Nov. 17, 1959 F. THURNHER 2,913,027

SIMULTANEOUS-ACTING MULTI-PLATEN HOT PRESS

Filed April 9, 1958 3 Sheets-Sheet 1

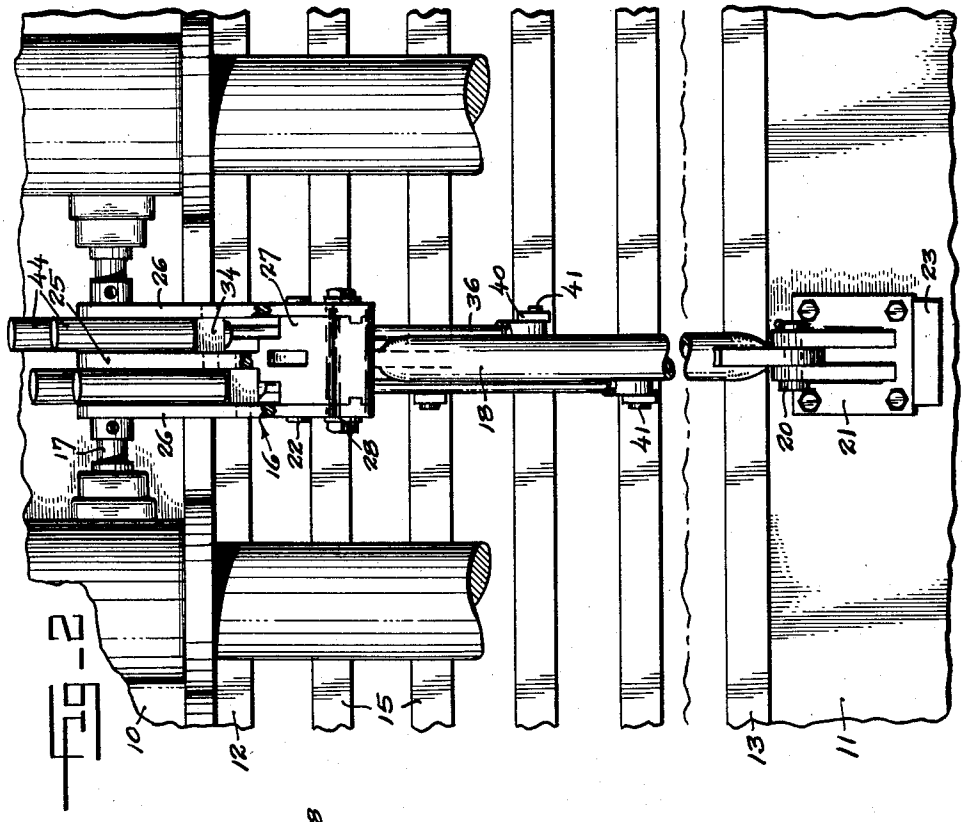


FIG. 2

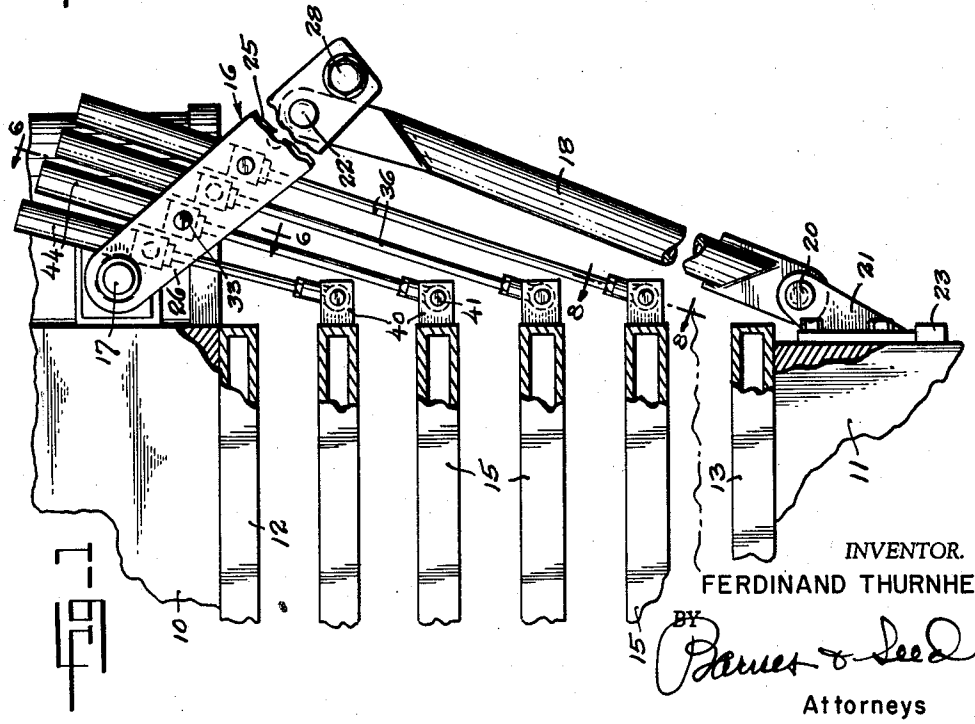


FIG. 1

INVENTOR.
FERDINAND THURNHER
BY
Attorneys

Nov. 17, 1959 F. THURNHER 2,913,027

SIMULTANEOUS-ACTING MULTI-PLATEN HOT PRESS

Filed April 9, 1958 3 Sheets-Sheet 2

Fig. 3

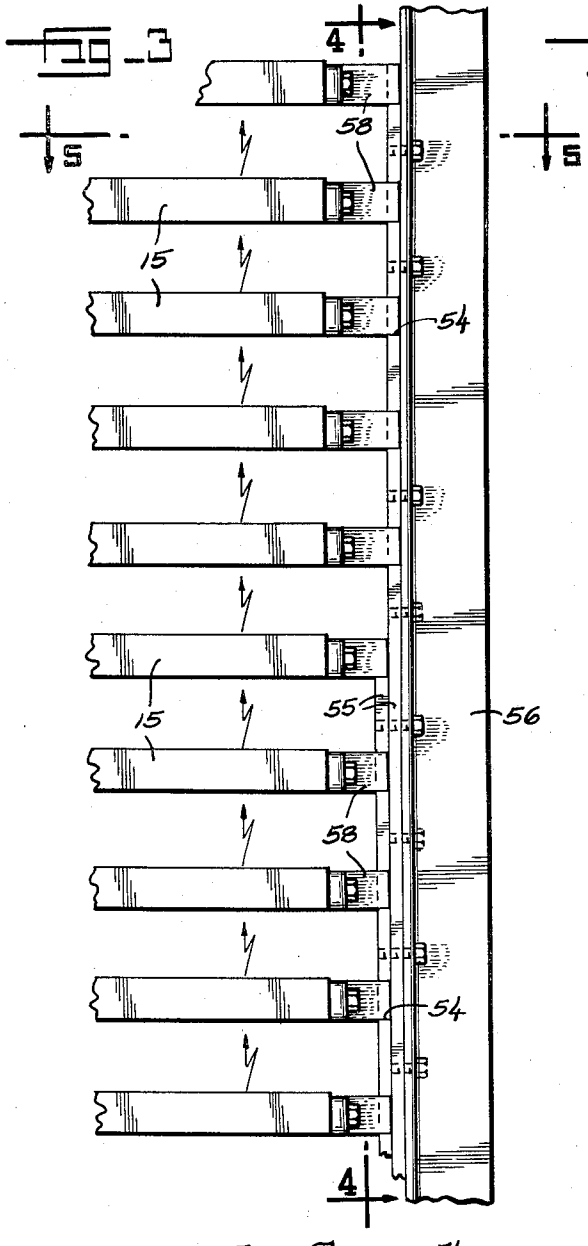


Fig. 4

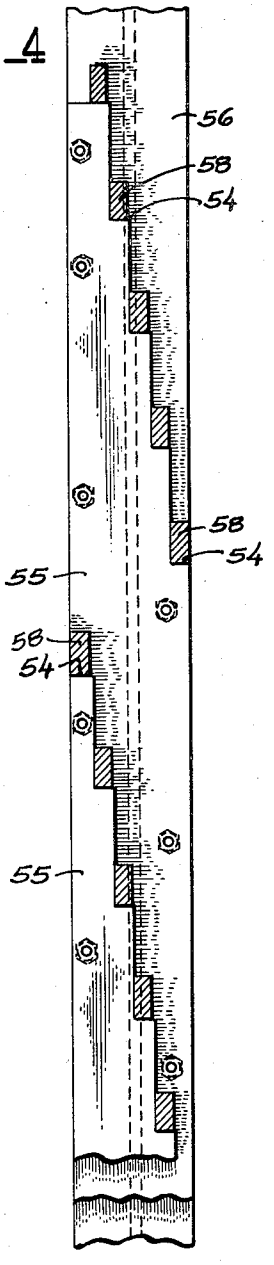
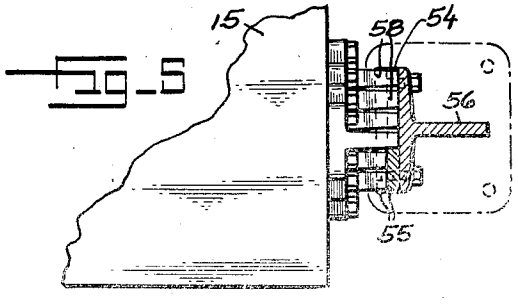


Fig. 5



INVENTOR.
FERDINAND THURNHER

BY Barnes & Seed

Attorneys

Nov. 17, 1959 F. THURNHER 2,913,027

SIMULTANEOUS-ACTING MULTI-PLATEN HOT PRESS

Filed April 9, 1958 3 Sheets-Sheet 3

FIG. 6

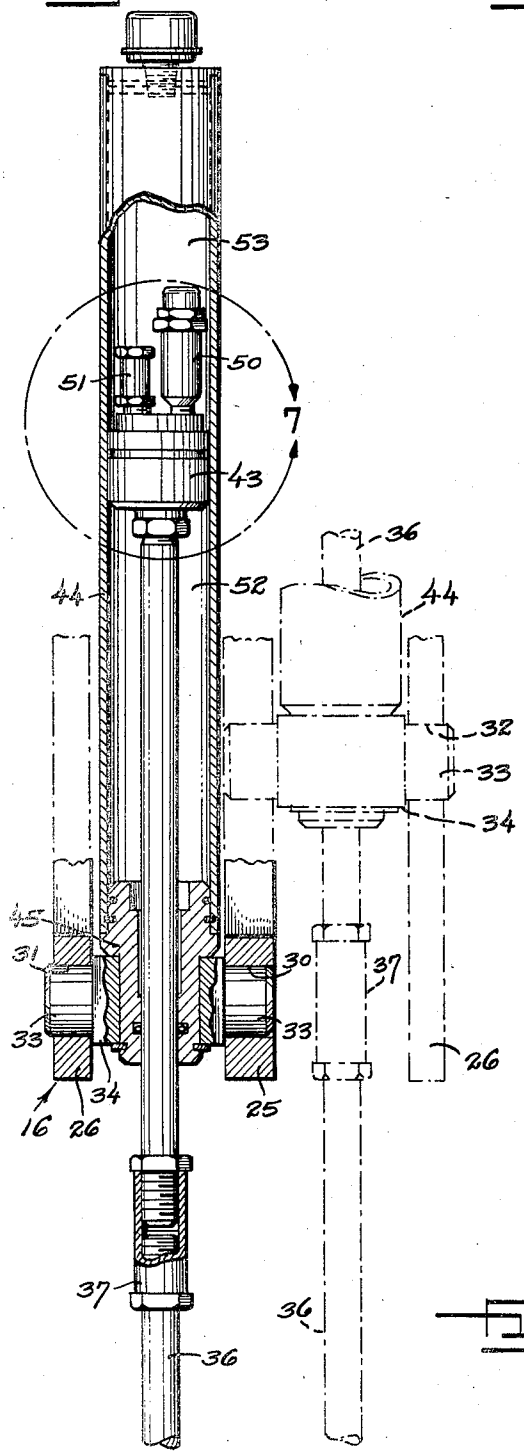
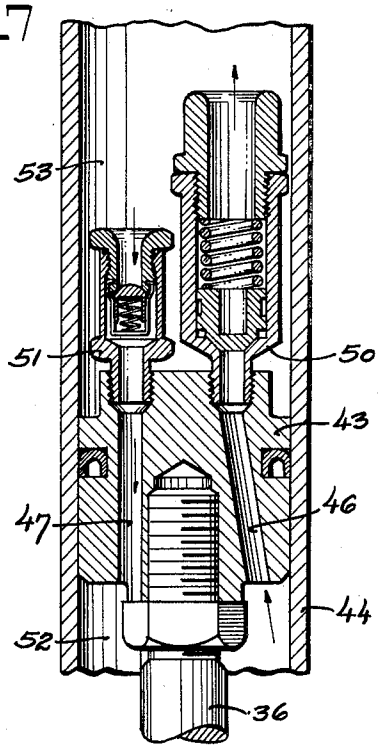


FIG. 7



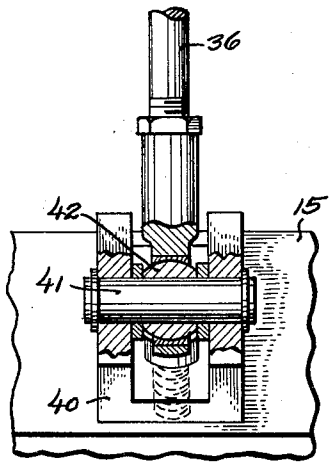


FIG. 8

INVENTOR.
FERDINAND THURNHER
BY Barnes & Seed
Attorneys

United States Patent Office 2,913,027
Patented Nov. 17, 1959

2,913,027

SIMULTANEOUS-ACTING MULTI-PLATEN HOT PRESS

Ferdinand Thurnher, Seattle, Wash., assignor to Washington Iron Works, Seattle, Wash., a corporation of Washington

Application April 9, 1958, Serial No. 727,406

8 Claims. (Cl. 144—281)

This invention relates to a hot press, particularly a multi-platen hot press of the type used in manufacturing hardboard, plywood and the like, and one, more especially, in which all of the plates close simultaneously so that respective mats received within the several openings will be subjected to curing heat and pressure for corresponding periods of time. The present invention is an improvement over the structure illustrated and described in my pending application filed April 15, 1957, Ser. No. 652,973.

For its general object the invention aims to provide a perfected system of suspending the platens of a multi-platen hot press to provide simultaneous opening and closing of the several pockets of the press in a manner overcoming recognized disadvantages of simultaneous acting multi-platen hot presses as they have been heretofore known.

With this and other more particular objects and advantages in view which will appear and be understood in the course of the following description and claims, the invention consists in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the accompanying drawings:

Figure 1 is a fragmentary view, partly in front elevation and partly in section, illustrating one corner of a multi-platen hot press equipped with hanger mechanism embodying teachings of the present invention. For maximum clarity in illustration this view deletes any showing of associated shelf structure on which the platens rest when the press is in its open condition.

Fig. 2 is a fragmentary side elevational view of said hanger mechanism.

Fig. 3 is a fragmentary front elevational view showing said shelf structure and, again for purposes of clarity, deleting any background representation of the hanger mechanism.

Fig. 4 is a fragmentary longitudinal vertical sectional view on line 4—4 of Fig. 3.

Fig. 5 is a fragmentary horizontal sectional view on line 5—5 of Fig. 3.

Fig. 6 is a fragmentary longitudinal vertical sectional view drawn to an enlarged scale on line 6—6 of Fig. 1.

Fig. 7 is an enlarged-scale fragmentary sectional view detailing the matter circled at 7 in Fig. 6; and

Fig. 8 is a fragmentary longitudinal vertical sectional view drawn to an enlarged scale on line 8—8 of Fig. 1.

Referring to said drawings, the numeral 10 designates the stationary head-plate, and 11 the movable base-plate, or cross-head as it will be hereinafter termed, of a conventional multi-platen hot press. Said cross-head is carried for vertical movement, usually by a plurality of hydraulic rams working in cylinders set into a box bedplate. Between said head-plate and cross-head there are provided a stacked succession of platens of which the uppermost platen 12 is made integral with the head-plate while the lowermost platen 13 is made integral with the cross-head. The hanger structure of the present

invention gives support to the intervening platens 15 so that such platens will open and close in concert responsive to a descending motion and an ascending motion respectively, of the movable cross-head. These structures are applied to the two sides of the press adjacent each of the ends. Inasmuch as the structures applied to all four corners are identical, a description of one will suffice for the others.

The hanger structure is in the nature of an elbowed lever mechanism employing, as an upper arm therefor, an outrigger beam 16 fixed by its inner end to a pivot shaft 17 which is journaled from the head-plate for oscillatory motion about a longitudinal horizontal axis. The forearm of the assembly comprises a radius bar 18 having its lower end pivoted, as at 20, to a bracket 21 boltably secured to the side face of the cross-head and at its upper end articulating with the free end of the beam by a pivot pin 22. A block or blocks 23 is welded to the cross-head under the lower edge of the bracket 21 in order that the bolts by which said bracket is attached to the cross-head will be relieved of the extreme load passed into the cross-head from the radius bar.

In the form in which I have elected to here illustrate the same the outrigger beam is made trifurcate so as to provide two elongated parallel stalls each defined by a tongue 25 at the inside common to both stalls and a respective cheek plate 26 at the outside. The tongue stems from a T-head 27 at the end which articulates with the radius bar, and the cheek plates are bolted, as at 28, to the arms of such T. The tongue is provided within its length with a plurality of horizontally drilled through-openings 30 (Fig. 6) extending in a line on parallel centers which are spaced equidistantly one from another and from the two terminal pins 17 and 22. These openings 30 correspond in number with the number of the platens 15. Alternately as between the two cheek plates, openings, as 31 and 32, corresponding in size to the openings 30 are drilled through the cheek-plates in positions coinciding axially with the successive openings 30. Each co-axial pair of these openings 30—31 and 30—32, as the case may be, has oppositely directed pins 33 of a respective squared trunnion block 34 journaled therein, and each said trunnion block presents a drill-hole extending diametrically of the block from one to another of two opposite flats. A related one of the multiple platens 15 is hung by a respective rod 36 from each of said trunnion blocks. The rod has a turnbuckle 37 within its length and has its lower end received between the arms of a furcate bracket 40 (Fig. 8) bolted or otherwise secured to the platen, connecting therewith by a pivot pin 41. The pivot connection includes a ball joint in compensation of minor variations in the degree of vertical movement between the four corners of a platen. While not illustrated, the bushing in which the ball 42 of said ball joint is socketed desirably receives a friction-free roller-bearing journal in the lower end of the rod.

The rod's upper end connects with a piston 43 working in an oil cylinder 44 having at its lower end a header 45 which fits in and shoulders upon the trunnion block so that the cylinder will surmount such block. The piston has two through-passages 46 and 47 extending endwise to the axis, and associated with these passages is a relief valve 50 for the one and a check valve 51 for the other. The arrangement is such that fluid traversing the relief valve travels upwardly through passage 46 from the chamber 52 of the cylinder which lies below to the chamber 53 of the cylinder which lies above the piston. A reverse travel occurs as fluid traverses the check valve. The relief valve which I prefer to employ is one in which the valve proper is unseated under a pressure condition of 1000# p.s.i. It will be understood that said upper

chamber 53 of the cylinder functions as a fluid reservoir and is vented to the atmosphere.

It is important that each of the platens 15 occupies an exact predetermined level when the press is open, and to this end I employ the conventional step-rests wherein toe pieces 58 are carried by the platens at each of the four corners thereof for resting engagement upon shelves 54 provided by stepped hanger plates 55 fixed to the inside faces of stationary vertical posts 56 located alongside the press. An upper set of, say, five platens has its toe pieces projecting laterally somewhat beyond those of a subjacent set, and the superimposed toe pieces in each of said sets are staggered in correspondence with the horizontal spacing between the steps of the hanger plates.

It will be particularly noted that the present invention permits degassing of hardboard to be accomplished throughout all the pockets of the press. As soon as contact is established between each platen of the press and a mat therebelow, so that the closing pressure is passed from platen to platen through the mats rather than through the radius bar, outrigger beam, and piston rods of the hanger structure, each said piston rod is completely free of any load and pressure then equalizes itself in the two chamber 52 and 53 of the cylinder. However, should the operator momentarily reduce the hydraulic pressure upon the rams of the press, each said piston 43 instantly picks up the load of its own platen and thus permits degassing to take place. Recommended procedure, using ⅛" hardboard as an example, is to initially subject the mats to an approximate 500# p.s.i. pressure maintained for a 15 second interval, then momentarily back off to 50# p.s.i. Next apply compression pressure at 800# p.s.i., maintained for a like time interval, and again back off to 50# p.s.i. The board may then be given a final pressure treatment of 1000# p.s.i. maintained for, say, 2 to 3 minutes.

It will be apparent that the described hydraulic arrangement safeguards each piston rod against liability of becoming overloaded from the weight of more than a single platen. Should any press opening be empty during a press-closing operation, with the result that the two platens which define the ceiling and floor for such empty pocket are separated when initial contact takes place between the platens and mats in the pockets thereabove, the "ceiling" platen would become unduly loaded were it not for the relief action provided by the relief valve. As pressure within any chamber 53 of the several oil cylinders 44 rises above the relief setting, 1000# p.s.i. for example, the affected pistons move downwardly in the concerned cylinders as oil is forced from the lower chamber 53 to the upper chamber 52. This transfer of oil continues until the "floor" and "ceiling" platens of the empty pocket are brought into contact. At this point the full load of all platens thereabove is passed downwardly through subjacent platens to the cross-head, with a consequent release of pressure upon the pistons 43. As the press opens following the press operation, all pistons which may have been displaced from a given normal position relocate themselves automatically in course of the cross-head's lowering movement, such relocation taking place as the platen of such displaced piston comes to rest upon the related shelves of the hanger plates and responsively relieves the piston of any platen load so that, as cylinder 44 continues to move downwardly with beam 16 while piston 43 has now become stationary, a vacuum condition occurs in chamber 52 causing the check-valve 51 to unseat itself and permit oil to flow from the upper reservoir chamber 53 to the lower chamber 52. If a spring, as here shown, is employed for urging the valve of the check-valve 51 toward a closed position, the force imposed by such spring is perforce light. Should any of the several suspension means change its length during a pressing operation such change will be one of lengthening, not shortening, and this is the case whether the factor responsible for such change of length is the circumstance

of an empty pocket or the presence of two mats in a single pocket.

It is thought that the invention will have been understood from the foregoing detailed description of my now-preferred illustrated embodiment. Changes in the details of construction may be resorted to without departing from the spirit of the invention and it is accordingly my intention that the hereto annexed claims be given a scope fully commensurate with the broadest interpretation to which the employed language admits.

What I claim is:

1. In combination with the upper head, the lower head, and the intervening platens of a multi-platen press, one of said heads being stationary and the other movable, structure applied to each of the four corners of the press comprising an outrigger beam having its inner end pivoted to the upper head for vertical swinging motion and having a radius bar extending as a pitman from the outer end to the lower head, a respective means for each platen suspending the platen from the beam comprising a hanger rod attached at one end to the platen and at the other end connecting with a piston working in a fluid cylinder attached to the beam, means being provided enabling fluid to pass from one to the other end of the cylinder such that the piston will move in a direction lengthening the suspension means when the suspended load exceeds a predetermined norm and permitting free transfer of fluid in an opposite direction when the suspension means is relieved of the load of its platen and subjected to a light compressive force during movement of the movable head in its press opening travel, said attachment of the cylinders to the beam being at points equidistantly spaced along the length of the beam.

2. Structure according to claim 1 in which the attachment of each cylinder to the beam comprises a respective trunnion block carried by the beam so as to pivot about a horizontal axis transverse to the beam and presenting a through-opening drilled diametrically on an axis normal to said pivot axis, the cylinder shouldering upon said trunnion block with a lower header portion fitting in said through-opening.

3. In combination with the stationary head at the top, the movable cross-head at the bottom, and the intervening platens of a press, structure applied to each of the four corners of the press comprising an outrigger beam having its inner end pivoted to the stationary head for vertical swinging motion about a horizontal axis and having a radius bar extending as a pitman from the outer end to the cross-head, a respective support means for each of said platens on which the platen rests when the press is open, a respective means for each platen suspending the platen from the beam comprising a hanger rod attached at one end to the platen and at the other end connecting with a piston working in a fluid cylinder attached to the beam, means being provided enabling fluid to pass from one to the other end of the cylinder such that the piston will move in a direction lengthening the suspension means when the suspended load exceeds a predetermined norm and permitting free transfer of fluid in an opposite direction when the suspension means is relieved of the load of its platen by coming to rest upon its related said support means during movement of the movable cross-head in its press-opening descending travel, said attachment of the cylinders to the beam being at points equidistantly spaced along the length of the beam.

4. In combination with the stationary head at the top, the movable cross-head at the bottom, and the intervening platens of a press, structure applied to each of the four corners of the press comprising an outrigger beam having its inner end pivoted to the stationary head for vertical swinging motion about a horizontal axis and having a radius bar extending as a pitman from the outer end to the cross-head, a respective means for each platen suspending the platen from the beam comprising a hanger rod attached at one end to the platen and at the other

end connecting with a piston working in a fluid cylinder attached to the beam, means being provided enabling fluid to pass from one to the other end of the cylinder such that the piston will move in a direction lengthening the suspension means when the suspended load exceeds a predetermined norm and permitting free transfer of fluid in an opposite direction when the suspension means is relieved of the load of its platen during movement of the movable cross-head in its press-opening descending travel, means being provided for relieving said pistons of the several suspension means of the loads of their respective platens as said platens reach predetermined levels during said descending travel of the movable cross-head, said attachment of the cylinders to the beam being at points equidistantly spaced along the length of the beam.

5. In combination with the stationary head at the top, the movable cross-head at the bottom, and the intervening platens of a press, structure applied to each of the four corners of the press comprising an outrigger beam having its inner end pivoted to the stationary head for vertical swinging motion about a horizontal axis and having a radius bar extending as a pitman from the outer end to the cross-head, a respective support means for each of said platens on which the platen rests when the press it open, a respective means for each platen suspending the platen from the beam comprising a hanger rod attached at one end to the platen and at the other end connecting with a piston working in an oil cylinder attached to the beam in a position surmounting the same, means being provided operating in the absence of a suspension load upon the rod, occurring as the platens come to rest upon the concerned support means during descending travel of the movable cross-head enabling the piston to move upwardly in the cylinder by permitting free transfer of oil from the end of the cylinder above to the end of the cylinder below the piston, and when the suspended load exceeds a predetermined safe maximum during ascending travel of the cross-head acting automatically to pass fluid in the opposite direction so that the piston will move downwardly, said attachment of the cylinders to the beam being at points equidistantly spaced along the length of the beam.

6. In combination with the stationary head at the top, the movable cross-head at the bottom, and the intervening platens of a press, structure applied to each of the four corners of the press comprising an outrigger beam

having its inner end pivoted to the stationary head for vertical swinging motion about a horizontal axis and having a radius bar extending as a pitman from the outer end to the cross-head, a respective support means for each of said platens on which the platen rests when the press is open, a respective means for each platen suspending the platen from the beam comprising a hanger rod attached at one end to the platen and at the other end connecting with a piston working in an oil cylinder attached to the beam in a position surmounting the same, means being provided operating in the absence of a suspension load upon the rod, occurring as the platens come to rest upon the concerned support means during descending travel of the movable cross-head, enabling the piston to move upwardly in the cylinder by permitting free transfer of oil from the end of the cylinder above to the end of the cylinder below the piston, and when the suspended load exceeds a predetermined safe maximum during ascending travel of the cross-head acting automatically to pass fluid in the opposite direction so that the piston will move downwardly, said attachment of the cylinders to the beam being at points equidistantly spaced along the length of the beam and comprising, for each cylinder, a respective trunnion block carried by the beam so as to pivot about a horizontal axis transverse to the beam and presenting a through-opening drilled diametrically on an axis normal to said pivot axis, the cylinder shouldering upon said trunnion block with a lower header portion fitting in said through-opening.

7. Structure according to claim 6 in which the means which permits transfer of oil from the end of the cylinder above to the end of the cylinder below the piston comprises a check valve, and wherein the means which permits oil to flow in the opposite direction comprises a relief valve.

8. Structure as recited in claim 7 in which the check valve and the relief valve are each contained in a respective communication passage drilled through the piston endwise to the axis.

References Cited in the file of this patent

UNITED STATES PATENTS

2,558,796	Tapper	July 3, 1951
2,586,474	Moore	Feb. 19, 1952
2,792,777	Uschmann	May 21, 1957