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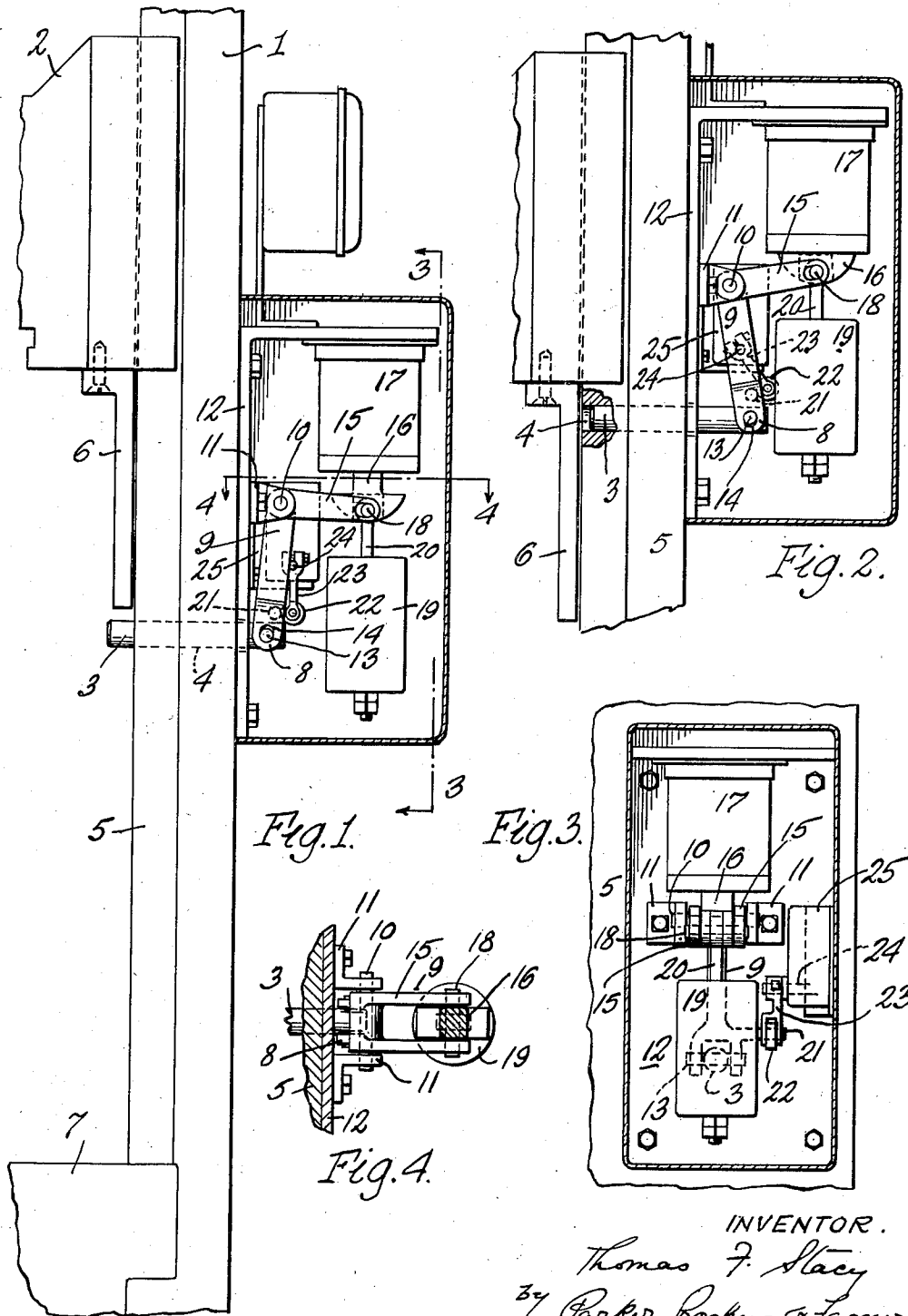
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2,240,630

SAFETY DEVICE FOR PRESSES

Filed Aug. 18, 1939

2 Sheets-Sheet 1



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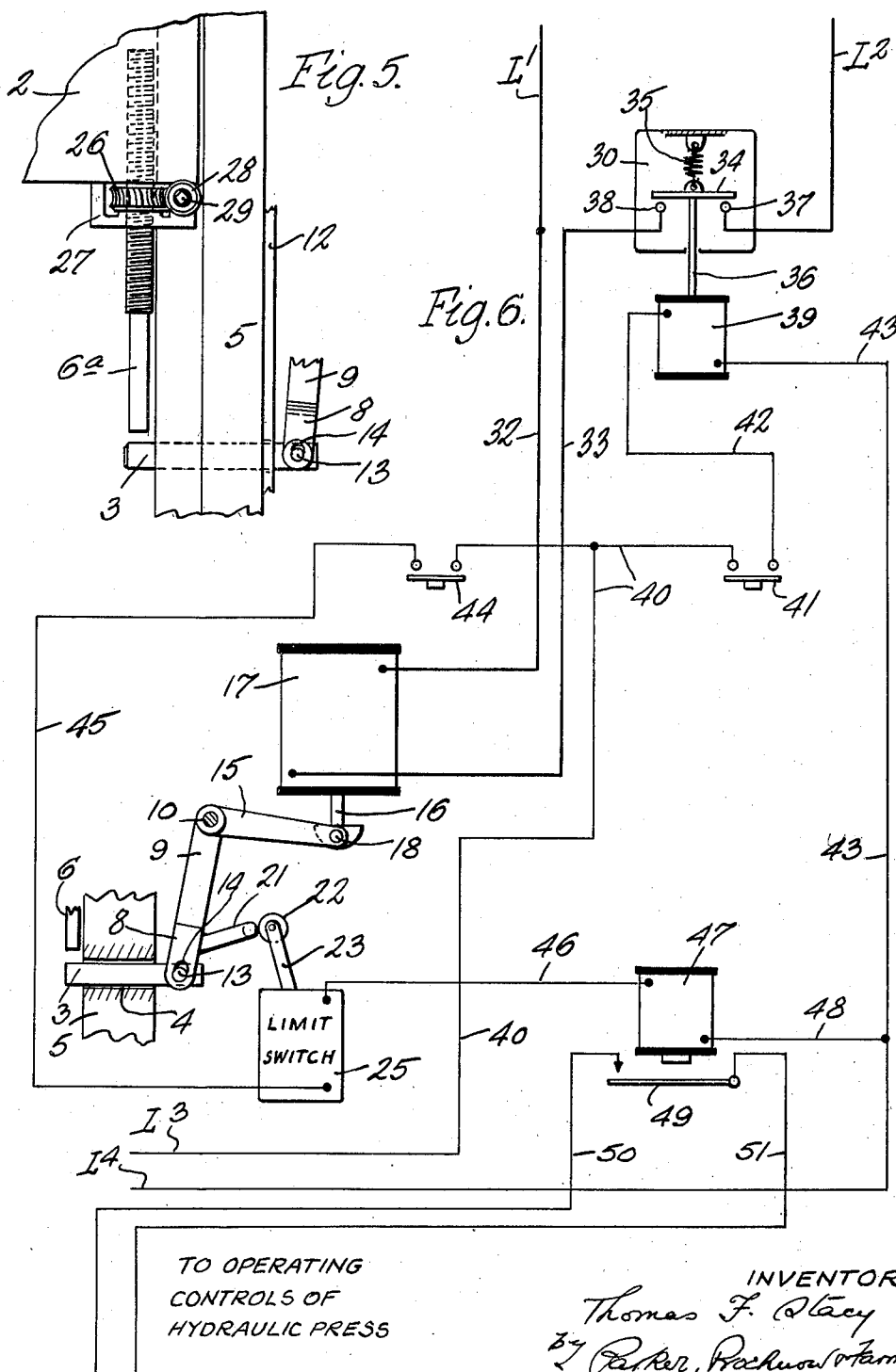
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,240,630

SAFETY DEVICE FOR PRESSES

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13 Claims. (Cl. 192—131)

This invention relates to presses of the type having a platen which descends during a working movement, and particularly to a safety device therefor, by which accidental and unintentional descent of the platen will be effectively prevented.

An object of the invention is to provide an improved press of this type with which accidental and unintentional descent of the platen from starting position will be effectively prevented; with which the safety device will be automatically rendered ineffective when the press controls are operated to cause a normal and intended descent of the platen, and with which injury to the press and platen will be prevented if the safety member is not removed before a power actuation of the platen during a working descent occurs.

Another object of the invention is to provide an improved safety device for a hydraulic press of the type in which the platen descends during a working movement, which may be applied to existing presses without material change therein, and with only minor changes in the controls, which will effectively prevent objectionable, accidental and unintentional descent of the platen, with which the manner of operating the press will not be changed, and which will be relatively simple, compact, dependable and inexpensive.

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

In the accompanying drawings:

Fig. 1 is a side elevation, partly in section, of part of a hydraulic press having this improved safety device applied thereto;

Fig. 2 is a similar view of a portion of the same, illustrating the safety member as in retracted or non-obstructing position, and also an intermediate position of the platen during its descent;

Fig. 3 is a sectional elevation of a portion of the same and illustrating the mechanism for retracting the safety member, the section being taken approximately along the line 3—3, Fig. 1;

Fig. 4 is a sectional plan of the same, the section being taken approximately along the line 4—4, Fig. 1;

Fig. 5 is an elevation of a portion of the press of Fig. 1, but with a slight modification of the abutment with which the safety device cooperates, and illustrating one manner of adjusting

the safety device for different elevated positions of the platen; and,

Fig. 6 is a schematic drawing and wiring diagram illustrating the manner in which the safety device is removed automatically from obstructing position when the usual controls are operated to initiate a downward, power-actuated movement of the platen.

In the embodiment of the invention illustrated in Figs. 1 to 4 and 6, the press 1 is of the hydraulic type in which the platen 2 descends in a working movement, and is hydraulically actuated in both vertical directions in the usual manner of hydraulic presses. A safety pin 3 is suitably mounted in the frame of the press for movement laterally of the direction of movement of the platen into and out of a position in which it obstructs the descent of the platen from its selected vertical or elevated position, and for convenience, this safety pin 3 may be mounted for reciprocation in an aperture or passage 4 in a side plate 5 of the press. Secured to the under side of the platen 2 is a depending bracket or extension 6 which preferably is located somewhat to one side of the platen, so as to clear the base 7 of the press, or at least clear any dies (not shown) that may be placed on the base 7 when the dies (not shown) carried by the platen 2 engage those carried by the base 7. The pin 3 is disposed in a position slightly below the lower end of the bracket 6 when the platen is in its elevated or starting position, but in its path of travel in the descent of the platen.

The pin 3 extends through the wall 5 of the press to the exterior thereof, and its outer end is received in the forked end 8 of a bell crank lever 9 which is pivoted by a pin 10 upon bracket arms or bearings 11 that are fixed to a frame 12 attached to one side of the press, such as to one side plate 5. A pin 13 extends through the outer end of the pin 3 and passes through slots 14 in the arms of the forked end of the bell crank lever, the slots being elongated lengthwise of the bell crank arm so as to provide for free swinging of the bell crank lever upon reciprocation of the pin 3. The other arm of the bell crank 9 is formed of parallel bars 15 which straddle a core 16 of an electromagnet 17. A pin 18 passes through apertures or slots in the bars 15 and the core 16 to provide a pivotal connection between them. It will be understood that the apertures in the bars 15 through which the pin 18 extends are elongated lengthwise of the bars 15, so that the pin 18 may move therein without

binding during the rocking of the bell crank lever.

A weight 19 is suspended by a rod 20 from the core 16 so as to normally pull the core 16 in a direction out of the electromagnet 17 and to yieldingly urge the pin 3 into obstructing position with respect to the platen 2. The bracket 6, during the descent of the platen 2, moves across the opening 4, in which the pin reciprocates, as shown in Fig. 2, so that if the electromagnet is deenergized after descent of the platen has started, the pin 3 will merely engage or ride against the side face of the bracket 6, and the bracket 6 will slide across the end of the pin 3 without being materially retarded thereby.

The depending arm of the bell crank 9 is provided with a laterally extending pin 21 which, when the electromagnet 17 is energized to rock the bell crank 9, engages with a roller 22 rotatably mounted in the forked end of a switch arm 23 which is carried by a shaft 24 projecting outwardly from a limit switch within the switch box 25. Within the box 25, is an ordinary limit switch, which is moved into closed position by the rocking of the arm 23 thereof, whenever the bell crank 9 is actuated to retract the pin 3 into the position shown in Fig. 2, that is, out of obstructing position with respect to the platen 2. When the weight 19 rocks the bell crank 9, following deenergization of the solenoid 17, the pin 21 releases the roller 22, whereupon the arm 23 of the switch is spring-actuated, as usual in this type of switch, back into its open circuit position shown in Fig. 1.

In Fig. 5, the arrangement is the same as in Figs. 1-4, except that the bracket 6 is replaced by a vertical rod 6a which has a threaded portion threaded axially through a worm wheel 26 which is rotatably confined between the lower face of the platen 2 and a bearing member 27. A worm screw 28 is rotatably mounted in the member 27 and meshes with the worm wheel 26, so that whenever the worm screw 28 is rotated, such as by a tool applied to the end 29 thereof, the worm wheel 26 will be rotated in one direction or the other, and because of its threaded connection to the rod 6a, will elevate or lower it, and thus determine the position in the descent of the platen where the rod 6a engages the safety pin 3. This permits of limited adjustment of the rod 6a which forms a portion of the platen 2 that engages the safety device or safety pin 3, so that the same safety device may be utilized when the platen is returned to different retracted or elevated positions.

Referring now to Fig. 6, I have illustrated means by which the safety pin 3 may be retracted out of obstructing position whenever a working descent of the platen 2 is desired. Power lines L¹ and L², which may, for example, carry a 550 volt current, are connected through a contact switch 30 with the solenoid 17 by wires 32 and 33, it being understood that the contact switch 30 is in series with one of the wires, such as 33. This contact switch may be of any suitable type, such as one having a bridge arm 34 which is normally retracted by a spring 35 into open circuit position, but which may be shifted by a core or rod 36 into closed position connecting contacts 37 and 38. The core or rod 36 is actuated by a relay solenoid 39 in a manner to carry the bridge 34 into engagement with contacts 37 and 38.

Line wires L³ and L⁴ also may be provided for supplying a lower voltage current, such as 110

volts, to operate the usual press controls. The line wire L³ may be connected by wire 40 to one side of a normally open switch 41, the other side of which is connected by a wire 42 to the relay solenoid 39. The other side of the solenoid 39 is connected by a wire 43 to the line wire L⁴. The wire 40 is also connected to one side of a normally open switch 44, the other side of that switch being connected by a wire 45 to one side of the limit switch 25, the other side of that limit switch being connected by wire 46 to a press circuit control relay 47. The other side of the relay 47 is connected by wire 48 to the wire 43 leading to the line wire L⁴. The armature 49 of the relay 47, when operated by energization of the relay 47 closes a circuit between wires 50 and 51, which lead to the operating controls of a hydraulic press by which the platen 2 is caused to move in one direction or the other, or remain stationary.

Such controls are well known in the art, and since they do not of themselves form any part of the present invention, they have been omitted in the interest of clarity. Examples of such controls are found in my prior Patents Nos. 2,034,157 of Mar. 17, 1936; 2,062,196 of Nov. 24, 1936 and 2,072,141 of Mar. 2, 1937, to which reference may be had for further details. It will be understood that in connection with my prior patent No. 2,034,157, above mentioned, the platen will be provided with a constant hydraulic pressure tending to retract it instead of having retracting hydraulic pressure applied intermittently to the platen, both of which are well known in the art. In my Patent No. 2,034,157, the switch 90 thereof corresponds to the switch 49 of Fig. 6 of this application. In my prior Patent No. 2,062,196, the switches 79 and 82 thereof are replaced by the switch 49 of Fig. 6 of this application. In my prior Patent No. 2,072,141, the switch 77 thereof corresponds to the switch 49 of the relay 47 of this application.

It will be understood that the bracket 6 in Figs. 1 and 2 enables the device to be applied to presses already sold and in use, and preferably several brackets 6 of different lengths may be employed for different die set-ups because it may be desirable to operate the press with the platen 2 into different positions when fully open. In new presses, brackets 6 of different lengths may also be employed, or the screw 6a may be employed and adjusted to different positions so as to correspond to the brackets 6 of different lengths. The pin 3 is made of such a size that in case the platen accidentally or unintentionally closes against or descends by gravity action upon the pin, such as permitted through leakage of the hydraulic actuating liquid, the platen will be held by the pin 3 against further descent, but if through any inadvertance the hydraulic power should be applied to the platen which causes the descent of the platen by hydraulic pressure before the pin 3 is retracted, the pin 3 will shear under some very light load from the platen, so that no damage will be caused to the equipment. Therefore, the pin 3 will be sufficiently strong to carry the weight of the ram, platen and upper dies without shearing, but will shear easily if a light load is applied to the platen beyond that which normally urges the platen 2 downwardly by gravity.

It is quite customary in such hydraulic presses to provide two starting push buttons, so that both hands of the operator must be out of the press before the press can be started in operation.

Accordingly, the two starting switches 41 and 44 serve as this starting safety device, and it is necessary to use both hands to close the switches 41 and 44 and hold them closed until the platen 2 has begun its descent. When the switches 41 and 44 are closed to start a movement of the plate 2, a circuit is closed by the switch 41 between the line wires L³ and L⁴ through the switch 41, contactor solenoid 39, using the relatively low voltage actuating current. The switch 44 also completes a circuit between the wires 40 and 45, but since the limit switch 25 is then in open circuit position because the safety device 3 is in obstructing position with respect to the platen 2, the circuit through the switch 44 and limit switch 25 will not be entirely completed. The completion of the circuit through the switch button 41, however, causes the energization of the contactor solenoid 39, and the latter pulls the bridge 34 into contact with the contacts 37 and 38 and completes a circuit for the relatively high voltage current from line wires L' and L², through the solenoid 17.

The solenoid 17, when energized in this manner, retracts the safety pin 3, and when the pin 3 has been fully retracted from obstructing position, it operates the limit switch 25 to close it. This completes the circuit for and energizes the press controlling relay 47, and this relay 47 then closes the switch 49 forming part of the operating controls of the hydraulic press which initiates a downward movement of the platen under hydraulic pressure. It is only necessary to keep the switches 41 and 44 closed until the bracket 6 or the screw 6a has passed over the end of the safety pin 3 so as to keep the pin 3 retracted, even though the solenoid 17 is then deenergized.

The pin 3 and the bell crank 9 together may be considered as a safety device which is operated by the solenoid 17 and which, when operated, in turn operates the limit switch. The safety device is particularly useful on high speed, self-contained hydraulic presses where the press ram and plates drop until the pilot valve is actually reversed at the end of a return movement of the platen to the upper position, and the rate at which the platen drops unintentionally will depend upon the amount of leakage from the usual controlling valve (not shown) and past the rings or packing on the end of the ram. Such unintentional or accidental dropping of the platen is objectionable for safety reasons, and this device overcomes such objectionable dropping.

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 downwardly acting press of the type having a movable platen which descends under power actuation during a working movement and freely under gravity when released, and which is power elevated at the end of a working movement, the improvement therein which comprises a safety member mounted for movement into and out of the path of travel of said platen in its downward movement from said elevated position, said member having a size which normally supports the weight of said platen and resists its free descent when released without shearing, but which is sufficiently small to be readily

sheared by said platen without further damage to the press mechanism when power is applied to said platen to cause its descent, means for retracting said safety member from obstructing position, and means rendered effective by said safety member only after that member has been retracted from obstructing position for making possible the application of power to said platen to initiate a descent of the platen.

2. In a hydraulic press of the type having a platen which descends during a working movement and is elevated back to starting position at the end of a working movement, the improvement therein which comprises a safety member mounted for movement into and out of a position in which it obstructs descent of the platen beyond a predetermined distance from its said starting position, means for retracting said safety member, a limit switch operated by said safety member when it is out of platen obstructing position, means including an electric circuit and a starting switch for initiating a descent of said platen, and having its circuit controlled jointly by said limit switch and said starting switch, whereby a working descent of said platen cannot be initiated until said safety member has been removed from obstructing position with respect to said platen.

3. In a hydraulic press of the type in which a platen is hydraulically operated in a descending direction during a working movement and is elevated back to starting position at the end of a working movement, the improvement therein which comprises a safety member shiftable into and out of a position in which it obstructs a descent of said platen below a predetermined extent from said starting position, power means for removing said safety member from obstructing position, a control member for rendering said power means effective to remove said safety member from obstructing position, a limit switch operated by said safety member when it is out of obstructing position with respect to said platen, means for causing a hydraulically actuated descent of said platen and having a controlling circuit therefor including in series therein said limit switch, a control switch also included in said circuit, whereby said control switch and limit switch must both be operated to cause a descent of said platen, and the descent of said platen will be prevented until said safety member has been moved out of obstructing position with respect to said platen.

4. In a hydraulic press of the type in which a platen is hydraulically operated in a descending direction during a working movement and is elevated back to starting position at the end of a working movement, the improvement therein which comprises a safety member shiftable into and out of a position in which it obstructs a descent of said platen below a predetermined extent from said starting position, power means for removing said safety member from obstructing position, a control member for rendering said power means effective to remove said safety member from obstructing position, a limit switch operated by said safety member when it is out of obstructing position with respect to said platen, means for causing a hydraulically actuated descent of said platen and having a controlling circuit therefor including in series therein said limit switch, a control switch also included in said circuit, whereby said control switch and limit switch must both be operated to cause a descent of said platen, and the descent of said

platen will be prevented until said safety member has been moved out of obstructing position with respect to said platen, said safety member being of a size which will prevent the descent of said platen through gravity pressure thereon when said platen is merely free to descend and which will be sheared easily by any material hydraulic pressure thereon through said platen when said platen is hydraulically actuated in its working descent.

5. In a hydraulic press of the type in which a platen is hydraulically operated in a descending direction during a working movement and in a reverse direction to starting position, the improvement therein which comprises a pin mounted in the frame of the press and reciprocable endwise into and out of a position in which it obstructs a descent of said platen below a predetermined extent from said starting position, an electromagnet, a bell crank lever operated by said electromagnet and connected to said pin for retracting it out of obstructing position, a circuit for said electromagnet and having a controlling switch therein, a relay controlling said switch, a limit switch operated into closed position by said bell crank when the pin is shifted out of obstructing position with respect to said platen, means for causing a hydraulically actuated descent of said platen and having a controlling circuit therefor including said limit switch in series therein, a manually controlled circuit for said relay, a manually operated switch, and means controlled jointly by said manually operated switch and said limit switch for controlling the hydraulic actuation of said platen and operable to prevent descent of said platen under hydraulic actuation until said pin has been moved out of obstructing position with respect to said platen.

6. In a downwardly acting press of the type having a movable platen which descends during a working movement and is held in elevated position between working movements, and power means to move the platen in both vertical directions, the improvement therein which comprises a safety member supported and mounted for movement into and out of a position in which it obstructs the platen to inflexibly arrest its descent, means for continuously urging said safety element into obstructing position, means for retracting and holding said member out of obstructing position, separate and selective means for controlling the power means for moving the platen, and means for cooperating with said selective means and said retracting means to render said selective means incapable of initiating a descent of the platen when the safety member is in obstructing position.

7. In a downwardly acting press of the type having a movable platen which descends during a working movement and is held in elevated position between working movements, and power means to move the platen in both vertical directions, the improvement therein which comprises a safety member supported and mounted for movement into and out of a position in which it obstructs the platen to inflexibly arrest its descent, means for retracting and holding said member out of obstructing position, separate and selective means for controlling the power means for moving the platen, and means cooperating with said selective means and said retracting means to render said selective means incapable of initiating a descent of the platen when the safety member is in obstructing position.

8. In a downwardly acting press of the type having a movable platen which descends during a working movement and is held in elevated position between working movements, and power means to move the platen in both vertical directions, the improvement therein which comprises a safety member supported and mounted for movement into and out of a position in which it obstructs the platen to inflexibly arrest its descent, means for continuously urging said safety element into obstructing position, means for retracting and holding said member out of obstructing position whenever said retracting means is activated, separate and selective means for controlling the power means which causes travel of said platen, and means cooperating with said separate and selective means, said retracting means, and said means urging the safety element into obstructing position for rendering said selective means incapable of initiating a descent of the platen when said safety member is in obstructing position and capable of initiating such descent when said safety member is out of obstructing position.

9. In a hydraulic press of the type having a vertically movable platen which descends during a working movement and is held in elevated position between working movements, and power means for moving said platen, the improved safety device therefor which comprises a safety member supported and disposed for movement in a direction laterally of the direction of travel of the platen into and out of a position in which it obstructs the descent of said platen, said member being of a size to easily support the weight of the platen, but small enough to be sheared by the moving platen when power is applied thereto, means for retracting said member from obstructing position, separate and selective means for controlling said power means, means interacting between said retracting means and said selective means to normally prevent initiation of a power actuated descent of the platen when the safety member is in obstructing position and to render said power controlling means operable to initiate a descent of the platen when said member is retracted from obstructing position.

10. In a downwardly acting hydraulic press of the type having a vertically movable platen and fluid actuated means for moving said platen in both directions, an improved safety device for preventing fall of the platen under influence of gravity due to leakage of the holding fluid which comprises a safety member mounted for movement in a direction laterally of the direction of movement of said platen into and out of the path of travel of said platen, said member being of a size to easily support the platen when acted upon solely by the forces of gravity, and small enough to be readily sheared by the platen without further damage to the press when any appreciable hydraulic operating power is applied thereto, and means for retracting said member from said path, and means rendered effective by the retraction of said member from safety position for making possible the application of said operating power to said platen.

11. In a press of the type having a movable platen which descends during a working movement and is held in any of a plurality of different possible elevated positions when the platen is retracted between working movements, and power means to move the platen in both vertical directions, a safety member mounted for movement into and out of a safety position in which

it obstructs descent of the platen, and means movable with said platen and having a surface disposed to abut against said safety member in its safety position when said platen is retracted and thereby cause said obstruction of the platen's descent, said element being adjustable on said platen by substantial amounts in the direction of travel of the platen so as to become effective to obstruct descent of the platen at any selected one of said different elevated positions representing a limit of retraction for said platen.

12. In a press of the hydraulic type having a reciprocable platen which is hydraulically operated in both vertical directions, descends during a working movement and is held in any selected one of a plurality of different possible elevated positions between working movements representing different limits for retraction of said platen, a safety member mounted for movement into and out of a safety position in which it obstructs descent of the platen, and abutment means mountable on said platen and engageable with said safety member at approximately any selected one of said different retracted positions

of said platen, to become effective to obstruct descent of the platen at any of said limits of retraction.

13. In a downwardly acting press of the type having a movable platen which descends during a working movement and is held in elevated position between working movements, and power means to move the platen in both vertical directions, the improvement therein which comprises a safety member supported and mounted for movement into and out of a position in which said member of itself obstructs descent of the platen and directly and positively arrests further descent of said platen, means for retracting and holding said member out of obstructing position, separate and selective means for controlling the power means for moving the platen, and means cooperating with said selective means and said retracting means to render said selective means incapable of initiating a descent of the platen when the safety member is in obstructing position.

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