May 30, 1944. T. F. STACY 2,349,916

POWER PRESS

Filed April 9, 1940 4 Sheets-Sheet 1

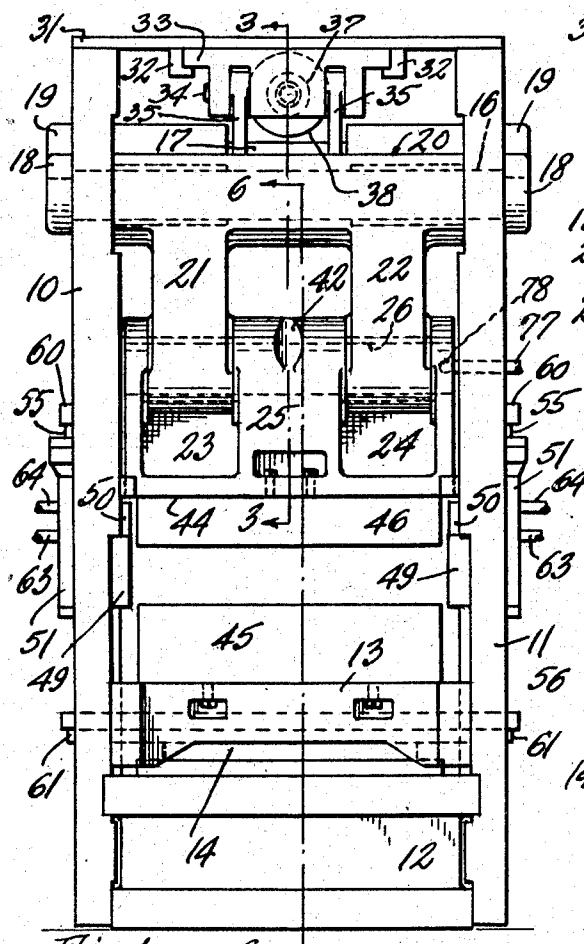


Fig. 1.

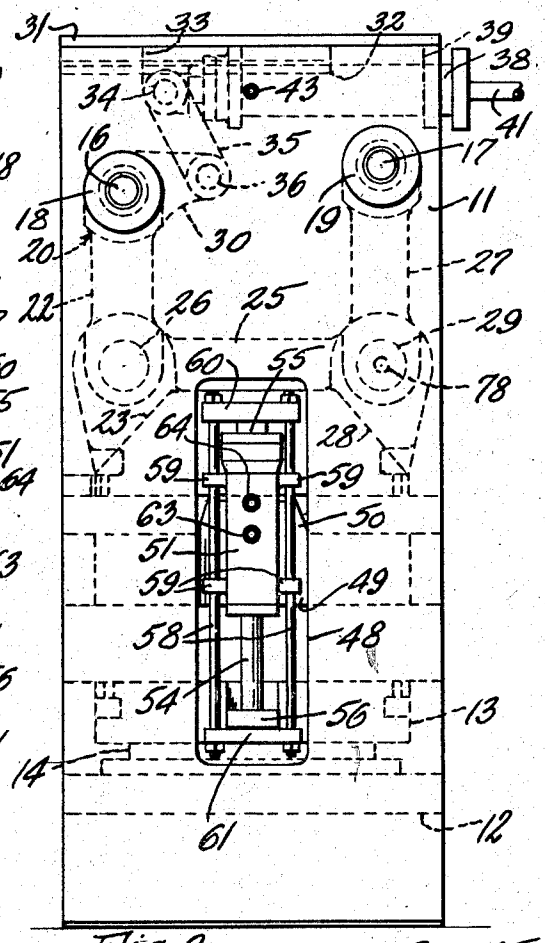


Fig. 2.

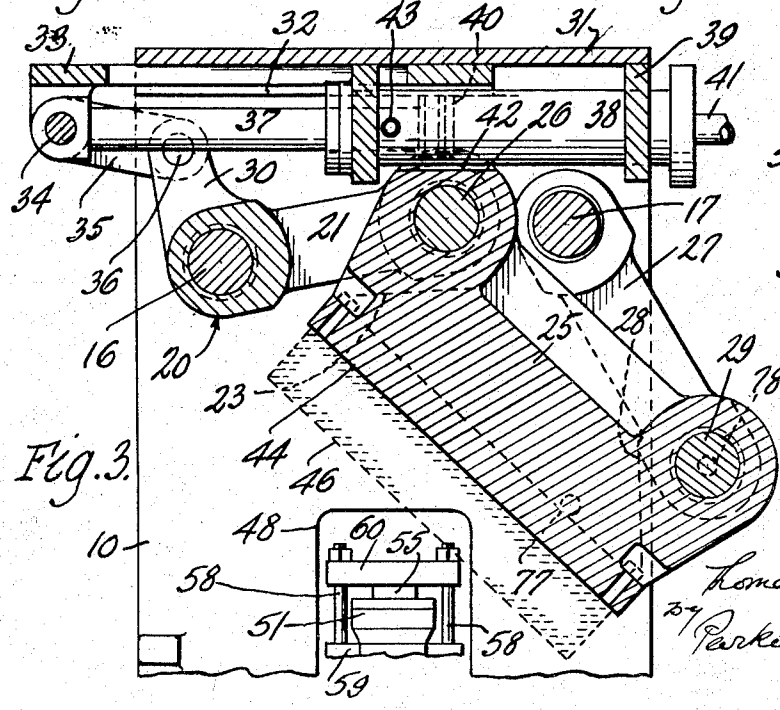


Fig. 3.

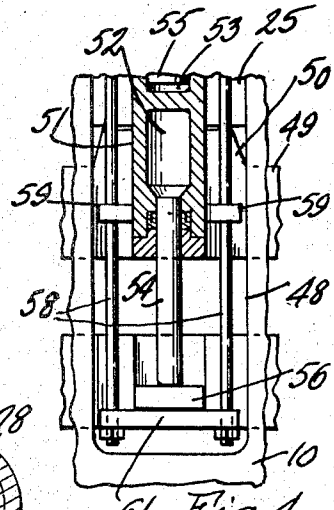


Fig. 4.

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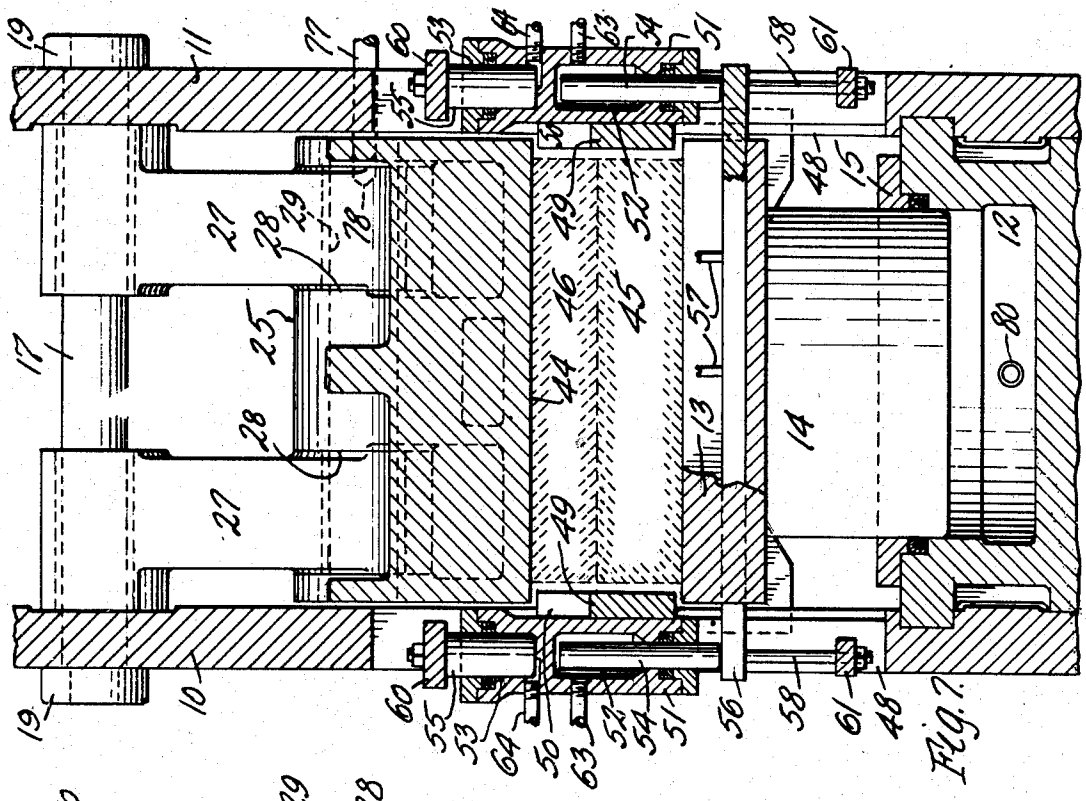


Fig. 7.

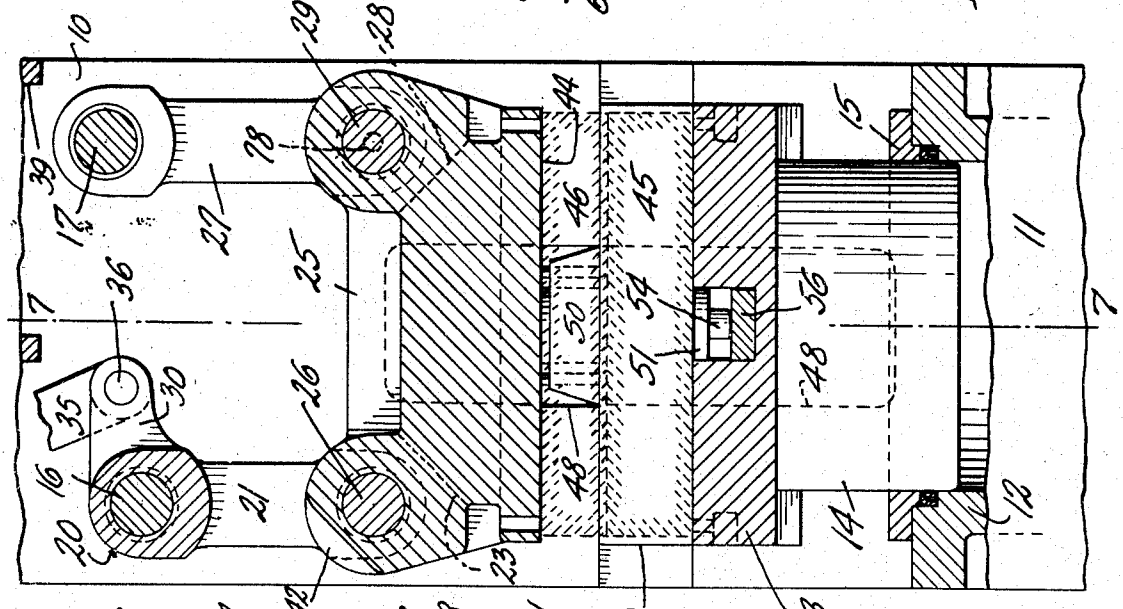


Fig. 6.

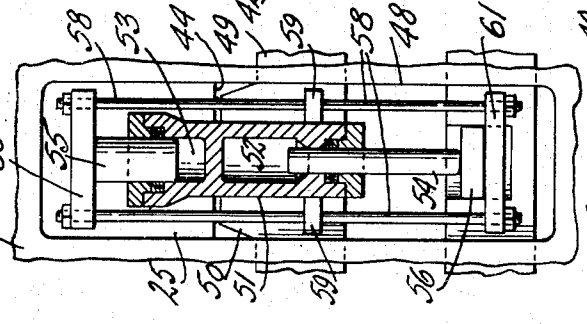


Fig. 5.

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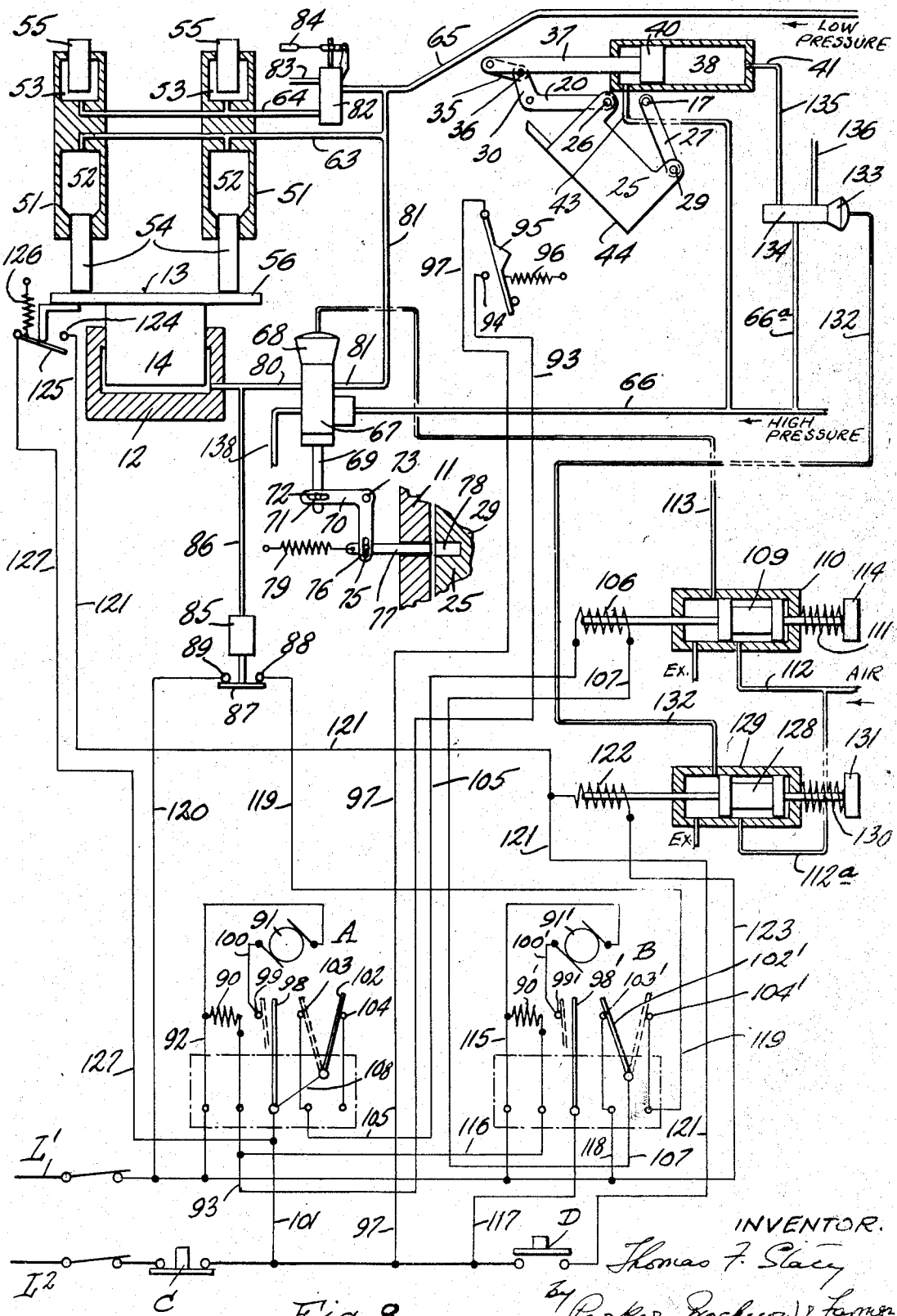


Fig. 8.

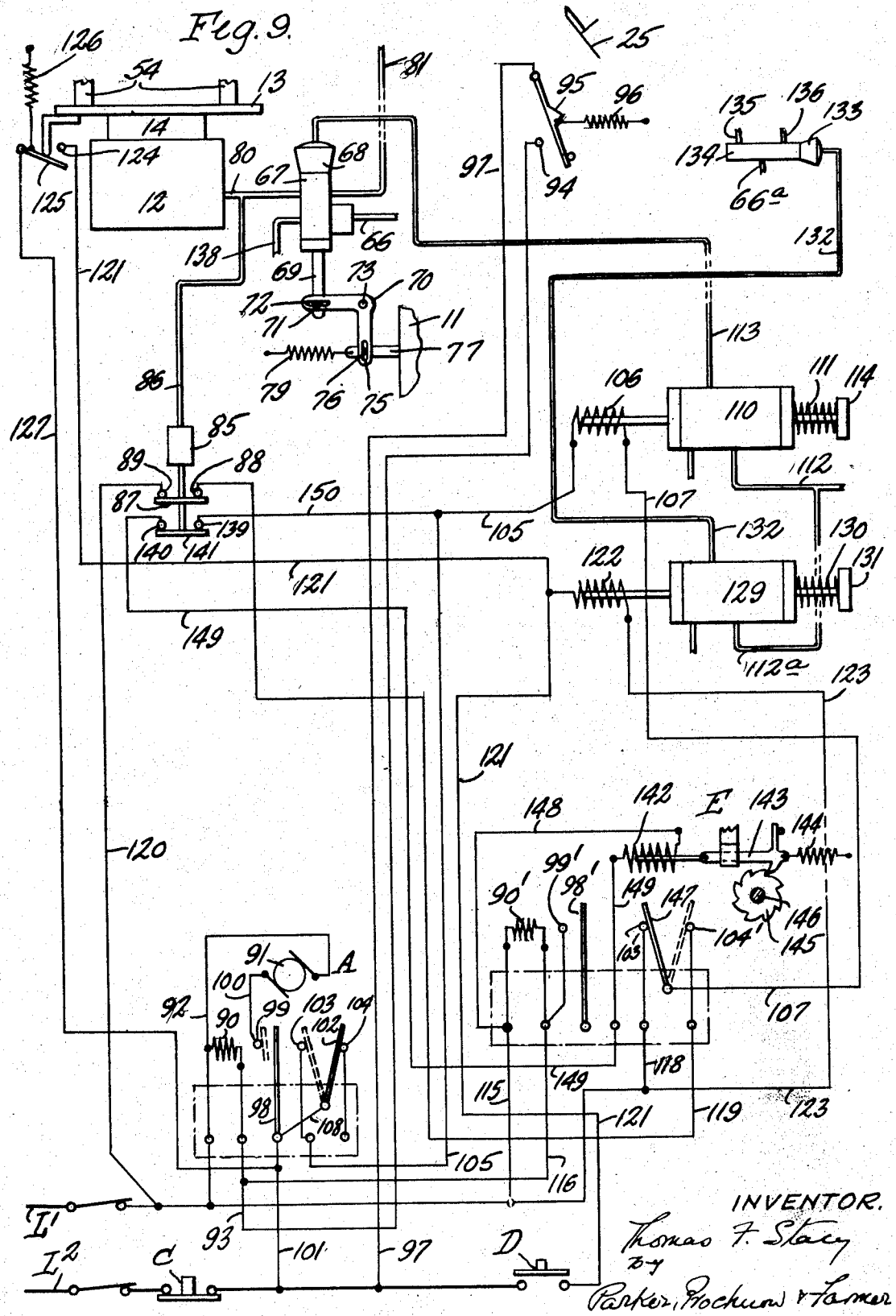
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Filed April 9, 1940 4 Sheets-Sheet 4

Fig. 9.



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Patented May 30, 1944

2,349,916

UNITED STATES PATENT OFFICE

2,349,916

POWER PRESS

Thomas F. Stacy, Piqua, Ohio, assignor to The French Oil Mill Machinery Company, Piqua, Ohio

Application April 9, 1940, Serial No. 328,643

25 Claims. (Cl. 18—16)

This invention relates to presses and more particularly to those actuated by hydraulic means. It also relates to a tilting head press, in which the press head is shifted or tilted into an inclined or other convenient position when the press is opened.

An object of the invention is to improve hydraulic presses of the shiftable head type, and their control in a pressing operation.

Another object of this invention is to provide an improved press of the shifting head type, with which the head may be shifted into and out of pressing position by power actuated means, and with which the links by which it may be supported will all be under direct compression, instead of tension, when in pressing position and subjected to pressing stresses.

Another object of the invention is to provide an improved press in which the head may be shifted into and out of pressing position, and which will be exceptionally rigid, convenient, rapid in operation, and simple and inexpensive in construction.

Another object of the invention is to provide an improved press of the type in which the press head is shifted between a pressing position and another position in which the mold section carried by the press head is more readily accessible, with which a pressing operation cannot be initiated until the press head is in full pressing position, with which the press head will be locked in the pressing position during a pressing operation, with which the sequence of events after initiation of a cycle of operation will be as automatic as possible, so as to cut down the time of a cycle of operation of the press, and which will be relatively simple and inexpensive.

Another object of the invention is to provide an improved press in which the ram when advanced into pressing relation, after encountering a predetermined resistance, will be given slight retractions and readvances repeatedly for a predetermined extent, either of time or number of retractions and readvances, and then advanced in a full pressing operation, and with which the duration of the pressing operation may be terminated after a predetermined condition of operation, such as after the lapse of a predetermined interval of time following the initiation of the pressing movement.

Other objects and advantages will appear from the following description of some embodiments of the invention, and the novel features will be particularly pointed out in connection with the appended claims.

In the accompanying drawings:

Fig. 1 is a front elevation of a tilting head press constructed in accordance with this invention, the platen being retracted and the head in pressing position;

Fig. 2 is a side elevation of the same;

Fig. 3 is a sectional elevation through the tilting head portion of the same, the section being taken approximately along the line 3—3 of Fig. 1, but with the press head in tilted or open position;

Fig. 4 is a sectional elevation through a portion of the mechanism of Figs. 1 to 3 to show the mechanism for retracting the platen;

Fig. 5 is a sectional elevation similar to Fig. 4 but illustrating an operation in which the molded articles are ejected from the dies or molds;

Fig. 6 is a sectional elevation through the press, the section being taken approximately along the line 6—6 of Fig. 1, but with the parts in the positions taken during a pressing operation;

Fig. 7 is another sectional elevation at right angles to that of Fig. 6, the section being taken approximately along the line 7—7 of Fig. 6;

Fig. 8 is a schematic diagram illustrating mechanism associated with the press of Figs. 1 to 7 for controlling the operations thereof in accordance with this invention; and

Fig. 9 is a similar schematic diagram, but illustrating a slight modification thereof.

Referring first to Figs. 1 to 7, the tilting head press illustrated is of the side plate type such as disclosed for example in my prior U. S. Patent No. 2,013,587. Such a press includes a pair of heavy, metal plates 10 and 11 (Fig. 1) which are disposed in upright, parallel positions, side by side but spaced apart. A cylinder head 12 is disposed between the upright plates 10 and 11 at their lower ends, and coupled thereto in any suitable manner such as explained in my prior patent, it being understood that the head is notched into the side plates. The cylinder head thus serves as a rigid connection between the side plates 10 and 11 at their lower ends. A platen 13 (Figs. 1, 6 and 7) is disposed between the plates 10 and 11 and guided thereby for vertical movement. The platen 13 is operated by a piston or ram 14 (Figs. 6 and 7) which depends into the open upper end of the cylinder head 12, there being a suitable packing gland 15 surrounding the piston 14 at the entrance to the cylinder head 12.

The upper ends of the side plates 10 and 11 are connected by heavy bolts 16 and 17 having nuts 18 and 19 on their outer ends and bearing against

the outer faces of the side plates 10 and 11. Hinged on the front rod or bolt 16 between the plates 10 and 11 is a frame or casting 20 (Fig. 1) which has an upper cross bar member through which the bolt 16 passes, and this cross bar member extends between the inner faces of the side plates 10 and 11. Depending from this cross bar portion are two arms 21 and 22 (Fig. 1) which are parallel and spaced apart, and also received in notches or grooves 23 and 24 respectively of a press head 25. A bolt or pivot rod 26 passes through the press head 25, the notches 23 and 24 and the free ends of the arms 21 and 22 so as to provide a hinged connection between the free ends of the arms 21 and 22 and the forward zone of the press head 25.

Hinged upon the rod or bolt 17 are a pair of arms or links 27 whose lower ends are similarly received in recesses or notches 28 (Fig. 7) in the rear of the press head 25. A bolt or pivot pin 29 passes through the rear portion of the press head 25, the recesses or notches 28 and the depending ends of the arms 27 so as to provide hinged connections between the links 27 and the rear portion of the press head 25. The distance between the pin 29 and the rod 17, which is the pivotal connection at the rear of the press head, is preferably greater than the distance from the pin 26 to the pin or bolt 16 so that in effect the hinge connection for the front of the head 25 is shorter than that for the rear of the press head for a reason which will appear presently.

The frame or casting 20 is also provided with a rearwardly extending arm 30 (Figs. 2, 3 and 6) approximately midway between the side plates 10 and 11, by means of which the press head may be shifted or tilted into an exposed position for access to its mold carrying face. A plate 31 extends across and connects the upper end edges of the side plates 10 and 11, and secured to the underface of the plate 31 are a pair of spaced, parallel guide rails 32 (Fig. 1) which run forwardly and rearwardly, and slidingly support a member 33. This member 33 is hingedly connected, at its forward end, by a pin 34 to a pair of links 35, the other ends of the links being pivotally connected to opposite sides of the arm 30 by a pin 36. Also connected to the slidable member 33 through the pin 34 is a piston rod 37 (Fig. 3) which enters a hydraulic cylinder 38 also secured to the plate 31 and to a connecting bar 39 extending across between the plates 10 and 11 adjacent their rear edges. The piston 37 terminates within the cylinder 38 in a piston head 40, so that the piston 37 will be shifted endwise in one direction or the other, depending upon whether an actuating fluid is admitted to one end or the other of the cylinder 38.

When actuating fluid is admitted to the rear end of the cylinder 38, such as through a pipe 41, the piston 37 will be forced outwardly and will carry the slidable member 33 with it, rock the frame or casting 20 through the arm 30 thereof in a manner to carry the depending arms 21 and 22 rearwardly and upwardly, and tilt the press head 25 into the inclined position shown in Fig. 3. During this movement the links 27 swing rearwardly, and when the links 27 are made longer than the arms 21 as shown, the press head is tilted into a substantial acute dihedral angle to the horizontal or inclination, with a lesser extent of rocking movement of the frame 20 than would be otherwise necessary. To enable the head to move into the substantial inclination shown in Fig. 3, the central portion of the head 25 may be notched as at 42 (Figs. 1, 3 and 6). When the piston 37 is forced to the right, in Fig. 3, by fluid under pressure admitted to the left hand end of the cylinder 38, such as through pipe 43, the member 33 will be retracted and will rock the frame 20 (clockwise in Fig. 3) and carry the press head 25 into the position shown in Fig. 6, in which its lower face 44 is directly across and normal to the direction of travel of the platen 13.

Cooperating mold sections 45 and 46 may be carried by the platen 13 and press head 25 respectively, as shown in the drawings, so that when the platen 13 is shifted upwardly, the molds will be first engaged and then the material interposed in or between the mold sections compressed in a manner usual in this type of press and which per se is not a part of this invention.

Each side plate 10 and 11 is provided with an open window or aperture 48 (Figs. 2 to 6) and a cross bar 49 extends across each window 48 on the inside face of each side plate 10 and 11. The portion of each bar 49 passing its related window 48 may be made wider than the others, as at 50, and to these wider portions are secured duplex cylinders 51 which are disposed within the openings 48 and extend vertically therein. The wider portions 50 of the cross bars 49 provide for greater rigidity of anchorage of the duplex cylinders. Each duplex cylinder 51 is provided with a lower piston chamber 52 and an upper chamber 53, it being understood that there is a duplex cylinder 51 in each window 48. A piston rod 54 extends outwardly through the bottom end of each lower chamber 52, and a larger but similar piston rod 55 extends upwardly out of each upper chamber 53. Extending across and through the platen 13 is a knock-out bar 56, the ends of this bar extending into and through the open windows 48 into positions below the lower ends of the piston rods 54. The knock-out bar 56 is free to move vertically in the platen to a limited extent, as shown particularly in Fig. 6, and within the platen this bar 56 engages knock-out pins 57 which pass upwardly into the lower mold 45. When the molds are open the upward movement of pins 57 by bar 56 serves to eject the molded articles from the mold cavities as usual in presses of this type. When the bar 56 is in its lowermost position, as shown in Fig. 6, it releases the pins 57 and they are then retracted into positions flush with the mold cavity.

Parallel rods 58 (Figs. 2, 4 and 5) are disposed along opposite sides of each duplex cylinder 51 and are mounted for endwise sliding movements in lugs 59 projecting exteriorly from the casing of the duplex cylinder 51. These rods 58 are connected to one another at their upper ends by a bar or yoke 60 and at their lower ends by a bar or yoke 61. Depending from the yoke 60 into each chamber 53 of the duplex cylinder 51 is the piston 55. Each bar or yoke 61 which connects the lower ends of a pair of rods 58 extends beneath the adjacent end of the knock-out bar 56. A pipe 63 opens into the lower chamber 52 of the duplex cylinder 51 so as to supply actuating fluid to the chamber 52, and a similar pipe 64 opens into the upper chamber 53, so as to supply actuating fluid to that cylinder. The pipe 64 leads to a suitable valve, which when operated into one position will supply actuating fluid under pressure to the chamber 53 and when operated into the other position will cut off the source of actuating fluid and vent the portion of the pipe leading to the chamber 53. When fluid is admitted to the chamber 52 it urges the piston 54 down-

wardly and through the ejector bar 56 it also urges downwardly the yoke 61 and the rods 58. Since the ejector bar 56 is carried in the platen it also forces the platen and ram piston 14 downwardly. The two chambers 52 and the pistons 54 thus constitute a pair of pull-back rams for aiding in retracting the platen, and they may be under a continuous pressure, as explained hereinafter. The chambers 53 and the pistons 55 therein, together constitute knock-out or ejector rams.

Referring now to Fig. 8, a schematic diagram of the operating circuits and mechanism is illustrated, and will now be described. An operating fluid under a relatively low pressure, such as 250 pounds per square inch, is supplied from any suitable source through a pipe line 65, and a source of actuating fluid under a considerably higher pressure, such as 1500 pounds per square inch, is supplied from any suitable source such as through a pipe 66. The pipe 66 leads to a valve 67 which may be of any suitable construction, one example being disclosed in my prior U. S. Patent No. 1,901,131, except that in place of the manual operation of the controlling valve element thereof there is provided a pilot cylinder 68 at one end of the valve housing. The piston in cylinder 68 when under pressure forces the valve element 69 in one direction to initiate an advance of the platen. The valve element 69 extends out of the valve chamber at both ends so as to be balanced, one end being operated by the pilot cylinder 68 and the other being connected to one arm of a bell crank lever 70 by a pin 71 carried by the element 69 and operating in an axially extending slot 72 in bell crank 70. The bell crank 70 is pivoted at 73, and its other arm has a slot 75, running radially to the pivot 73, which slidingly receives a pin 76 carried by a safety locking bolt or member 77 on one of the press side plates such as 11.

The locking bolt 77 is slidingly mounted in an aperture in the plate 11, so as to pass therethrough and be removably received in a locking recess 78 provided in the press head 25, such as at approximately the center of the pin 29. A spring 79 acting on the locking bolt 77, urges it into retracted position and through the bell crank 70 urges the valve element 69 into one limit of its movement in the valve 67 in which it terminates an advance of the platen and allows a return movement thereof. When the pilot cylinder 68 is energized, it shifts the valve element 69 in a direction to inject the locking bolt 77 into the recess 78. The valve 67 is connected by a pipe 80 to the lower end of the cylinder head 12, and a pipe 81 also leads from the valve 67 to the pipe 65 which supplies the low pressure actuating fluid. The pipe 63 may be connected to the pipe 81 directly, so that there will always be a relatively low pressure acting on the knock-out bar 56 and urging the platen into retracted position, but because of the low pressure and small pressure area on which it acts in cylinders 52, the pressure in cylinder 12 overcomes this returning pressure during an advance of the platen. The pipe 64 from the ejector cylinders 53 is connected to a valve 82 which in turn is connected to the pipe 65 so that when the valve 82 is operated it will admit fluid from the pipe 65 to the ejector cylinders 53. When the valve 82 is in its normal closed position it vents the pipe 64 through an exhaust pipe 83. The valve 82 has a suitable operating member 84 and may be of any suitable construction, this type of valve being very common in the art.

A pressure responsive switch 85 is connected by a pipe 86 to the pipe 80 leading to the main ram cylinder head 12, so as to be responsive at all times directly to the pressure in the cylinder head 12 which urges the platen upwardly or forwardly. This switch may be of any suitable construction, and has a bridge 87 which normally connects contacts 88 and 89 when the pressure on the valve 85 is below a selected or predetermined pressure for which it may be set. When the pressure in the pipe 86 exceeds that selected pressure, the bridge 87 moves out of engagement with the contacts 88 and 89 and opens a circuit between them for a purpose which will appear later.

In connection with this embodiment of the invention, I employ a pair of similar timers A and B, the timer A being connected to regulate the period of the pressing operation and the timer B being used to incapacitate the pressure responsive switch 85 after the lapse of a predetermined interval of time which is less than that for which the timer A is set. These timers may be of any suitable type, and are available in the open market. One example of such a timer is disclosed in U. S. Patent No. 2,175,865 of October 10, 1939, to which reference may be had for more detailed information. Such a timer may be a synchronous motor driven, time delay relay which includes a contact operating mechanism driven by the motor through an electro-magnetic clutch. It is entirely automatic in action, requiring only the closing or opening of a control circuit to initiate or terminate a cycle of operation. The timers A and B in Fig. 8 are shown only diagrammatically and inasmuch as both timers are of similar construction but are merely connected differently in the system, it is only necessary to describe the circuit connections of these timers.

The timer A includes a clutch coil 90 and a synchronous motor 91, one side of the clutch coil 90 and one side of the motor 91 being connected by a wire 92 to a line wire L1 which supplies a suitable source of alternating current. The other side of the clutch coil 90 is connected by a wire 93 to a contact 94 of switch 95 which is normally held in open position, as by spring 96, and which is operated into closed position by the press head 25 as the latter reaches closed or pressing position. The other side of the switch 95 is connected by a wire 97 to the line wire L2. Thus as the press head 25 moves into closed position it closes the switch 95 and completes a circuit through the clutch coil 90 between the line wires L1 and L2. When the clutch coil 90 is energized it operates to couple the motor 91 to the timing mechanism (not shown) and also shifts a switch member 98 into engagement with a contact terminal 99 which is connected by wire 100 to the other side of the motor 91. The member 98 is connected by a wire 101 to the line wire L2 and hence when it is shifted into engagement with the terminal 99 a branch circuit is completed from line wire L1 through wire 92 to motor 91, thence by wire 100 to terminal 99, thence by switch member 98 and wire 101 to line wire L2. The timer also has another switch member 102 which is operable by the timing mechanism alternately between the contacts 103 and 104. In this particular use of the timer, the contact 104 serves merely as a stop for the switch member 102. The terminal 103 is connected by a wire 105 to one side of a solenoid 106, the other side of that solenoid being connected by a wire 107 to a switch member 102' of timer B which corresponds

to the switch member 102 of timer A. In timer A the switch member 102 is connected by a wire 108 to the wire 101 leading to line wire L2. The solenoid 106 above referred to is connected to operate a valve element 109, provided in a valve casing 110, against the action of a spring 111 from the position shown in full lines in Fig. 8 into a position in which the annular groove in the spool of the valve 109 connects an air supply pipe 112 to a pipe 113 leading to the pilot cylinder 68. The pipe 112 receives air under pressure from any suitable source such as a shop air line, and it will be seen that the solenoid 106 controls the admission of air under pressure to the pilot cylinder 68 or discontinues the air and vents the pilot cylinder. The spring 111 acts between a head 114 on an extending stem of the valve element 109 and the casing 110 to urge the valve element 109 into the full line position whenever the solenoid 106 is deenergized.

The timer B is similar in construction to the timer A and corresponding parts are given corresponding reference characters but to which the prime mark (') has been added in order to distinguish these parts from the corresponding parts in timer A. One side of the clutch coil 90' and one side of the motor 91' are connected by wire 115 to the line wire L1 and the other side of the clutch coil 90' is connected by wire 116 to the wire 93. The clutch coils 90 and 90' are therefore connected in parallel to one another between the line wire L1 and the wire 93. The member 98' is connected by a wire 117 to line wire L2. The contact 103' is connected by a wire 118 to line wire L1 and the contact 104' is connected by a wire 119 to contact 88 of the pressure responsive switch 85. The contact 89 of the switch 85 is connected by wire 120 to the line wire L1. One of the line wires, such as the line wire L2, is provided with a normally closed or emergency switch C, before any connections are made to the circuits supplied thereby, and this line wire also includes in series therein a normally open or main switch D which is beyond the connection to wires 117, 97 and 101.

The switch D is connected by wire 121 to one side of another solenoid 122, the other side of that solenoid being connected by a wire 123 to the line wire L1. The wire 121 is also connected to contact terminal 124 of a switch 125 which is normally urged into closed position in any suitable manner such as by spring 126, and which is disposed to be forced into open position by the platen 13 when the latter reaches a desired retracted position. The other side of switch 125 is connected by a wire 127 to the wire 101 leading to the line wire L2 beyond the normally closed switch C. The solenoid 122 is connected to operate a valve element 128 which may be of the spool type and which reciprocates in a casing 129. The valve element 128 is urged into a normal position by a spring 130 acting between a head 131 on the valve element and the casing 129, which normal position is shown in full lines in Fig. 8. When the solenoid 122 is energized it moves the valve element 128 against the action of spring 130 into a position to connect a branch 112a from the air supply line 112 to a pipe 132 leading to a pilot cylinder 133 of a valve 134. The valve 134 may be similar to the valve formed of valve element 109 and casing 110 above described. These valves are common in the market and therefore a detailed description is omitted.

When no pressure is applied to the pilot cylinder 133, the valve element (not shown) of the valve 134 is yieldingly urged by a suitable spring (not shown) into a position in which it connects a pipe 135 leading thereto from one end of the cylinder 38 with a branch pipe 66a leading to the pipe 66 which delivers the actuating fluid under relatively high pressure to the valve 67. When the pilot cylinder 133 is subjected to air under pressure, delivered thereto from the pipe 132, it shifts the valve element within the valve 134 into a position to disconnect the pipe 135 from the pipe 66a and to connect the pipe 135 to an exhaust vent 136. A pipe 137 connects the pipe 66 to the opposite end of the cylinder 38 through which the piston 37 extends, so as to exert a continuous pressure on the piston head 40 tending to shift it to the right in Fig. 8 and move press head 25 into the pressing position. Inasmuch as the effective pressure area of the piston head 40 on the side having the piston stem 37 and the connection to the pipe 137, is smaller than that on the opposite face of the piston, the piston 40 will be moved to the left in Fig. 8 against the action of the pressure delivered by pipe 137 whenever the valve 134 is operated to admit the pressure from the same source 66 to the chamber 38 through pipe 135.

In the operation of the press under the system shown in Fig. 8, let it be assumed that the parts are in the normal inactive position shown in full lines in Fig. 8, at which time it will be noted that the switch 125 is open, press head 25 is in the tilted position, the switch 95 is open and the contacts or switch members 98, 98', 102 and 102' of the timers A and B are in the full line positions. The valve elements 109 and 128 will also be in the full line positions. There will be no pressure on the pilot cylinders 68 and 133 and the safety bolt 77 will be in withdrawn position, as shown in full lines in Fig. 8. The switch D will be in open position and the switch C will be closed.

To initiate a pressing operation, the attendant closes the switch D and holds it closed until after the ram 14 has shifted the platen 13 upwardly, or in an advance or working direction, far enough to allow the switch 125 to close. When switch D was closed it completed a circuit through line wire L2, switch D, wire 121, solenoid 122, wire 123 to line wire L1. The solenoid 122 when thus energized will operate the valve element 128 out of its full line position into one in which it connects the branch pipe 112a, carrying air under pressure, to the pipe 132 leading to the pilot cylinder 133. This causes air under pressure to be delivered to the pilot cylinder 133 and causes an operation of the valve 134 in a manner to interrupt the connection between pipes 66a and 135 and to connect pipe 135 with the exhaust vent 136, whereupon the fluid pressure in pipe 137 entering cylinder 38 will force the piston 40 to the right (Fig. 8) and swing the press head 25 into the closed position shown in Figs. 1, 2, 6 and 7.

As the press head 25 moves into closed position it engages and operates the switch 95 into closed position which then completes another circuit as follows: from line wire L1 through wire 92, clutch coil 90, wire 93, switch 95, wire 97 to line wire L2. It also completes a branch circuit from line wire L1 through wire 115, clutch coil 90', wire 116 then to wire 93 and through it to switch 95, then by wire 97 to line wire L2 as previously described for the clutch coil 90 of timer A. When this circuit is completed the clutch coils 90 and 90' of the two timers

will couple the motors 91 and 91' to the timing mechanism and will also cause the members 98 and 98' to engage the contacts 99 and 99' completing circuits through the motors 91 and 91'. The circuit through the motor 91 will be from line wire L1 through wire 92, motor 91, wire 100, contact 99, switch member 98 and wire 101 to line wire L2. For the motor 91' the circuit will be from line wire L1 through wire 115, motor 91', wire 100', contact 99', switch member 98' and wire 117 to line wire L2. At the time that the clutch coils 90 and 90' are energized, the mechanism of the timers which is thus rendered effective as explained in U. S. Patent No. 2,175,865 above identified, will shift the switch members 102, 102' from the full to the dotted line positions in Fig. 8. When this happens a circuit will be established as follows: from line wire L2 through wires 101 and 108, switch member 102 of timer A, contact 103, wire 105, solenoid 106, wire 107, switch member 102' of timer B, contact 104', wire 119, contacts 88 and 89 of switch 85, wire 120 to line wire L1.

Solenoid 106, being energized in this manner, will operate the valve element 109 out of its full line position and will connect the pipe 112 carrying air under pressure to the pipe 113 leading to the pilot cylinder 68. This will operate the valve 67 and cause a movement of the valve element 69 downwardly in Fig. 8, rock the bell crank 70 and shift the safety locking bolt 77 into the recess 78 and thus lock the press head 25 against movement out of pressing position. At the same time that the valve element 69 is operated from the pilot cylinder 68 in this manner it also connects the pipe 81 leading from the pipe 65 carrying low pressure actuating fluid to the pipe 80 going to the cylinder head 12, and the fluid thus delivered to the cylinder head 12 elevates or advances the ram 14 and platen 13. When this advance is sufficient to allow switch 125 to close, another circuit is completed as follows: from line wire L2 through wires 101, 127, switch 125, wire 121, solenoid 122, wire 123 to line wire L1. Thus the switch 125 shunts the switch D and thereupon the switch or button D can be released and allowed to open because the solenoid 122 will continue to be energized by the closing of the shunt switch 125.

The platen 13 continues to advance and when the resistance encountered causes the back pressure in the pipe 80 to increase to a selected extent, the valve 67 will automatically connect the pipe 66 carrying actuating fluid under high pressure to the pipe 80, an automatic check valve leading to pipe 81 automatically closing to prevent flow of the high pressure actuating fluid through pipe 81 into the pipe 65 carrying fluid under low pressure. The high pressure then continues to advance the platen 13. When a desired resistance is encountered, which may be before or after the high pressure has been admitted to the cylinder head 12, depending upon the setting of the switch 85, the pressure exerted on the switch 85 will open the circuit between the contacts 88 and 89 by carrying the bridge 87 out of engagement therewith, and this interrupts the circuit of solenoid 106 through the wires 119 and 120.

When the circuit of solenoid 106 is opened in this manner the spring 111 immediately shifts the valve element 109 back into the full line position in which the air pipe 112 is disconnected from pipe 113 and the latter vented, which releases the pressure in the pilot cylinder 68 allowing spring 79 to retract the safety bolt 77, cut off the flow of actuating fluid to the pipe 80 and the ram 14, and vent the pipe 80 to the exhaust pipe 138, whereupon the pressure falls in cylinder head 12 and the platen starts to open. As the platen starts to open, however, the pressure falls also in switch 85 and this switch then immediately recloses and recompletes the circuit through the solenoid 106, and this again shifts the valve element 109 into position to reconnect the pipes 112 and 113 and reapply pressure to the pilot cylinder 68. The valve element 69 of valve 67 is again moved to readmit fluid under pressure to pipe 80 and cause a readvance of the platen. When the pressure again builds up, switch 85 will again open and momentarily deenergize solenoid 106, and this cycle of openings and closings of switch 85 is repeated. These slight retractions and readvances of the platen in this manner are called "bumping" and "bumping" is frequently used in the rubber industry to allow escape of air from the molds at intervals after pressure is applied and before final pressure is applied to the material in the molds.

After the lapse of a selected interval of time for which the timer B is set, and which time interval may be varied by a suitable adjustment of the timer B, the timer B times out and in doing so the switch member 102' is shifted from the dotted line position back into the full line position shown in Fig. 8, which interrupts the circuit through the switch 85 and instead completes a shunt circuit as follows: from line wire L1 through wire 118, contact 103' of timer B, switch member 102', wire 107, solenoid 106, wire 105, contact 103, switch member 102 and wires 108 and 101 to line wire L2. Thus the solenoid 106 now remains energized free of the control of the switch 85, and the pressure in pilot cylinder 68 of valve 67 will remain continuous and this will result in a continued advance of the platen 13, the latter portion of this advance being under the high pressure fluid derived from pipe 66. This advance of the platen 13 will continue until the timer A times out at the end of a time interval for which it has been set, and which time interval may be varied by suitable adjustment of timer A.

When timer A times out, it shifts the switch member 102 from the dotted line position into the full line position in Fig. 8 which breaks the circuit through the wire 108 to wire 105 and thus interrupts the circuit through the solenoid 106. The latter is then deenergized and the valve element 109 is shifted into a position to relieve the air pressure in pilot cylinder 68, whereupon the safety locking bolt 77 is retracted from the press head 25, the supply of actuating fluid under pressure is relieved from the pipe 80, and the cylinder head 12 and the pipe 80 are vented through the pipe 138 which allows the escape of the fluid from cylinder head 12 and a descent of the platen. It will be noted that the pull-back cylinders 52 are continuously connected to the pipe 65 carrying an actuating fluid under low pressure, and therefore as soon as the pressure in cylinder head 12 is released, the pressure in push back cylinders 52 will be active in accelerating the retraction of the platen 13 and ram piston 14. This will continue until the switch 125 is opened at approximately the end of the retraction of the platen.

The opening of switch 125 deenergizes the solenoid 122, and thereupon the spring 130 shifts

the valve element 128 back into the full line position in which it disconnects the branch air supply line 112a from the pipe 132 and vents the latter, thus releasing the air pressure in the pilot cylinder 133 of valve 134. The valve 134 then automatically connects the pipe 66 to the pipe 135 and fluid under pressure then flows into the right hand end of cylinder 38 in Fig. 8, shifting the piston 40 to the left and rocking the press head 25 into the tilted position. This last movement of press head 25 into tilted position releases the switch 95, which thereupon automatically opens and thus opens the circuit through the clutch coils 90 and 90' and these coils when deenergized disconnect the motors 91 and 91' from the timing mechanism. The switch members 98 and 98' are at the same time released and open the circuits to the motors of the timers. The parts are then in the normal idle position from which the cycle was started.

If at any time during the operation of the system, one desires to terminate it without waiting for the timers to operate, one merely operates the safety switch C which automatically opens all of the circuits and causes an immediate return of the platen 13 to retracted position. The switch C should, however, be held open until the platen 15 has completed its retraction movement.

After the platen 13 has been retracted and the press head 25 swung into the tilted or inclined position, the attendant may operate the valve 82 and cause delivery of low pressure actuating fluid to the knock-out cylinders 53. The pressure therein forces the pistons 55 outwardly and since they are larger than the pistons 54 (the pressure per unit area being the same in both sets of cylinders 52 and 53), the pistons 55 will overcome the resistance of pistons 54 and will shift the frame formed of the bars or yokes 60 and 61 and the rods 58 upwardly, lifting the knock-out bar 56 upwardly. The bar 56 shifts the knock-out pins 57 (Fig. 7) upwardly in a manner to eject the molded articles from the mold section carried by the platen.

In the embodiment of the invention shown in Fig. 9, the mechanism is generally the same as in Figs. 1 to 8 except that the switch 85 controls two circuits, one between contacts 88 and 89 as previously, and also one between contacts 139 and 140 through a bridge member 141. The timer A remains the same, but the timer B is replaced by a counter E which is similar to the timer B in construction and operation except that in place of the motor 91' in Fig. 8, a magnet 142 is substituted. The magnet 142 reciprocates a pawl 143 against the action of a spring 144, and the pawl 143 at each operation engages the teeth of a ratchet wheel 145 carried on a shaft 146, and imparts increments of rotation to the shaft 146. The shaft 146 is connected to the timing mechanism by clutch mechanism controlled by clutch coil 90' in the same manner that the motor 91' of timer B was connected to the timing mechanism by the coil 90', so that after a predetermined extent of movement of the shaft 146, the switch member 147 corresponding to the switch member 102' of timer B is shifted from the dotted line position into the full line position shown in Fig. 9. In this mechanism, however, the connections to the magnet 142 are slightly different from those to the motor 91' of timer B and will now be described.

One side of the magnet 142 is connected by wire 148 to the wire 115 which leads to the clutch coil 90' which corresponds to the coil 90' of timer B. The other side of the magnet 142 is connected by a wire 149 to the contact 140 of switch 85. The contact 139 of the switch 85 is connected by a wire 150 to the wire 105 which leads to the solenoid 106. The switch member 147 of counter E is also connected by wire 107 to the solenoid 106 the same as for the switch member 102' of timer B. The contact 104' of counter E is connected by a wire 119 to the contact 88 of pressure responsive switch 85 as in Fig. 8, and the contact 103' is connected by wire 118 to the line wire L1, as in Fig. 8. In the counter E the switch member 98' and contact 99' are not utilized, and may merely remain unconnected. Otherwise than as just described, the parts in Fig. 9 are the same as in Fig. 8 and have corresponding reference characters.

The operation of the system as modified in Fig. 9 will now be explained. When the press is idle, the switch member 147 of counter E is in the full line position shown in Fig. 9. A cycle of operation of the press is initiated by closing the switch D and holding it closed until the platen has advanced sufficiently to allow the switch 125 to close, and as soon as the press head 25 reaches closed position it closes switch 95 which initiates an energization of the clutch coil 90 of timer A and the clutch coil 90' of counter E. The timer A functions in the same manner as explained for Fig. 8 and in counter E the switch member 147 is at once moved from the full line to the dotted line position in Fig. 9. Counter E otherwise functions as does timer B in Fig. 8, except that the magnet 142 has its circuit opened each time that the pressure responsive switch 85 is opened, and each time that the magnet 142 is reenergized in this manner it operates the counter ratchet 145 and drives shaft 146 step by step. The shaft 146 may be the same shaft that was operated by the motor 91' of counter B. After the counter shaft 146 has been rotated through a desired extent corresponding to a selected number of impulses through magnet 142, the counter times out and the switch member 147 is shifted automatically from the dotted to the full line position in which the switch member 147 engages contact 103' and thus shunts the switch 85, whereupon solenoid 106 remains energized until the timer A times out and moves the switch member 102 from the dotted line to the full line position. The operation is otherwise the same as explained for Fig. 8. When counter E times out, it automatically moves switch member 147 from the dotted position to the full line position of Fig. 9.

It will be understood that various changes in the details and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention, as expressed in the appended claims.

I claim as my invention:

1. In a shiftable head press, a frame, a platen, a press head disposed in alinement with said platen, means for moving said platen toward and from said press head, rigid links hinged to said head, forming the sole support therefor, extending therefrom in a direction away from said platen, and at zones further from said platen than said head, hinged to said frame on axes parallel to the axes of the hinge connections to said head, whereby pressure against said head from said platen during a pressing operation

will place all of said links under direct endwise compression, and means for swinging said head by said links in a direction generally crosswise of the direction of movement of said platen into and out of pressing position in which it is alined with said platen.

2. In a shiftable head press, a frame, a platen, a press head generally rectangular on its pressing face and disposed in alinement with said platen, means for moving said platen toward and from said press head, rigid links hinged to said head adjacent the corners of said face forming the sole support therefor, extending therefrom in a direction away from said platen, and at zones further from said platen than said head, hinged to said frame on axes parallel to the axes of the hinge connections to said head, whereby pressure against said head from said platen during a pressing operation will place all of said links under direct endwise compression, said links being all approximately parallel to one another with two of said links at adjacent corners of said face hinged to the head on aligned axes and to the frame on aligned axes, and the links that are hinged to the other adjacent corners hinged to the head on aligned axes and to the frame on aligned axes, said two links being of different length than the other links, and means for swinging said head by said links in a direction generally crosswise of the direction of movement of said platen into and out of pressing position in which it is aligned with said platen.

3. In a shiftable head press, a base, heavy side plates secured to said base and extending therefrom in the same direction in face to face, but spaced parallel relation to one another, a platen disposed between said plates for movement therealong in a direction toward and from said base, means on said base for moving said platen in said direction, a press head disposed between said plates and toward and from which said platen moves when operated by said means, rigid links hinged to said head, extending therefrom in parallel relation to one another and in directions away from said platen, and generally parallel to said direction of movement of said platen, said links at portions thereof away from said head and further from said platen than the hinged connections between the head and links, being hingedly connected to said side plates to floatingly support said head from said plates, whereby pressure against said head from said platen during a pressing operation will place all of said links under direct endwise compression, and means for swinging said head on said links in a direction generally crosswise of said direction of movement of said platen in a pressing operation, into and out of pressing position in which the face of said head towards said platen is aligned with said platen and generally normal to the said direction of movement of said platen.

4. In a shiftable head press, a frame, a platen, a press head generally rectangular in plan and having a pressing face, means for moving said platen toward and from said head in a direction approximately normal to said face, rigid links hinged to said head on parallel axes spaced apart in directions across said face, and extending in directions approximately parallel to one another and to said direction of platen movement but away from said platen, said links at zones away from said head and further from said platen than said head, being hinged to said frame about parallel axes spaced apart in a direction crosswise of said direction of platen movement, to provide a floating, swinging support for said head, whereby pressure against said face from said platen will place all of said links under direct, endwise compression, the links hinged to said head on different axes being of different lengths, and means for swinging said head on said links to carry said head out of pressing position in the path of movement of said platen.

5. In a shiftable head press, a frame, a platen, means attached to said frame for operating said platen back and forth in a desired path, a press head having a pressing face toward and from which said platen moves in said path, a plurality of rigid links parallel to one another and each hinged at one end to said frame and at its other end to said head for swinging movement about parallel axes, with a direction of swinging forwardly and rearwardly of the frame and wholly and floatingly supporting said head from said frame for movement into and out of a pressing position in which said pressing face is across and approximately normal to said path and said links are all generally parallel to one another and to said path, and extend from said head in directions away from said platen, one pair of said links having coincident axes of hinging to said head and coincident axes of hinging to said frame, the other links having similarly coincident axes of connection to said head and frame, whereby the stresses created on said head by said platen during a pressing will be transmitted endwise through said links to said frame, said head when in pressing position being disposed between said platen and the ends of the links that are hinged to said frame, whereby the pressing stresses in said links will be direct endwise compression of said links, said one pair of said links which are hinged to said head with coincident axes differing in length from the links of the other pair and means for swinging said head on said links to carry said head into a position in which said pressing face is disposed in a different and more accessible position on said frame.

6. In a shiftable head press, a frame, a platen, means attached to said frame for operating said platen back and forth in a desired path, a press head having a pressing face toward and from which said platen moves, a plurality of links hinged to said frame and to said head for swinging movement about parallel axes, with a direction of swinging forwardly and rearwardly of the frame and wholly and floatingly supporting said head from said frame for movement into and out of a pressing position in which said pressing face is across and approximately normal to said path and said links are all generally parallel to one another and to said path, said links extending from their connections to said head in directions away from said platen in the direction of platen movement for their connections to said frame, whereby the stresses created on said head by said platen during a pressing operation will be transmitted endwise through said links to said frame and cause endwise, direct compressions of said links, two of the links supporting said head being hinged thereto by substantially coincident axes and having equal lengths but which are different than the lengths of the other links connected to said head, said other links being also hinged to said head by substantially coincident axes spaced from said other coincident axes, whereby when said head is swung on said links, said head will move through posi-

tions inclined to said path as well as horizontally, and into a position in which the pressing face thereof makes an angle to said path substantially different than approximately 90°, and means for swinging said head on said links and for holding it in different positions into which it may be swung.

7. In a shiftable head press, a base, a pair of side plates connected to said base and disposed in spaced, parallel, side by side upright positions, and with the faces of said plates extending forwardly and rearwardly of said press a platen disposed between said plates and guided for movement along said plates, means supported by said base for operating said platen back and forth in a desired path, a press head having a pressing face, rigid links hinged at one end to said plates adjacent the forward edges thereof for swinging movement about coincident axes and hinged at its other end to said head adjacent the forward edge thereof, a rigid link similarly hinged to said plates adjacent the rear edges thereof and similarly hinged to said head adjacent the rear edge thereof, with all of said links approximately parallel to one another when extending generally in the direction of travel of said platen, and floatingly supporting said head with said pressing face approximately normal to said path, and said head when in pressing position being disposed between said platen and the ends of said links that are hinged to said side plates, whereby the pressure on said face by said platen during a pressing operation will be transmitted through said links to said plates in directions endwise of said links, and means for swinging said head on said links into a position in which said pressing face is out of pressing relation to said platen and is exposed for easy access thereto.

8. In a shiftable head press, a base, a pair of plates connected to said base disposed in spaced, parallel, side by side upright positions, and with the faces of said plates extending in directions substantially forwardly and rearwardly of said press a platen disposed between said plates and guided for movement along said plates, means supported by said base for operating said platen back and forth in a desired path, a press head having a pressing face, a pair of rigid links each hinged at one end to said plates adjacent the forward edges thereof for swinging movement about coincident axes and each hinged at its other end to said head adjacent the forward edge thereof, a pair of links similarly hinged to said plates adjacent the opposite edges thereof and similarly hinged to said head adjacent the rear edge thereof, with all of said links approximately parallel to one another when extending generally in the direction of travel of said platen, and floatingly supporting said head with said pressing face approximately normal to said path, whereby the pressure on said face by said platen during a pressing operation will be transmitted through said links to said plates in directions endwise of said links, and means for swinging said head on said links into a position in which said pressing face is out of pressing relation to said platen and is exposed for easy access thereto, one of said pairs of said links being shorter than the other pair, whereby when said head is swung on said links, said head will be tilted into a position in which said pressing face makes an acute angle to said path.

9. In a shiftable head press, a base, a pair of plates connected to said base disposed in spaced, parallel, side by side upright positions, and with the faces of said plates extending in directions substantially forwardly and rearwardly of said press a platen disposed between said plates and guided for movement along said plates, means supported by said base for operating said platen back and forth in a desired path, a press head having a pressing face, a pair of links hinged to said plates along the forward edges thereof for swinging movement about coincident axes and hinged at their free ends to said head adjacent the forward edge thereof, a pair of links similarly hinged to said plates adjacent the opposite edges thereof and similarly hinged to said head along the rear edge thereof, with all of said links approximately parallel to one another when extending generally in the direction of travel of said platen, and floatingly supporting said head with said pressing face approximately normal to said path, whereby the pressure on said face by said platen during a pressing operation will be transmitted through said links to said plates in directions endwise of said links, means for swinging said head on said links into a position in which said pressing face is out of pressing relation to said platen and is exposed for easy access thereto, and means carried by at least one of said plates for releasably engaging with said head for locking it against swinging movement with said pressing face approximately normal to said path.

10. In a shiftable head press, a frame, a platen, means attached to said frame for operating said platen back and forth in a desired path, a press head having a pressing face, a plurality of links hinged to said frame and mounted to swing about parallel axes in a direction from front to rear of said press, some of said links being attached to said head adjacent the forward and some adjacent the rearward edges of said face so as to wholly and floatingly support said head from said frame, with said pressing face approximately normal to said path, and said links extending generally parallel to said path, whereby the pressure on said head from said platen during a pressing operation will be transmitted solely through said links to said frame in directions generally lengthwise of said links, means connecting together the links attached to said head adjacent one of said forward and rearward edges of said face of said head, and power actuated means connected to said connected links for rocking the same about their connections to said frame, the links attached to said head adjacent one edge of said face being shorter than the other links, whereby said head may be swung by said power actuated means from a position in which its pressing face is across and normal to said path into a position in which the plane of said face makes an acute angle with said path.

11. In a shiftable head press, a pair of upright, parallel heavy plates spaced apart side by side and with the faces of said plates extending in directions forwardly and rearwardly of said press, a cylinder head disposed between and connecting said plates at one end of said plates, a ram in said cylinder head, a platen carried by said ram between said plates and shiftable along said plates back and forth by said ram, a plurality of links disposed between and hinged to said plates adjacent the other ends thereof and adjacent the forward and rearward edges of said plates, a pressing head disposed between said plates and hingedly connected to the free ends of said links so as to be floatingly and entirely supported by

said links, the links hinged to the plates adjacent one pair of corresponding edges of said plates being shorter than the other links, the links along one pair of corresponding edges of said plates being connected together for simultaneous swinging movement, power actuated means connected to said connected links for swinging the same about the pivoted connections to said plates to carry said head from a position, in which its pressing face faces said platen and is normal to the path of travel of said platen when the links all extend in directions endwise of said plates, into a position in which said pressing face is at a substantially acute angle to its former position, and means for locking the unit formed of said links and head to one of said plates while the head is in said pressing position.

12. In a shiftable head press, a pair of parallel upright plates spaced apart and disposed side by side, a cylinder head connected between said plates at one end thereof, a ram mounted in said cylinder head and operable therein in one direction in the space between said plates, a platen disposed between said plates and connected to said ram for operation thereby in said one direction, a pressing head disposed between said plates and toward and from which said platen is operable, and mounted between said plates for movement between a pressing position in which its face towards the platen is approximately normal to said one direction, and another position in which it has a substantial inclination to said one direction, a knock-out bar mounted in said platen for independent movement in said platen in said one direction, said plates having apertures, in the zone traversed by said platen, through which the opposite ends of said knock-out bar extend, a casing disposed adjacent each of said apertures in said plates, each casing having separate chambers therein opening in opposite directions which are parallel to said one direction, a piston in each of said chambers extending outwardly therefrom, one of said pistons bearing upon said knock-out bar and operable when forced in a direction outwardly of its chamber to force the knock-out bar toward said cylinder head and thereby retract said ram into said cylinder head, a member extending along each of said casings and having a portion engageable at one end beneath the adjacent projecting end of the knock-out bar and at its other end connected to said other piston at the opposite end of said casing, whereby when said last named piston is forced outwardly, it shifts said member in said one direction and carries said knock-out bar toward the exposed face of said platen for ejection purposes, and means for selectively supplying actuating fluid to said chambers of said casings.

13. A shiftable head press comprising a frame, a cylinder head at one end of the frame, a piston in said cylinder head, a platen carried by the outer end of said piston and shifted back and forth by operation of said piston, a press head attached to said frame and shiftable from a pressing position in which its pressing face is normal to the direction of movement of said platen to a position in which the pressing face is more conveniently accessible, a source of actuating fluid under pressure, means connecting said source to said cylinder head, valve means included in said connecting means and controlling the delivery of fluid from said source to said cylinder head and the escape of fluid from said cylinder head, said valve means having a valve element movable into one position in which it causes delivery of fluid to said cylinder head and in another in which it releases fluid from said cylinder head, a safety lock carried by said frame and engageable with said press head to lock the latter in pressing position and operable to release the head for movement out of said pressing position, and a connection between said safety lock and said valve element operable to prevent movement of said valve element far enough to connect said source to said cylinder head until said safety lock is in locking position between the frame and press head.

14. A shiftable head press comprising a frame, a cylinder head at one end of the frame, a piston in said cylinder head, a platen carried by the outer end of said piston and shifted back and forth by operation of said piston, a press head attached to said frame and shiftable from a pressing position in which its pressing face is normal to the direction of movement of said platen to a position in which the pressing face is more easily accessible, a source of actuating fluid under pressure, means connecting said source to said cylinder head, valve means included in said connecting means and controlling the delivery of fluid from said source to said cylinder head and the escape of fluid from said cylinder head, said valve means having a valve element movable into one position in which it causes delivery of fluid to said cylinder head and in another in which it releases fluid from said cylinder head, a safety lock carried by said frame and engageable with said press head to lock the latter in pressing position and operable to release the head for movement out of said pressing position, a connection between said safety lock and said valve element operable to prevent movement of said valve element far enough to connect said source to said cylinder head until said safety lock is in locking position between the frame and press head, a switch operable by said head when said head is in pressing position, means for operating said valve element in a manner to cause delivery of fluid from said source to said cylinder head and in turn controlled by said switch and operable to prevent movement of said valve element in a direction to cause delivery of fluid to said cylinder head until said switch is operated by said press head, whereby operation of said valve element to cause delivery of fluid to said cylinder head is impossible until said press head is substantially in pressing position and locked by said safety lock.

15. In a press, a frame, a cylinder head having a ram mounted for advance and retraction, a pressure head shiftable on said frame into and out of pressing position, power actuated means for moving said pressure head into and out of pressing position, means including a pilot circuit for controlling said power actuated means, and when effective causing a movement of said head into pressing position, a device including a single electromagnet for controlling said pilot circuit, a source of electric current, a controlling circuit for said electromagnet including therein said source of current, a manually operated switch in said circuit and effective, when operated, to cause an operation of said power actuated means to move said head into pressing position, means rendered effective by said head when it reaches said pressing position to initiate an advance of said ram, a switch responsive to an advance of said ram, operated automatically upon an advance of said ram, and connected in parallel to said manually

operated switch to also control said electromagnet, said ram responsive switch being held in the same operated position throughout the advance of said ram until the ram returns to its starting position, whereby when said ram is away from its retracted position said circuit through said electromagnet will cause said pressure head to be held in its pressing positions, regardless of the position of said manually operated switch.

16. In a press, a frame, a cylinder head having a ram mounted for advance and retraction, a pressure head shiftable on said frame into and out of pressing position, power actuated means for moving said pressure head into and out of pressing position, electromagnetically controlled means for in turn controlling said power actuated means, an electric circuit through and controlling said electromagnetically controlled means, a manually operable switch in said electric circuit for selectively causing an operation of said electromagnetically controlled means, and through it of said power actuated means, in a manner to cause a shifting of said head into pressing position, and a press operated switch connected electrically in parallel across said manually operable switch, and opened and held open by said ram while the ram is retracted beyond a selected position and closed automatically upon advance of said ram beyond said position and held closed until return of said ram beyond said position in a retraction movement.

17. In a hydraulic press, a frame, a pressing head on said frame, a ram on said frame and operable toward and from said head, means including a hydraulic circuit for operating said ram in a pressing stroke, valve means in said circuit for controlling the advance and retraction of said ram, control means having a control member yieldingly urged into a position in which it causes an operation of said valve means into a condition to cause an advance of said ram, means responsive to the pressure on said ram in said circuit and operable automatically and repeatedly whenever the pressure on said ram fluctuates above and below one selected pressure for forcing said control member out of said position and causing a retraction of said ram, when the pressure on the ram exceeds said selected pressure and releasing said control member when said pressure on said ram falls below said selected pressure, thereby causing repeated operations of said valve means and thereby repeated momentary, incomplete minor retractions and then readvances of said ram alternately and means for automatically causing said valve means to remain in said condition in which it causes an advance of said ram for all pressures on said ram, after a plurality of repeated, incomplete advances and retractions.

18. In a hydraulic press, a frame, a pressing head on said frame, a ram on said frame and operable toward and from said head, means including a hydraulic circuit for operating said ram in a pressing stroke, valve means in said circuit for controlling the advance and retraction of said ram, control means having a control member yieldingly urged into a position in which it causes an operation of said valve means into a condition to cause an advance of said ram, means responsive to the pressure on said ram in said circuit and operable automatically and repeatedly whenever the pressure on said ram fluctuates above and below one selected pressure for forcing said control member out of said position and causing a retraction of said ram, when the pressure on the ram exceeds said selected pressure and releasing said control member when said pressure on said ram falls below said selected pressure, thereby causing repeated operations of said valve means and thereby a plurality of repeated momentary, incomplete minor retractions and then readvances of said ram alternately and means for automatically removing said valve means from the control of said control member and causing said valve means to remain in said condition in which it causes an advance of said ram for all pressures on said ram, for a predetermined extent after a plurality of said incomplete advances and retractions.

19. In a hydraulic press, a frame, a pressing head on said frame, a ram on said frame and operable toward and from said head, means including a hydraulic circuit for operating said ram in a pressing stroke, valve means in said circuit for controlling the advance and retraction of said ram, control means having a control member yieldingly urged into a position in which it causes an operation of said valve means into a condition to cause an advance of said ram, means responsive to the pressure on said ram in said circuit and operable automatically and repeatedly whenever the pressure on said ram fluctuates above and below one selected pressure for forcing said control member out of said position and causing a retraction of said ram, when the pressure on the ram exceeds said selected pressure and releasing said control member when said pressure on said ram falls below said selected pressure, thereby causing repeated operations of said valve means and thereby a plurality of repeated momentary, incomplete minor retractions and then readvances of said ram alternately whenever pressure on said ram fluctuates above and below one selected pressure, means effective in all positions of the platen away from retracted position for removing said valve means from the control of said pressure responsive means after said retractions and readvances have continued for a predetermined extent, and means for automatically causing a complete retraction of said ram a predetermined interval of time after the first advance of said ram has been initiated and regardless of the rate of travel of said ram.

20. In a press, a frame, a head, a ram, hydraulic power means operable to move said ram toward and from said head, valve means for controlling the movement of said ram by said power means, means for automatically controlling said valve means and yieldingly urged into a condition in which it causes an advance of said ram, but operable out of said condition, when said platen encounters one predetermined resistance to its advance, to cause a plurality of repeated slight and incomplete retractions and readvances of said ram, and means including a counter operable to remove said valve means from control by said valve controlling means at the expiration of a predermined plural number of said slight retractions and readvances.

21. In a hydraulic press, a frame, a press head on said frame, a main cylinder, a ram in said cylinder operable toward and from said head, a source of fluid under pressure, a conduit for connecting said source to said main cylinder, a pilot operated control valve in said conduit, an exhaust pipe connected to said valve, said valve being operable to connect said cylinder alternately to said source and to exhaust, a solenoid, a hydraulic circuit for operating said control valve controlled by said solenoid, a yieldingly closed control switch

responsive to pressure in said main cylinder, and opened by pressure and closed automatically when said pressure in said main cylinder fluctuates above and below a selected pressure, an electric circuit including said switch and said solenoid, and operable through said solenoid and hydraulic circuit to operate said pilot controlled valve and connect said source to said main cylinder when said pressure is below said selected pressure, and to connect said main cylinder to exhaust when said pressure is above said selected pressure, and means for removing said electric circuit from the control of said pressure responsive switch and holding it closed beginning a predetermined time after a pressing stroke of said ram is begun.

22. In a hydraulic press, a frame, a press head on said frame, a main cylinder, a ram in said cylinder operable toward and from said head, a source of fluid under pressure, a conduit for connecting said source to said main cylinder, a pilot operated control valve in said conduit, an exhaust pipe connected to said valve, said valve being operable to connect said cylinder alternately to said source and to exhaust, a solenoid, a hydraulic circuit for operating said control valve controlled by said solenoid, a control switch responsive to pressure in said main cylinder, and opened when said main cylinder pressure rises above a selected pressure and closed automatically when said main cylinder pressure falls below said selected pressure, an electric circuit including said switch and said solenoid, and operable through said solenoid and hydraulic circuit to operate said pilot controlled valve and connect said source to said main cylinder when said switch is closed, and to connect said main cylinder to exhaust when said switch is open, and means for shunting said control switch a predetermined time after a pressing stroke of said ram is begun.

23. In a hydraulic press, a frame, a press head on said frame, a main cylinder, a ram in said cylinder operable toward and from said head, a source of fluid under pressure, a conduit for connecting said source to said main cylinder, a pilot operated control valve in said conduit, an exhaust pipe connected to said valve, said valve being operable to connect said cylinder alternately to said source and to exhaust, a solenoid, a hydraulic circuit for operating said control valve controlled by said solenoid, a yieldingly closed control switch responsive to pressure in said main cylinder, and opened and closed automatically when said pressure in said main cylinder fluctuates above and below one selected pressure, an electric circuit including said switch and said solenoid, and operable through said solenoid and hydraulic circuit to operate said pilot controlled valve and connect said source to said main cylinder when said pressure is below said selected pressure, and to connect said main cylinder to exhaust when said pressure is above said selected pressure, and means for removing said electric circuit from the control of said pressure responsive switch and holding said circuit closed automatically after said main cylinder pressure has fluctuated above and below said selected pressure a predetermined number and plurality of times.

24. In a hydraulic press, a frame, a press head on said frame, a main cylinder, a ram in said cylinder operable toward and from said head, a source of fluid under pressure, a conduit for connecting said source to said main cylinder, a pilot operated control valve in said conduit, an exhaust pipe connected to said valve, said valve being operable to connect said cylinder alternately to said source and to exhaust, a solenoid, a hydraulic circuit for operating said control valve controlled by said solenoid, a control switch responsive to pressure in said main cylinder, and automatically opened and closed when said pressure in said main cylinder fluctuates above and below a selected pressure, an electric circuit including said switch and said solenoid, and operable through said solenoid and hydraulic circuit to operate said pilot controlled valve and connect said source to said main cylinder when said pressure is below said selected pressure, and to connect said main cylinder to exhaust when said pressure is above said selected pressure, and means for removing said electric circuit from the control of said pressure responsive switch and causing said valve to remain in a condition to connect said source to said main cylinder, hydraulic means for swinging said head on said links, an electric circuit controlling said hydraulic means and having a starting switch, said circuit and the hydraulic means controlled thereby being operable to move said head into said pressing position when said switch is closed and to tilt said head when said starting switch is open, and means for automatically shunting said starting switch while said ram is out of its retracted position.

25. In a hydraulic press, a frame, a press head on said frame, a main cylinder, a ram in said cylinder operable toward and from said head, means for moving said head on said frame into and out of a pressing position, a source of fluid under pressure, a conduit for connecting said source to said main cylinder, a pilot operated control valve in said conduit, an exhaust pipe connected to said valve, said valve being operable to connect said cylinder alternately to said source and to exhaust, a solenoid, a hydraulic circuit for operating said control valve controlled by said solenoid, a control switch yieldingly urged into one position and responsive to pressure in said main cylinder, and opened and closed automatically when said pressure in said main cylinder fluctuates above and below one selected pressure, an electric circuit including said switch and said solenoid, and operable automatically through said solenoid and hydraulic circuit to operate said pilot controlled valve and connect said source to said main cylinder when said pressure is below said selected pressure, and to connect said main cylinder to exhaust when said pressure is above said selected pressure, means for removing said electric circuit from the control of said pressure responsive switch and causing said valve to connect said source to said main cylinder for a predetermined time after a pressing stroke of said ram is begun, and switch means responsive to the position of said head for automatically opening and maintaining open said circuit through said solenoid while said press head is out of pressing position.

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