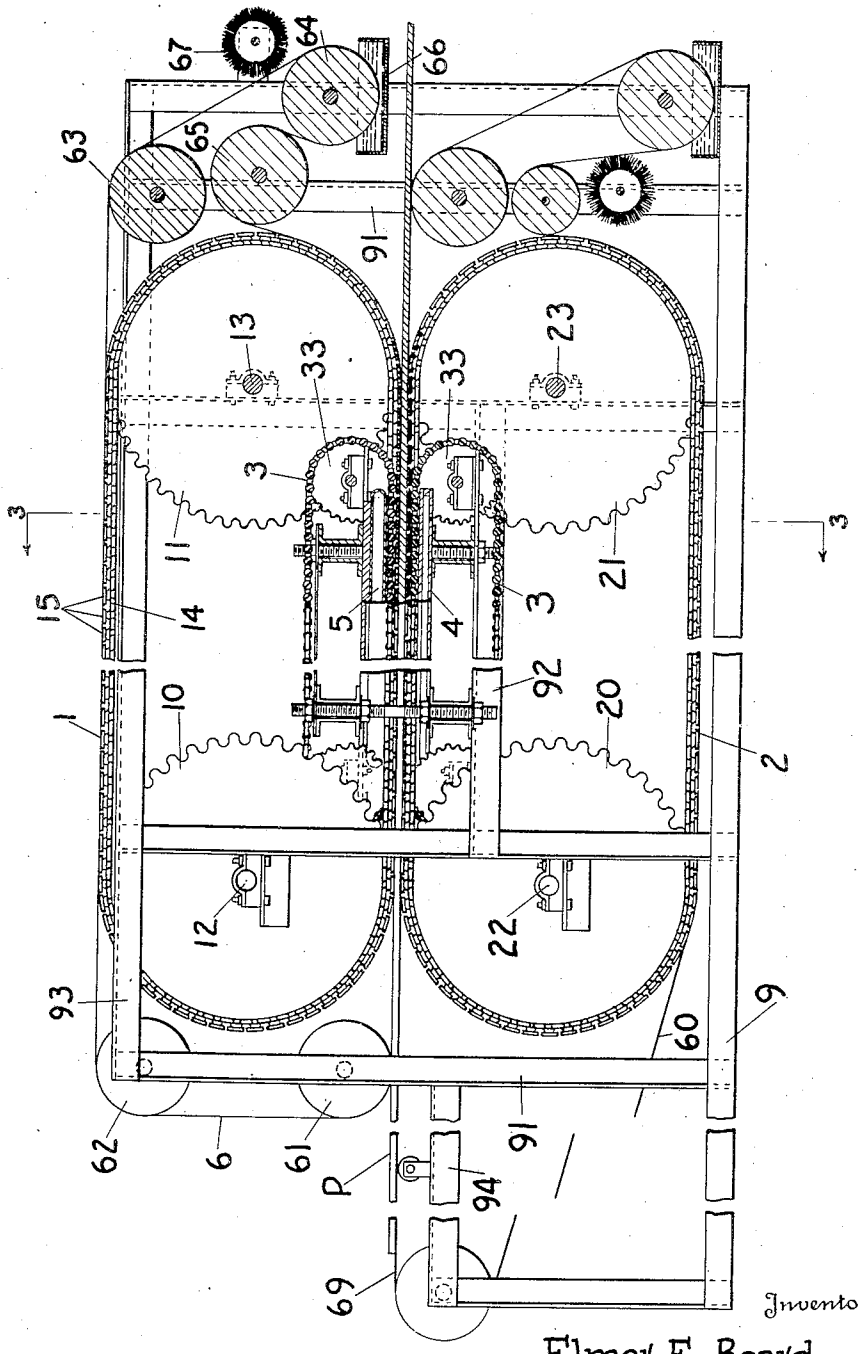
Jan. 3, 1939. E. E. BEARD 2,142,932

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Fig. 1



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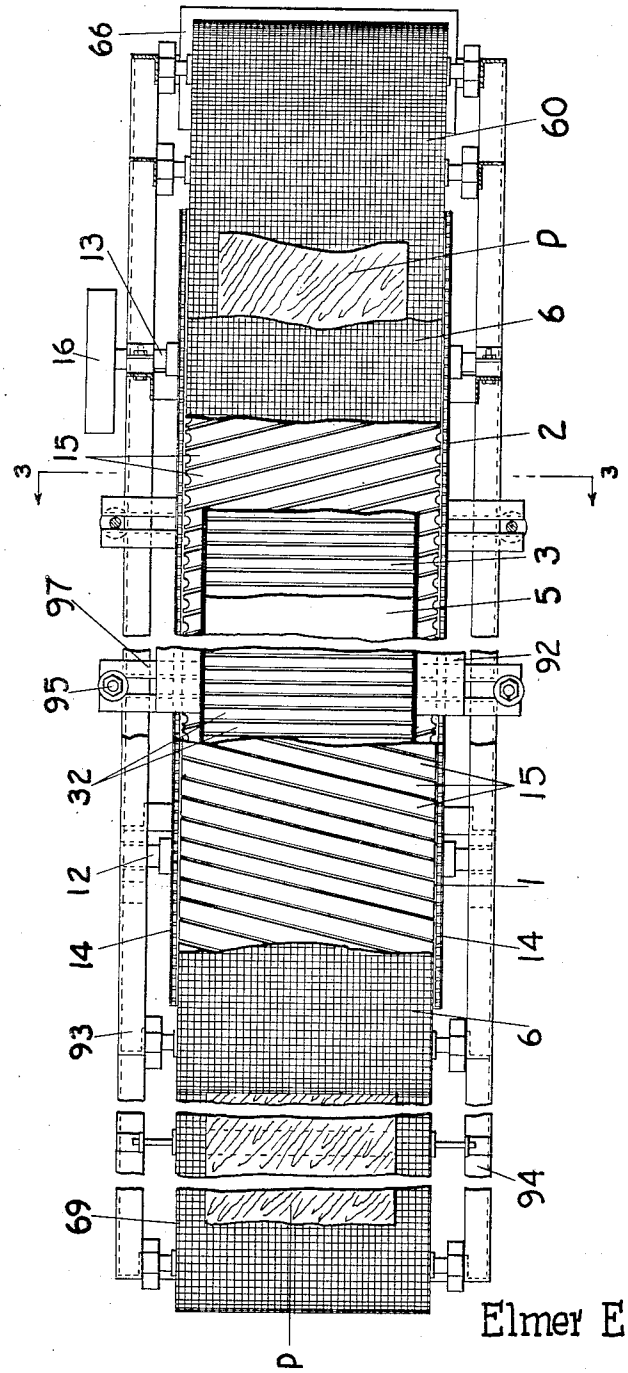
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Fig. 2



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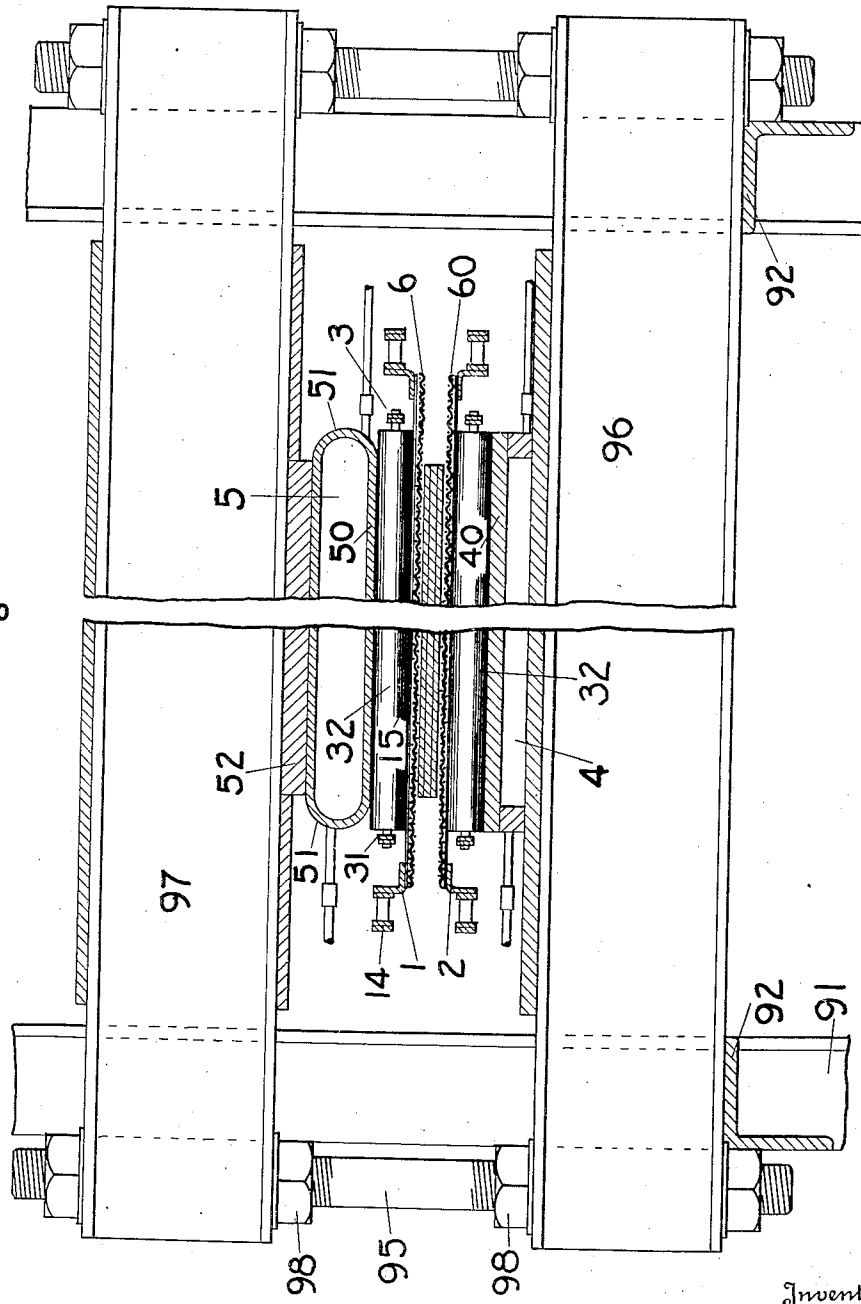
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Fig. 3



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2,142,932

PLYWOOD PRESS

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Application March 11, 1935, Serial No. 10,485

17 Claims. (Cl. 144—281)

My invention relates to the manufacture of panels of plywood and the like, and preferably is concerned with the manufacture, by a continuous process, of panels of indeterminate length.

More especially my invention relates to a press for use in such manufacture of plywood, but which can be employed for the manufacture of individual panels of plywood or like materials.

In the manufacture of plywood it is necessary to apply pressure to the panels while the glue is setting. The application of heat is sometimes desirable to hasten the setting. The panels will vary somewhat in thickness, due to local conditions in the veneer or in the panel, and it is one of the objects of my invention to provide a press which will suitably apply heat and pressure distributed evenly over the entire surface of the panel within the press, at the same time permitting the continuous feed-through of the panel in process of formation.

For a continuous feed-through operation conveyor belts are employed, receiving the panel between them. It is essential that pressure be distributed evenly from press members to these conveyor belts, which are in contact with the panel to be pressed, and that the conveyor belts be permitted to move through with little or no friction, and while the employment of rollers on either the conveyor belt or the press suggests itself as an antifriction means, yet it is extremely desirable to avoid the employment of large pressure rollers, such as would be required, supported in heavy bearings at their ends, to carry the heavy pressures without bending, since such heavy rollers space widely apart the press members, which are heated, from the panel which is being pressed, and therefore make transmission of heat difficult; furthermore, such large rollers cannot be closely spaced, therefore the distribution of pressure is uneven, and there is a tendency to form waves in the faces of the panel. Yet previous methods of facilitating the feed-through of conveyor belts with which I am acquainted, necessitated the employment of large heavy rollers, since light rollers, of small diameter, would not be sufficiently stiff. It is an object of my present invention, then, to facilitate the feed-through of the conveyor belts and panels and to evenly distribute the pressure within closely spaced intervals, by a construction enabling the employment of small rollers, thereby avoiding pressure ridges or waves in the panels, evenly distributing the pressure, and bringing the heated press member into as close association as possible with the panel being pressed.

It is necessary in any such continuous process that the glue be set quickly, and since this is accompanied by the emission of moisture, and since it may be desirable to use veneer which has been dried only partly, or not at all, either in order to avoid the step of drying it or to lessen the time consumed by a drying process, it is essential in such a press that free escape of moisture be permitted, and the provision of means to this end, such as a foraminous belt, is one of the objects of my invention.

It is impossible, practically speaking, to avoid extrusion of glue onto parts of the press in immediate association with the panels, or to avoid fouling of the press with pitch or like substances exuding from the wood, and since for the purpose previously mentioned it is desirable to employ a foraminous belt in close contact with the faces of the panel, and this foraminous belt may become clogged by the extruded glue or pitch, it is a further object to provide means for immediately cleaning this belt and removing the deposited substances.

It is an object to provide in such a press an arrangement which is simple and convenient, which flexibly adapts itself to the exertion of equalized pressure over a large area, regardless of local irregularities, which requires the minimum of adjustment, and which will be reliable and sturdy over long continued periods of operation, and these and other objects will become apparent as the specification progresses.

My invention comprises the novel press, and the novel process, as illustrated in the accompanying drawings, described in this specification, and as will be more particularly pointed out by the claims which terminate the same.

In the accompanying drawings I have shown my invention embodied in an illustrative form such as is now preferred by me, it being understood that various changes may be made in the form and arrangement of the parts within the scope of the claims.

Figure 1 is in general a side elevation of such a press, parts being broken away and shown in section.

Figure 2 is a plan view of the press, successively broken back to illustrate the different characteristics and relationship of the component parts.

Figure 3 is a transverse section through the press substantially on the line 3—3 of Figures 1 and 2.

The press elements are conveniently supported upon any suitable structural frame comprising, for example, the base 9, the uprights 91, the longitudinal supports 92, the top rail 93, and a table supporting rail 94. These several parts may be connected together to form a rigid framework.

Supported in this frame are pairs of large sprocket wheels 10 and 11, carried upon the respective shafts 12 and 13, upon and about which sprocket wheels are carried a conveyor belt 1. A companion conveyor belt 2 is carried upon sprocket wheels 20 and 21 carried upon the respective shafts 22 and 23. These two conveyor belts 1 and 2 are parallel, the one above the other, are of a width to encompass the maximum width of panel to be made, and extend for a sufficient length to accomplish the pressing of the plywood panel received between them at the rate of advance for which the machine is designed. The machine would normally be of a length considerably in excess of that shown in Figures 1 and 2.

Each of the conveyor belts 1 and 2 is like the other, and a detailed description of one will suffice for both. Each of these belts is composed of two spaced chains 14, carried upon the sprocket wheels and supporting transverse slats 15 of flexible material, for example, saw steel. Preferably the slats do not extend at right angles to the chains 14, but instead are placed somewhat at an angle, as is best seen in Figure 2. These flexible slats readily bend or twist as their supporting chains pass over their sprocket wheels, defining a semicylindrical surface.

Spaced at opposite sides of the adjacent runs of the conveyor belts are cooperating press members, which will be described in detail hereafter. The faces of these press members, toward the adjacent conveyor belts, are smooth-surfaced and are spaced somewhat from the corresponding conveyor belts, though the amount of this spacing should be kept down to a minimum in order the better to transmit heat across the space to the conveyor belt and thence to the panel, and for another purpose which will appear.

In the space between the smooth surface of each press member and the corresponding conveyor belt are positioned antifriction members which roll freely, bearing at one side upon the slats 15 of the conveyor belts, and at the other side upon the smooth surface of the press member. Any suitable form of antifriction member may be employed. Preferably these are formed as rollers 32 which extend at right angles to the direction of advance and therefore at an angle to the slats 15 with which they contact, and of such length that each roller bears upon two or more slats. These rollers, in order to space them slightly apart, to avoid friction, may be held at their ends in chains 31, the chains and rollers together constituting a roller belt 3. The adjacent runs of these roller belts are substantially in the same plane as the adjacent runs of the corresponding conveyor belts, though the pairs of sprocket wheels 33 which carry the roller belts are considerably smaller and more closely spaced, transversely and longitudinally, than the sprocket wheels of the conveyor belts. The rollers of the belt which is above the lower run of the upper conveyor belt, rest on top of that run, that is, in contact with the slats 15 of this belt 1, and at the same time engages beneath the smooth surface of the upper press member, while the rollers of the lower roller belt ride beneath the upper run of the lower conveyor belt 2 and roll over the upper smooth surface of the press member immediately beneath. The slats 15, though in themselves flexible, are held by the rollers, which are small and closely spaced, thus to define substantially a plane surface while pressing the panel P. Therefore while the slats are in themselves flexible, and are capable of yielding to accommodate minor differences in the panel's thickness, they will nevertheless distribute the pressure of the rollers over a considerable area of the panel, and the rollers are sufficiently close together to prevent the formation of waves in the surface of the panel, and the combination of closely spaced rollers and angled slats will press the panel smoothly. Because the rollers are small, the heated press members are spaced the minimum distance from the conveyor belts and from the panels, and heat is transmitted through the rollers and across this space with the minimum of difficulty. Again, because of the small diameter of the rollers 32, they may be made light, yet they will not in themselves flex materially, though they will flex slightly under the pressures obtaining to press evenly at each side of a local irregularity in the panel's surface. Being held between two surfaces, each of which is substantially plane, they do not require to be made heavy enough to carry, of themselves, the rather considerable pressures transmitted through them, since they roll over the smooth surface of the corresponding press member. Due to the diagonal disposition of the slats 15 with respect to the chains 14, each of the rollers 32 may, as illustrated in Fig. 2, engage simultaneously a plurality of said slats, whereby deep impressions of the slat end portions on the panel are avoided and even distribution of pressure is facilitated.

Immediately beneath the upper run of the lower roller belt is a steam chest 4, which may have a solid top 40 serving as the table over which the rollers of this belt roll. Immediately above the rollers of the upper roller belt is another steam chest 5 which is preferably of special design, to be inherently yieldable or flexible. If yieldably supported, its lower surface 50 might be inflexible, but preferably this lower surface 50 is formed as a flexible diaphragm, and preferably its edges 51 are flexible and supported from a solid backing plate 52, whereby the entire upper steam chest 5 may expand or contract, thus to exert pressure downward, evenly distributed over all the rollers, yet yieldable upwardly in case of an excess in thickness of the panel being pressed. If the lower surface 50 is in itself flexible, it may in addition yield to local variations in the panel's thickness. Suitable steam and drain connections are made to the two steam chests. The steam chest 4 may be supported upon a transverse frame member 96 supported from the rail 92, and the backing plate 52 may be supported from a similar cross member 97 supported from and fixedly spaced above the member 96 by studs 95 and nuts 98 thereon. Thus pressure is not communicated from the lower steam chest to the upper through any expansion or contraction of the members supporting the steam chest, but is accomplished by expansion within the upper steam chest 5 alone, which is flexible. It is within the spirit of my invention to reverse the positions of the inflexible lower steam chest and the flexible or flexibly supported upper steam chest, though the preferable arrangement is as shown and described.

One purpose in providing the slats 15 is to

permit escape of moisture over substantially the whole surface of the panel, but if these slats were in immediate contact with the faces of the panel, escape of moisture from the surface in contact with a slat would be inconsequential, or at least would be so slow as to unduly increase the length of the press or the time of treatment. In order, therefore, that moisture may escape generally and substantially uniformly from all parts of the area of the panel I provide a foraminous belt 6, carried over suitable guide drums 61, 62, 63, 64 and 65, which lies between the face of the panel and the slatted conveyor belt, 1 for example. A similar foraminous belt 60 may be employed lying between the under face of the panel and the lower slatted conveyor belt 2. This may be of ordinary screening or wire mesh of such character that it will not be affected by the moisture, glue, or pitch, or by other conditions which it may encounter in the press. Notwithstanding the close-woven character of such a belt, it will nevertheless somewhat space the slatted conveyor belt from the face of the panel, and thus affords multiple avenues of escape for moisture to the spaces between the slats or to the edges of the press, and the screened surface will not harm the face of the panel, especially if the panel is slightly sanded after pressing, as is customary.

One of the guide rollers, the roller 64, is shown as dipping within a tank 66 which contains a solution intended to clean from the belt glue or pitch, if necessary, which may tend to collect upon the belt as it is exuded from the panel. This is preferably located as near as possible to the delivery side of the press, and there may be employed in addition brushing means, indicated at 67 (omitted in Figure 2), to assist in the cleaning of the belt. The means shown are largely diagrammatic, and any suitable means to this end may be employed, if required.

The panels may be laid up on an extension 69 of the lower foraminous belt 60 (or on any suitable conveyor or table), which constitutes a feed table. As this belt advances, the panel is advanced into the press, held always between the belts 6 and 60 and passing between the conveyor belts 1 and 2, and then being pressed upon by the roller belts 3. Heat is transmitted to the plywood from the steam chests 4 and 5, and the free action of the rollers, advancing at half the speed of the slatted conveyor belts, permits ready advance of the panel through this zone of heat and pressure until it emerges at the opposite end of the press with the glue set and excess moisture largely eliminated. Since the panel may continue to be laid up on the feed table 69, the pieces being laid crosswise, as is customary, and usually only two plies being employed, there results the discharge of a panel of indeterminate length which can be cut into lengths as desired at the discharge end.

Each slat 15, as the belt 1 reaches the sprocket wheels 11, begins to twist, and since the ends of the slat are held by the parallel chains 14, the slat retains this twisted condition until it emerges at the top of the sprockets and flattens out again in the upper run of the conveyor belt.

Suitable means are provided for driving the belt 1 or 2, or both of them, and for synchronizing them. Ordinarily it is not necessary nor desirable to drive the roller belts 3 nor the foraminous belts 6 and 60; these are advanced with the belts 1 and 2 due to the pressure exerted upon them. Since the manner of providing any suitable drive means will be obvious, it has not been thought necessary to illustrate the same, other than to show a main drive pulley 16 on the shaft 13.

What I claim as my invention is:

1. A press for plywood and the like comprising parallel superposed conveyor belts adapted to receive between them superposed panel plies with adhesive therebetween and to exert pressure over substantially the entire surface area of said panel plies, a table supporting the lower belt, a flexible heat-supplying member having a generally planiform under surface above the upper belt, and a plurality of rollers connected to form an endless belt disposed between the under surface of said heat-supplying member and the upper conveyor belt.

2. A press for plywood and the like comprising parallel superposed conveyor belts adapted to receive between them superposed panel plies with adhesive therebetween and to exert pressure over substantially the entire surface area of said panel plies, a heat-supplying member supporting the lower belt, an expansible heat-supplying member having its upper surface fixed and its under surface movable towards and from such upper surface and disposed above the upper belt, and two roller belts, one between each heat-supplying member and the corresponding conveyor belt.

3. A press for plywood and the like comprising parallel superposed conveyor belts adapted to receive between them superposed panel plies with adhesive therebetween and to exert pressure over substantially the entire surface area of said panel plies, a frame and spaced rotary members fixedly journaled therein for supporting said belts, a table intermediate said rotary members to support the upper run of the lower belt, a flexible heat-supplying member, supported in the frame, and having a surface overlying the lower run of the upper belt, and movable under the influence of pressure within said member towards the table, and anti-friction means disposed between the table and the upper run of the lower belt, and between the said movable surface and the lower run of the upper belt.

4. A press for plywood and the like, comprising parallel superposed conveyor belts adapted to receive between them superposed panel plies with adhesive therebetween and to exert pressure over substantially the entire surface area of said panel plies, a heated table supporting the lower belt, a heat-supplying member yieldingly pressing downward upon the upper belt, and means comprising an endless series of spaced elements movable with one of said conveyor belts and engaging the panel plies, said spaced elements providing apertures for conducting moisture transversely outwardly from the panel plies to the side edges thereof.

5. The combination of claim 4, characterized by the provision of two endless series of spaced elements providing apertures for conducting moisture transversely outwardly from the panel plies to the side edges thereof, one interposed between each of said conveyor belts and the panel.

6. The combination of claim 4, means guiding and supporting the series of spaced elements providing moisture-conducting passages, to separate them from the panel at the discharge end of the press, and means to clean the same disposed adjacent such point of separation.

7. A press for plywood and the like comprising parallel conveyor belts, spaced to receive a panel therebetween, each belt comprising spaced chains and a plurality of individual flexible slats extending from one chain to another, and disposed

diagonally to the chains, wheels supporting all the chains for their advance in synchronism to advance the panel, means to support the upper run of the lower belt to define a plane beneath the panel, and to resist pressure thereon, and means to press downward upon the lower run of the upper belt.

8. A press for plywood and the like comprising parallel conveyor belts spaced to receive a panel therebetween, each belt comprising spaced chains and a plurality of individual flexible slats extending from one chain to another, and disposed diagonally to the chains, wheels supporting all the chains for their advance in synchronism to advance the panel, means to support the upper run of the lower belt to define a plane beneath the panel, and to resist pressure thereon, means to press downward upon the lower run of the upper belt, and a foraminous belt interposed between each conveyor belt and the adjacent face of the panel.

9. A press for plywood and the like comprising parallel conveyor belts spaced to receive a panel therebetween, each belt comprising spaced chains and a plurality of individual flexible slats extending from one chain to another, and inclined at an angle to the chains, wheels supporting all the chains for their advance in synchronism to advance the panel, means to support the upper run of the lower belt to define a plane beneath the panel and to resist pressure thereon, a roller belt disposed between the upper run of the lower belt and its supporting means, and a second roller belt disposed immediately above the lower run of the upper belt, said inclined slats of each belt being so disposed that a plurality thereof are adapted to be engaged simultaneously by a single roller of the associated roller belt and means to press downward upon said second roller belt.

10. A press for plywood and the like comprising parallel conveyor belts spaced to receive a panel therebetween, each belt comprising spaced chains and a plurality of individual flexible slats extending from one chain to another, and disposed at an angle to the chains, wheels supporting all the chains for their advance in synchronism to advance the panel, means to support the upper run of the lower belt to define a plane beneath the panel, and to resist pressure thereon, a roller belt disposed between the upper run of the lower belt and its supporting means, and a second roller belt disposed immediately above the lower run of the upper belt, and means comprising a flexible diaphragm disposed immediately above the second roller belt for exerting downward pressure on the latter and supplying heat thereto.

11. A press for plywood and the like comprising parallel conveyor belts spaced to receive a panel therebetween, each belt comprising spaced chains and a plurality of individual flexible slats extending from one chain to another, wheels supporting all the chains for their advance in synchronism to advance the panel, means to support the upper run of the lower belt to define a plane beneath the panel, and to resist pressure thereon, a roller belt disposed between the upper run of the lower belt and its supporting means, and a second roller belt disposed immediately above the lower run of the upper belt, means to press downward upon said second roller belt, a foraminous belt interposed between each conveyor belt and the adjacent face of the panel, and two means, one associated with the means to support the upper run of the lower belt, and the other with the pressure inducing means, to supply heat through the roller belts, the conveyor belts, and the foraminous belts, to the panel.

12. In a press, a conveyor belt including supporting and advancing means, and flexible slats supported thereon and extending therebetween diagonally to the direction of advance, a work support beneath said slats, rollers engaging said slats from above, and disposed generally at right angles to the direction of advance, and means to press said rollers downwardly, to communicate pressure therethrough and through the flexible slats to the work upon said work support.

13. In a press, a pair of conveyor belts spaced to receive the work between them, two cooperating continuous-surfaced heat and pressure applying members disposed at opposite sides of said belts and each spaced from the adjacent belt, and rollers between and freely rolling along and engaging each belt and the corresponding heat and pressure applying member, to transmit pressure from the respective heat and pressure applying members to the belts.

14. In a press for plywood panels or the like, two cooperating spaced-apart press members, one having a substantially planiform, flexible surface facing towards the companion member, a conveyor belt disposed between such surface and the adjacent face of a panel positioned between the press members, said conveyor belt comprising a plurality of closely spaced flexible slats disposed diagonally to the direction of the belt's advance, and having two smooth surfaces, one of which is next to the panel's surface, and a plurality of closely spaced flexible rollers disposed at right angles to the direction of advance, between and rolling along the surfaces of the slats and the flexible surface of the press member, respectively.

15. The combination of claim 14, the second press member having a substantially inflexible surface facing towards the opposite face of the panel, but spaced therefrom, a second conveyor belt having two substantially smooth surfaces, one of which is next to this face of the panel, and a second series of closely spaced rollers disposed at right angles to the direction of advance, between and rolling along the surfaces of the second conveyor belt and the second press member, respectively.

16. The combination of claim 14, including a mesh belt disposed between the slats and the corresponding face of the panel.

17. A plywood press comprising a pair of superposed conveyor belts adapted to receive between them superposed panel plies with adhesive therebetween, means comprising a chamber adapted to receive a heated fluid medium for applying heat and pressure to said belts and panels, one of said belts having movable therewith and interposed between said belts and said panels an endless means providing for the escape of moisture transversely outwardly from the panel plies to the side edges thereof.

ELMER E. BEARD.