to ears 55 towards the rack 93. This will bring the teeth of the short rack 38 into mesh with the teeth of the rack 93.

As the downward movement of the piston shall continue, said short rack 38, actuated by said arm 26 of the toggle, will force down the beam 56 and thereby move the rack 93 downwardly. The downward movement of said rack 93 will be transferred, by means of the sprocket wheels and chains, to the pinion 101 engaged with the two racks. The diameters of all the sprocket wheels are the same. Similarly, the diameter of pinion 63 is the same as that of pinion 101 so that all three racks will move downwardly at the same rate of speed. This will continue or may continue to the limit of the downward movement of the beam 56.

As the ram is but a means for support of a punch or an analogous member designed for operation with a die secured to the top surface of the bolster plate of the press, the downward movement of the ram will be set to terminate at the suitable level with respect to said bolster plate.

In connection with the swing of the short rack 38 toward the rack 93, attention is invited to the spur 70 at the free end of link 67 which at the opposite end is connected to link 68. The swing of the rack 38 towards said rack 93 causes said spur 70 to be swung upwardly so that with the descent of the beam 56 the spur will encounter the pawl 80. The latter will be deflected downwardly on contact with the spur which will be moved with said beam to a position shown in Fig. 4 at a level below said pawl.

On conclusion of the downward movement of the ram, the piston rod will be automatically withdrawn into the cylinder in response to the means controlling the operation of the piston within said cylinder, and as a result thereof, the following movements of the operative parts of the mechanism described herein will take place:

Moving upwardly, the piston 18 will pull up lever 20, which by means of the link 23 will cause the toggle arms 25 and 26 to fold up, that is, to converge towards each other. The wings 47 of member 44, one of which is seated at each end of shaft 29 at the lower end of arm 26, will serve to lift the member which includes the short rack 38 and which at its upper end is hinged to the beam 56. As the beam is pulled upwardly, the spur 70, at its free end of link 67, will encounter said pawl 80 and will be depressed by said pawl downwardly. This will result in a clockwise swing of the other end of said link 67 and a pull upon the short swing rack 38 away from the rack 93 till the two racks will be disengaged from the respective positions shown in dotted lines in Fig. 4 to the positions shown in dotted lines in Fig. 3.

In cases where the ram is to be employed in molding operations, as exemplified in Fig. 12, the procedure is the same in all respects except that the props 123 are shifted out of the way rearwardly upon the platform 121, and that the ram may have to travel for a considerable distance before the bar 136a will initiate the operative cycle of the piston 18 in combination with the toggle mechanism described above.

If it should be desired, or when needed to adjust the part of the press for best results, the press may be operated without the toggle mechanism. In such a case, the arrow-head members 44 mounted at the ends of shaft 29 may be shifted from the grooves 43 away from the shoulders 39 on brackets 36. This would permit lowering of the beam 56 while the shaft, at the lower end of arm 26 of the toggle, would remain in a stationary position.

With the toggle disengaged from the beam, the ram could be operated as an arbor press manually, by means

of the hand wheel 97 which is adapted to drive pinion 95, best shown in Fig. 4, and by means of a manually-operated lever in the last or operative stage of the downward movement of the ram.

The lever 171 would be fulcrumed at the rear of the framework of the press within the block 83, as shown at 172, and would operate the toggle in the same manner as the lever 20 which is operated by the piston rod 18.

Assuming that the beam 56 should be disposed in the upper end of the slideway 57 and that the short rack 38 should be in a disengaged position with relation to rack 93, a downward movement of the ram as effected by said hand wheel would, in the manner already described, actuate rods 108a and rod 107 and cause links 67 and 68 to swing the short rack 38 into engagement with the rack 93. It is at this stage that the hand lever would be used to bear against the toggle 56 and to force the ram downwardly against objects supported by the bolster plate of the press in the same manner as if the toggle were operated by power means.

While the mechanism described by me, including power-operated toggle means for application to a ram, has been shown as used in a vertical press, it will be understood that said mechanism may be also employed in a horizontal position or any other position, and in other machines and structures than a press.

It will be further understood that a number of changes may be made in the structural elements of the press described herein and that such changes may be made without departing beyond the inventive concept disclosed herein.

What I, therefore, wish to claim is as follows:

1. In a press including a vertical frame and a vertically-moving ram consisting of vertical rack means and a horizontal plate member at the lower ends thereof, a horizontal beam disposed crosswise to the rack means, the ends of the beam being disposed in vertical slideways in said frame, a short swing rack at one end pivotally connected to the beam and adapted to be swung towards the last-named rack means for engagement therewith, a toggle having two arms pivotally connected endwise by means of a knuckle joint, the arms being normally disposed at an angle to each other, the outer end of one arm being pivotally secured to the frame, the outer end of the other arm being connected to said swing rack, a cylinder within the upper end of the frame, a reciprocating piston within the cylinder, a rod connected to the piston and extending out of the cylinder, the piston being adapted to be operated by fluid means under pressure, the outer end of the piston being connected, by intermediate means, to the toggle, manual means to operate the ram, means responsive to the movement of the ram downwardly to bring the swing rack into engagement with the rack means of the ram and to cause the rod of the piston to bear against the toggle to force the ram downwardly by means of said swing rack.

2. In a press including a vertical frame and a vertically-moving ram consisting of vertical rack means and a horizontal plate member at the lower end thereof, a horizontal beam disposed transversely to said rack means, the ends of the beam being disposed in vertical slideways in said frame for a vertical movement of said beam, the latter being provided with a pair of arms extending therefrom towards the rear of the frame, a short swing rack at one end pivotally connected to the beam and adapted to be swung towards the last-named rack means for engagement therewith, link means pivotally connected to the beam and normally keeping the swing rack out of engagement with the rack means of the ram, a lever pivotally secured to the frame and adapted to engage the link means, a toggle having two arms pivotally connected endwise by means of a knuckle joint, the arms being normally disposed at an angle to each other, the outer end of one arm being pivotally secured to the frame, the outer end of the other arm being connected

to said swing rack, a cylinder within the upper end of the frame, a reciprocating piston within the cylinder, the piston being adapted to be operated by fluid means under pressure, the outer end of the piston being connected, by intermediate means, to the toggle to impart a divergent movement to its arms, manual means to move the ram downwardly, means operated by the ram on its downward movement to cause the lever to bring the swing rack into engagement with the rack means of the ram and to cause the rod of the piston to bear against the toggle to cause its arms to spread apart to impart a downward thrust to the ram by means of said rack.

3. In a press including a vertical frame and a vertically-moving ram consisting of a plurality of racks and plate means supported by said racks at the lower ends thereof, a horizontal shaft journalled at its ends in bearings within the frame and provided with axially-disposed pinion means, the pinion means being in engagement with at least one rack, a hand wheel for the operation of said pinion, a similar shaft with similar pinion means disposed parallel to the first-named shaft, the last-named pinion means being in engagement with the other racks, sprocket wheel and endless chain means connecting the two shafts to secure uniform rotation of both, a horizontal beam disposed crosswise to the racks, the ends of the beam being disposed in vertical slideways in the frame to allow the beam to be moved vertically therein, the beam being provided with arms extending therefrom towards the rear of said frame, a short swing rack pivotally secured at its upper end to the upper portion of the beam and adapted to be swung towards at least one rack of the plurality of said racks for engagement therewith, a toggle including two arms connected endwise by a knuckle joint and normally disposed at an angle to each other, the outer end of one arm being secured to the frame above said joint, the other arm being secured to said short rack, a cylinder within the upper portion of the frame, a piston adapted to be reciprocated within the cylinder by fluid means under pressure, a rod connected to the piston and extending from the cylinder, the outer end of the rod being adapted to bear against the knuckle joint of the toggle to impart a divergent movement to the arms thereof, link means pivotally connected to the beam and normally keeping the swing rack out of engagement with the racks of the ram, a lever pivotally secured to the frame and adapted to engage the link means, the pinion operated by the hand wheel being adapted to move the racks of the ram downwardly, means mounted on the frame and adapted to be operated by the ram on its movement downwardly to actuate the lever to bear against the link means to bring the swing rack into engagement with the rack or racks of the ram and to initiate a movement of the piston rod against the toggle to force the ram downwardly by means of said swing rack.

4. In a press including a vertical frame and a vertically-moving ram consisting of a plurality of racks and plate means supported by said racks at the lower ends thereof, a horizontal shaft journalled at its ends in bearings within the frame and provided with axially-disposed pinion means, the pinion means being in engagement with at least one rack, a similar shaft with similar pinion means disposed parallel to the first-named shaft, the last-named pinion means being in engagement with the other racks, sprocket wheel and endless chain means connecting the two shafts to secure uniform rotation of both, a horizontal beam disposed crosswise to the racks, the ends of the beam being disposed in vertical slideways in the frame to allow the beam to be moved vertically therein, the beam being provided with arms extending therefrom towards the rear of said frame, a member pivotally secured to the upper end of the beam and including at its upper portion bracket means provided with vertical slots, the lower portion of the member including a short swing rack, the teeth of the rack facing the

teeth of at least one rack of the ram, a toggle including two arms connected endwise by a knuckle joint and normally disposed at an angle to each other, the outer end of one member being secured to the frame above said knuckle joint, the end of the other arm being secured to a horizontal shaft, the ends of which are disposed in the vertical slots in said brackets, a cylinder within the upper end of the frame, a piston reciprocating within the cylinder, a rod connected to the piston and extending outwardly from the cylinder, the piston being adapted to be operated by fluid means under pressure, the outer end of the piston being adapted to bear, by intermediate means, against the knuckle joint of the toggle to impart a divergent movement to the arms of said toggle, link means pivotally connected to the beam for normally keeping the swing rack out of engagement with the racks of the ram, a lever pivotally secured to the frame and adapted to engage the link means, the pinion operated by the hand wheel being adapted to move the racks of the ram downwardly, means mounted on the frame and adapted to be operated by the ram on its movement downwardly to actuate the lever to bear against the link means to bring the swing rack into engagement with the rack or racks of the ram and to initiate a movement of the piston rod against the toggle to force the ram downwardly by means of said swing rack, and stationary means projecting from the frame to engage the other end of said link means to pull said short rack out of engagement with the rack or racks of the ram on the return movement of the beam when pulled upwardly by the return movement of the piston rod.

5. In a press including a vertically extending frame and a vertically-moving ram consisting of vertical rack means and a horizontal plate member at the lower end thereof, a horizontal beam disposed transversely to said rack means, the ends of the beam being disposed in vertical slideways in said frame for a vertical movement of said beam, the latter being provided with a pair of arms extending therefrom towards the rear of the frame, a horizontal shaft journalled within the beam crosswise to the rack means, a pinion mounted upon said shaft and meshed with said rack means, a hand wheel at the end of the shaft for said pinion, a short swing rack at one end pivotally connected to the beam and adapted to be swung towards the last-named rack means for engagement therewith, a pair of parallel arms extending laterally from the beam, link means at one end connected to said arms and connected at the other end to the swing rack in order to keep the swing rack normally out of engagement with the rack means of the ram, a lever at one end pivotally connected to a stationary member and adapted to bear against the link means, a toggle having two arms pivotally connected endwise by means of a knuckle joint, the arms being normally disposed at an angle to each other, the outer end of one arm being pivotally secured to the frame, the outer end of the other arm being connected to said swing rack, a cylinder within the upper end of the stand, a reciprocating piston within the cylinder, the piston being adapted to be operated by fluid means under pressure, electric control means to initiate the movement of the piston, the means including a switch for said control means, the outer end of the piston being connected, by intermediate means, to the toggle to impart a divergent movement to its arms, means responsive to the movement of the ram downwardly to cause the lever to bear against the link means to swing the swing rack into engagement with the rack means of the ram and to trip the switch, and stationary means projecting from the frame to engage the other end of said link means to pull said short rack out of engagement with the rack means of the ram on the return or upward movement of the beam.

6. In a press including a vertical frame and a vertically-moving ram consisting of vertical rack means and a horizontal plate member at the lower end thereof, a horizontal beam disposed transversely to said rack means, the

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ends of the beam being disposed in vertical slideways in said frame for a vertical movement of said beam, the latter being provided with a pair of arms extending therefrom towards the rear of the frame, a horizontal shaft journalled within the beam crosswise to the rack means, a pinion mounted upon said shaft and meshed with said rack means, a hand wheel at the end of the shaft for said pinion, a short swing rack at one end pivotally connected to the beam and adapted to be swung towards the last-named rack means for engagement therewith, a toggle having two arms pivotally connected endwise by means of a knuckle joint, the arms being normally disposed at an angle to each other, the outer end of one arm being pivotally secured to the frame, the outer end of the other arm being connected to said swing rack, a cylinder within the upper end of the frame, a reciprocating piston within the cylinder, the piston being adapted to be operated by fluid means under pressure, the outer end of the piston being connected, by intermediate means, to the toggle to impart a divergent movement to its arms and to cause the lower arm of the toggle to bear against the swing rack, electric control means to initiate the movement of the piston, the means including a switch for said control means, foldable link means connecting the beam to the swing rack, a lever at one end pivotally connected to the frame, a rod extending from the lever and serving as a means of causing the lever to bear against the link means to spread them from the normal folded position, means mounted on the ram to pull the lever and thereby to spread the links to cause the swing rack to be brought into engagement with the rack means of the ram, means on the ram to close the switch, and stationary means projecting from the frame and adapted, on the return movement of the ram, to engage the links and to pull the swing rack, by means of said links, out of engagement with the rack means of the ram.

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7. In a press including a frame, a ram movable therein, the ram consisting of parallel rack means and a transverse plate at the operative end of said rack means, a movable beam disposed transversely to the rack means in a spaced relation thereto, the ends of the beam being disposed in slideways in the frame, a short swing rack pivotally connected to the beam and adapted to be brought into engagement with the rack means, link means pivotally connected to the beam so as to keep the swing rack normally out of engagement with said rack means, a toggle having two arms pivotally connected endwise by means of a knuckle joint, the arms being normally disposed at an angle to each other, the outer end of one arm being pivotally secured to the frame, the outer end of the other arm being connected to said swing rack, a cylinder within the upper end of the frame, a reciprocating piston within the cylinder, a rod connected to the piston and extending out of the cylinder, the piston being adapted to be operated by fluid means under pressure, the outer end of the piston being connected, by intermediate means, to the toggle, manually-operated means to impart a longitudinal movement to the ram, means responsive to said movement of the ram to cause the link means to bring the swing rack into engagement with said rack means and to cause the piston rod to impart a divergent movement to the arms of the toggle to impart a continued longitudinal movement to said rack means by means of said swing rack.

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