

June 28, 1932.

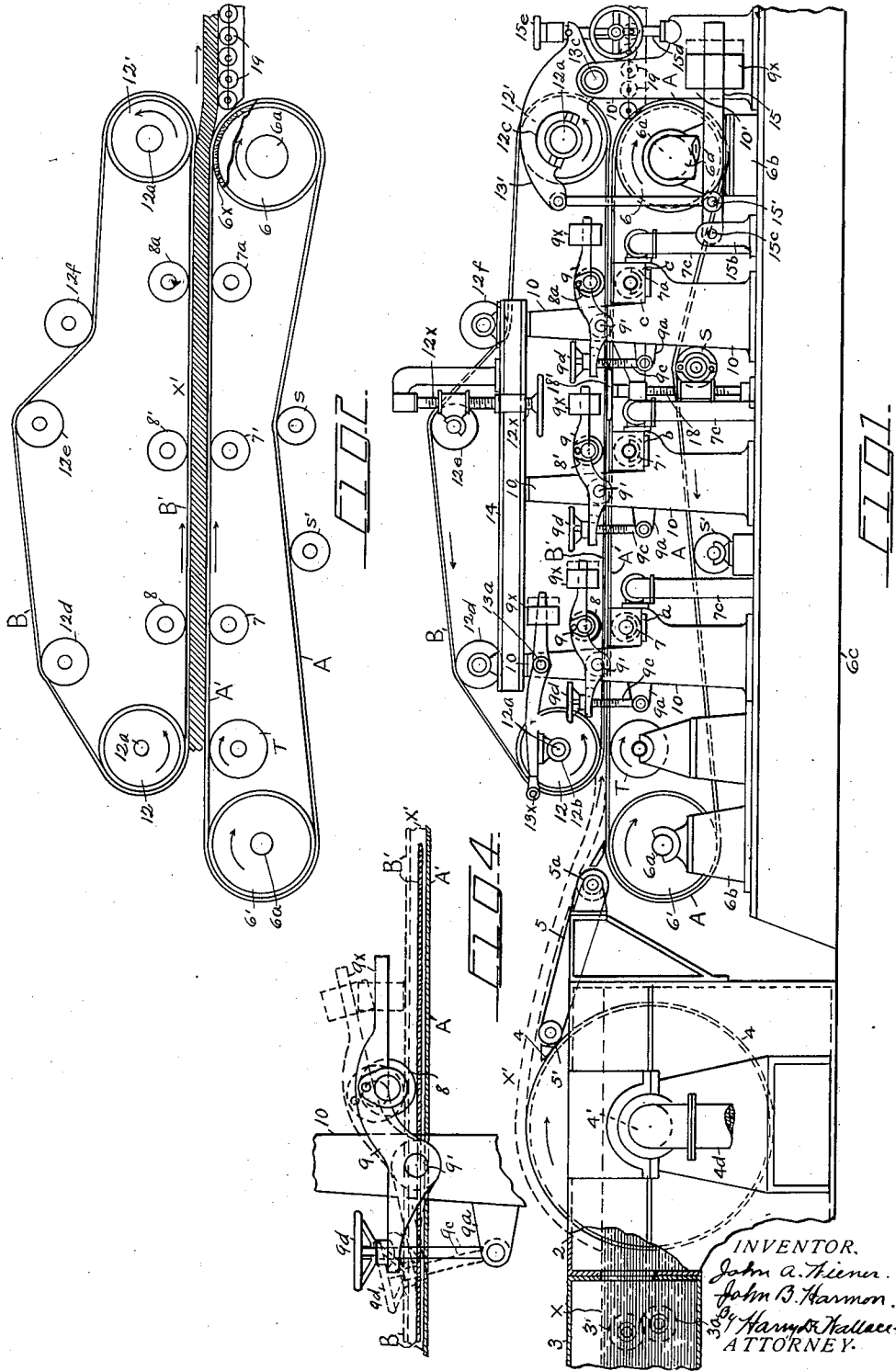
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WET MACHINE FOR INSULATING BOARD

Filed Nov. 30, 1931

2 Sheets-Sheet 1



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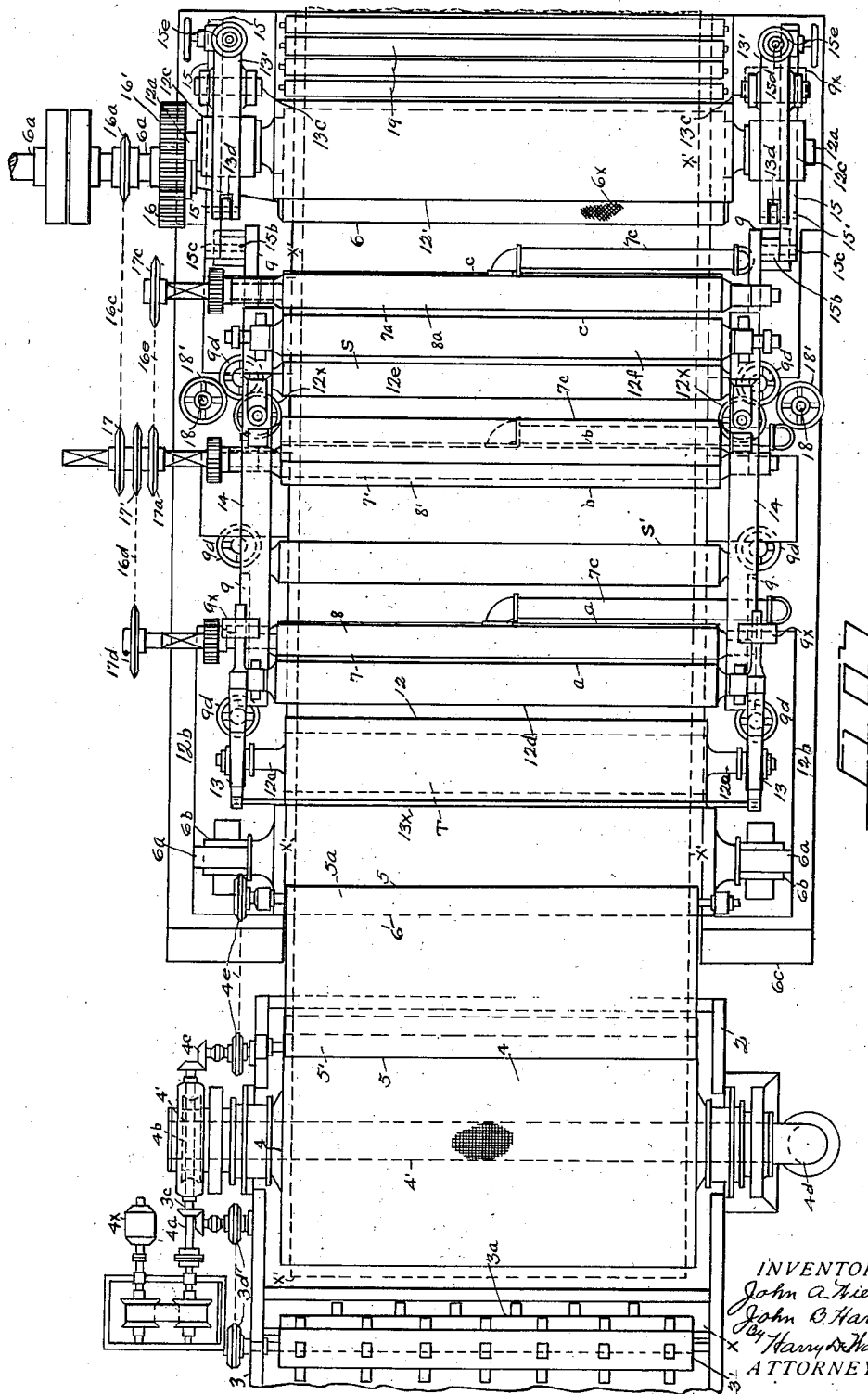
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WET MACHINE FOR INSULATING BOARD

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This invention relates to the art of molding wall board and other fibrous sheets from wood pulp and the like, and has for its object to provide a continuous web-forming mechanism in the nature of a rotatable form-
5 raminous cylinder upon whose circumference the endless fibrous web is deposited, by the maintenance of a strong vacuum within the cylinder, that initially extracts the greater
10 portion of the water from the pulp stock. A further object is to provide novel means for continuously stripping the newly formed web from the external surface of the cylinder, said means comprising an apron that con-
15 ducts the web unbroken preferably to a Fourdrinier belt, which in turn carries it, still in a continuous strip, over a plurality of vacuum boxes and between press-rolls that co-
20 operate to sequentially and quickly extract the remaining water from and compress the web, the said vacuum boxes and press-rolls preferably being located between the rolls that support and drive the main Fourdrinier belt. The Fourdrinier belt may de-
25 liver the web to a roller conveyor which may be equipped with means to cut the web, while still in motion, into sheets or boards of convenient size, and from which the said sheets may be finally passed through a hot drying
30 press and made ready to be applied to walls, or to other uses. A further object is to provide a second or upper belt, preferably metal gauze like the Fourdrinier belt, which paral-
35 lels and travels at the speed of the latter belt, the freshly formed web passing between the said belts, which are normally spaced a small fraction of an inch to prevent injurious contact with each other when the machine is
40 operating idly; this upper belt being controlled by a number of independent adjusting devices, by which the pressure of the several gravitative squeeze-rolls that support and drive the upper belt may be varied, and whereby the relatively thick and soggy web
45 issuing from the cylinder mold may be progressively reduced in thickness and moisture content by the action of the press-rolls that cooperate with the several suction boxes. And a further object is to provide, by novel
50 and simple combination of cooperative mechanisms and parts, for the effective and rapid production of fiber boards or sheets from a continuously-forming web, to supplant the former slow, laborious and expensive practice of producing single sheets or
55 boards by intermittently operated molding presses.

We obtain these objects by the means set forth in the detailed description which follows, and as illustrated by the accompany-
60 ing drawings, in which—

Figure 1 is a broken side elevation of the machine, showing the upper and lower belts in the idling position and the press-rolls and various adjusting means. Fig. 2 is an eleva-
tional diagram showing the main and auxiliary press-rolls in the act of conditioning the continuous strip of pulp board. Fig. 3
is a broken top plan view of the machine showing the cylindrical mold, also showing the belt-supporting and tightening rolls, press-rolls, and the driving means for the various rotatable parts, the Fourdrinier belts being omitted. And Fig. 4 is an enlarged
side view of one of the cantilevers, showing in shadow its operation to spread the belts for conditioning thicker fiber sheets.

The present continuous web-forming machine is designed to supplant the well-known instrumentalities, wherein wall and other artificial boards are formed into individual sheets of definite sizes by the use of station-
ary press-molds, that require a complete operation of the press for each sheet; the stop-
page of the machine for removing the mold-
85 ed product, and the subsequent rehandling of the sheets manually and mechanically, in order to effect the drying of the sheets without interim pressing, and finally sawing or otherwise reducing the molded boards to
90 smaller sections.

In the drawings, 2 represents a vat or chest adapted to be continually supplied with watery pulp stock x , which may be primarily de-
100 livered to an adjacent mixing-box 3, by any suitable means (not shown). Within the box 3 is disposed two or more rotary agitators, as 3'—3a, which are kept in continuous motion by a motor 4x, counter-shaft 4a, bevel-gears 3c and chain-and-sprockets 3d, in order

to finally condition the stock before it enters the molding vat 2. Within the vat 2 is disposed a foraminous cylinder or drum 4 mounted upon a shaft 4', and which may be driven by counter-shaft 4a and a worm-gear 4b, all actuated by the motor 4x, as shown in Fig. 3. The cylinder 4 is hollow and rotates continuously, and during said operation, powerful suction or vacuum is maintained therein to extract the water through the pores and leave a relatively thick felting x' of the soggy pulp upon the circumference of the cylinder, similar to tissue and other paper mill practices. The water extracted from the pulp mixture by the vacuum is usually drained from the drum 4 by a pipe, as 4d. The top of the vat 2 is normally open, and mold 4 extends horizontally slightly above said top, to facilitate transferring the fresh soggy web x' from the mold to a plurality of press-rolls, which are arranged in pairs, and between which relatively finely woven Fourdrinier or like belts, as A and B, are operated.

The stripping of the web x' from the cylinder 4, and its transference to the main belts A—B is preferably effected by a short endless apron 5, which is mounted upon rolls 5'—5a, the latter being driven by motor 4x through counter-shaft 4a, bevel-gears 4c, and a chain-and-sprocket mechanism 4e. The apron may comprise a close arrangement of "Tex-rope" belts (not shown) or suitable woven material, that delivers the web x' directly to the adjacent horizontal portion A' of the lower belt A, which is supported and driven by rolls 6—6' having shafts 6a mounted in pedestal bearings 6b, that rise from a common base 6c.

The rolls 6—6' are spaced a considerable distance to facilitate disposing therebetween a number of vacuum boxes, as $a-b-c$, having normally open tops that lie in the plane of and are closed and virtually sealed by the belt A. The vacuum boxes are associated with corresponding pairs of press-rolls, as 7—8, 7'—8' and 7a—8a, the rolls 7—7'—7a being disposed in the said boxes below the belt A, while the rolls 8—8'—8a are disposed above the belt B, and are adjustably supported by cantilevers 9, that are arranged in pairs and are pivoted at 9' to similar pairs of upright brackets 10 located at the opposite sides of the machine. The short ends of the levers 9 are forked to detachably receive swingable bolts or rods 9c, whose lower ends are pivoted to lugs 9a formed with the brackets 10, the upper ends of said bolts being threaded and fitted with threaded hand-wheels 9d, by which said levers may be rocked in vertical planes to raise and lower the press-rolls 8—8'—8a, to permit adjustment of the horizontal portion B' of belt B relatively to the portion A' of the belt A, for gauging the thickness of the fibrous web x' (compare Figs. 1 and 2). The press-rolls 8—8'—8a and the portion B' of the belt B may be suitably tensioned, i. e.

caused to exert greater or less pressure upon the strip x' by weights, as 9x, that are slidably mounted upon the longer arms of the levers 9, as shown in Figs. 1 and 4, and the degree of the pressure exerted by said weights may be maintained, or may be relaxed at the will of the operator, by the proper manipulation of the hand-wheels 9d. The vacuum boxes $a-b-c$ may be drained by pipes 7c, that preferably tap the said boxes midway in the breadth of the machine, as shown in Figs. 1 and 3.

The driver roll 6 is preferably hollow and foraminous, as at 6x in Figs. 2 and 3, and performs work similar to drum 4 and suction boxes $a-b-c$, by vacuum that finally extracts the last of the free water from the web x' via a suction pipe 6d, shown in Fig. 1.

The belt B is supported at the end nearest the cylinder 4 by a relatively light dandy or couch roll 12. This roll is disposed directly above a smaller table-roll T, which is mounted beneath and engages the belt A, and these rolls effect the first pressing of the web x' . At its opposite end, belt B is supported by a plain roll 12' that registers with roll 6. The ends of several rolls 12 are formed with gudgeons or shafts 12a that play in bearings 12b—12c, carried by cantilevers 13—13', and which in turn are supported respectively by the leftward pair of brackets 10 and by similar brackets 10' (see Figs. 1 and 3). From the roll 12', the belt B extends horizontally parallel with belt A to the roll 12, thence over idler rolls 12d—12e, and beneath a similar roll 12f, all of said idlers being supported at the opposite sides of the machine by timbers 14 that rest upon the several brackets 10. The idler 12e is adjustable by means of hand-screws 12x, for regulating the tension of the belt B. The levers 13 are pivoted medially to the leftward bracket 10 by pins 13a (see Fig. 1), the corresponding arms of said levers supporting the bearings 12b for roll 12, while the other arms are fitted with counterweights 9x, by which the roll 12 and belt B may be raised and lowered relatively to the table roll T. The roll 12 being of relatively light weight, is not ordinarily tensioned to produce greater than the normal pressure exerted by its own weight. The levers 13' that support the roll 12' are pivoted to the brackets 10' by pins 13c, and like the levers 9 are fitted with depending links or rods 13d, whose lower ends connect to horizontal levers 15, at 15', the latter levers being rockably supported by fulcrum posts 15b, as at 15c (see Fig. 1). The raising and lowering, as well as the tensioning, of roll 12' is controlled by the levers 15 and the adjustable counterweights 9x. The right-hand ends of cantilevers 13' are provided with adjusting screws 15d, which are fitted with hand-wheels 15e, by which the roll 12' may be tilted vertically different degrees in spite of the weights 9x, in

order to definitely fix the thickness of the web w' , as it issues from the machine, as may be understood by consulting Fig. 1. After the web w' leaves the present machine, it is supported and carried away towards a drying press (not shown) by a roller conveyor 19, shown respectively in broken elevation and plan in Figs. 1 and 3. The corresponding ends of levers 13 are tied together by a rod 13 x , as shown in Figs. 1 and 3. The belts A—B are preferably driven by a motor (not shown) that may connect directly with one end of the shaft 6 a of roll 6 (see Fig. 3), the latter positively driving roll 12' by means of gears 16—16' that are mounted respectively upon the shafts 6 a —12 a . The shaft 6 a is fitted with a sprocket wheel 16 a , which drives the several press-rolls of the vacuum boxes a — b — c , and for this purpose, the shaft of roll 7' is fitted with three sprocket wheels, as 17—17'—17 a , as shown in Fig. 3. The sprocket 16 a drives the press-roll 7' directly by a chain 16 c that connects with the sprocket 17. The sprocket 17' drives roll 7 by a chain 16 d and a sprocket 17 d . And the sprocket 17 a drives roll 7 a by a chain 16 e and a sprocket 17 e .

The web w' must necessarily be relatively thick, in order to produce the more rigid and inflexible wall or insulation boards, and its gauge when stripped from the mold 4 usually ranges from one-half to an inch or more. To produce this thick web, the drum 4 must be rotated slowly say at the speed of fifteen to twenty-five feet per minute surface travel. This, it has been found, will produce a continuous web w' , that will withstand the requisite pressing for removing the free water and rendering the web so dry and compact as to obviate undue shrinking by the heat of the dryers, and therefore yield assorted stock wall boards ranging from three-eighths to one-half inches or more in thickness. By thus slowing down the drum 4, each revolution thereof, produces a web of the desired thickness and breadth (according to the length of drum 4) which the apron 5 continuously strips and transfers unbroken to the screening belts A—B for final conditioning ready for the dryers, as explained.

Obviously, the press-rolls 7—8, 7'—8' and 7 a —8 a may be dispensed with and the web w' may be simply passed over the suction boxes a — b — c and vacuum roll 6, and thence directly through a series of drying presses, and the cutting of the web into boards of different sizes may take place after the web issues from the dryers without requiring any stoppage of the web-forming or conveying parts, and without departing from the spirit of the invention.

Having thus described our invention, what we claim is—

1. In combination a cylindrical foraminous vacuum mold adapted to produce a continu-

ous thick web of fiber, a pair of Fourdrinier belts one above the other, adapted to receive therebetween said web, means to transfer the web from the mold to said belts, common means to drive said mold and said transfer means, rolls to independently support said belts, vacuum means below the lowermost belt to sequentially extract the water from said web, press-rolls arranged in pairs, the corresponding rolls of each pair being disposed respectively above and below said belts, and common means to drive said belt-supporting rolls and the lowermost of press-rolls.

2. The combination of a rotatable porous vacuum mold adapted to produce a continuous web of fiber, a pair of strainer belts, one above the other, adapted to receive therebetween said web, a carrier to transfer the web from said mold to said belts, common means to drive said mold and said carrier, vacuum means to sequentially reduce the moisture content of the web while the latter is being carried along by said belts, press-rolls arranged in pairs associated with said vacuum means, corresponding rolls of each pair being disposed respectively above and below said belts, manually adjustable means to move one of said belts towards and from the other to regulate the gauge of the web, and common means to drive both of said belts and one of each pair of press-rolls.

3. The combination with a cylindrical vacuum mold adapted to produce a continuous web of fiber, of a pair of Fourdrinier belts, one above the other, adapted to receive therebetween said web, means to transfer the web from said mold to said belts, common means to drive said mold and said transfer means, a roller conveyor to carry the web from said belts, suction means to reduce the moisture content of the web while passing between said belts to enable the web to withstand transfer by said conveyor unaided, press-rolls arranged in pairs associated with said suction means, corresponding rolls of said pairs being disposed respectively above and below said belts, means to move one of said belts towards and from the other to accommodate webs of different thickness, and common means to drive both of said belts and one of each pair of press-rolls.

4. In combination a cylindrical foraminous vacuum mold adapted to produce a continuous web of fiber, a woven belt, rolls to support and drive said belt, an apron to strip said web from said cylinder and deliver the same to said belt, common means to drive said cylinder and said apron, suction boxes disposed between the rolls that support said belt to reduce the moisture content of said web, a second belt above the first belt having a portion that is disposed parallel to the lower belt, press-rolls arranged in pairs and associated with each suction box, the press-rolls of each pair being spaced to receive therebe-

tween said upper and lower belts, rockable levers to adjust the uppermost belt to vary the thickness of the fiber web, and independent means to drive both of said belts and one of each pair of the press-rolls.

5. The combination with a cylindrical foraminous mold adapted to produce a continuous thick web of fiber by vacuum applied to said mold, of a pair of woven strainer belts one above the other, adapted to receive therebetween said web, independent series of rolls to support and drive said belts, the lowermost belt being arranged to travel in substantially a fixed path, means to raise and lower the uppermost belt to accommodate webs of different thicknesses, means to transfer the web from the mold to said belts, means to simultaneously drive said mold and said transferring means, suction boxes to draw water from said web through the lowermost belt, means to press the web adjacent each suction box, means to raise and lower corresponding members of said pressing means to vary the spacing of said belts, and independent means to drive both of said belts and one of each pair of press-rolls.

6. The combination with a cylindrical foraminous mold adapted to produce a continuous thick web of fiber by vacuum applied to said mold, of a pair of liquid strainer belts, one above the other, adapted to receive therebetween said web, the lowermost belt being arranged to travel in substantially a fixed path, means to raise and lower the uppermost belt to accommodate webs of different thickness, means to transfer the web from the mold to said belt, means to drive said mold and transferring means, vacuum boxes to draw water from said web through the lowermost belt, rolls arranged in pairs to press the web adjacent each vacuum box, and a pair of power-actuated rolls beyond the vacuum boxes to drive said belts and said press-rolls, one of said driving rolls comprising a foraminous vacuum cylinder adapted to extract the remaining free water from said web.

7. In combination with a cylindrical foraminous vacuum mold adapted to form a continuous web of fiber, a liquid straining belt, rolls to support and drive said belt, an apron to strip said web from said cylinder and deliver same to said belt, common means to drive said cylinder and said apron, vacuum boxes disposed between the rolls that support said belt, a second belt above the first belt having a portion disposed parallel to said first belt, press-rolls arranged in pairs and associated with each vacuum box, said press-rolls being spaced to receive therebetween said upper and lower belts, cantilevers to support and adjust the uppermost belt relatively to the lowermost belt to vary the thickness of a fiber web, independent means to adjust the uppermost press-rolls relatively to the uppermost belt, and independent

means to drive the rolls that support said belts and one of each pair of the press-rolls.

8. A wet machine for insulating board, including in combination a cylindrical vacuum mold adapted to produce a continuous fibrous web, a pair of endless woven belts beyond said mold, corresponding portions of said belts being disposed parallel and normally spaced, means to transfer said web from said mold and direct the same towards the gap between said belts, means to drive said mold and said transferring means, vacuum boxes disposed beneath the said belts to sequentially extract the moisture from said web, press-rolls arranged in pairs and disposed above and below the facing portions of said belts and coinciding with said vacuum boxes, independent means to drive said belts and corresponding press-rolls of each pair, vacuum means beyond the suction boxes to extract the remaining free water from said web, and independent series of levers to adjust said uppermost belt and the uppermost press-rolls relatively to the lower belt and press-rolls to predetermine the thickness of the compressed web.

9. The combination with a rotatable vacuum mold adapted to form a continuous web of wet fiber, a pair of moisture draining belts one above the other adapted to receive therebetween said web, means to strip the web from said cylinder and direct the same between said belts, suction boxes beneath the lowermost belt, press-rolls arranged in pairs that coincide with said boxes, said rolls being spaced to receive therebetween said belts, means to raise and lower the uppermost press-rolls to vary the spacing of said belts, means to predetermine the pressure to exerted by the uppermost press-rolls, means to drive said mold and said stripping means, and independent means to drive both of said belts and the several lowermost press-rolls. In testimony whereof we affix our signatures.

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