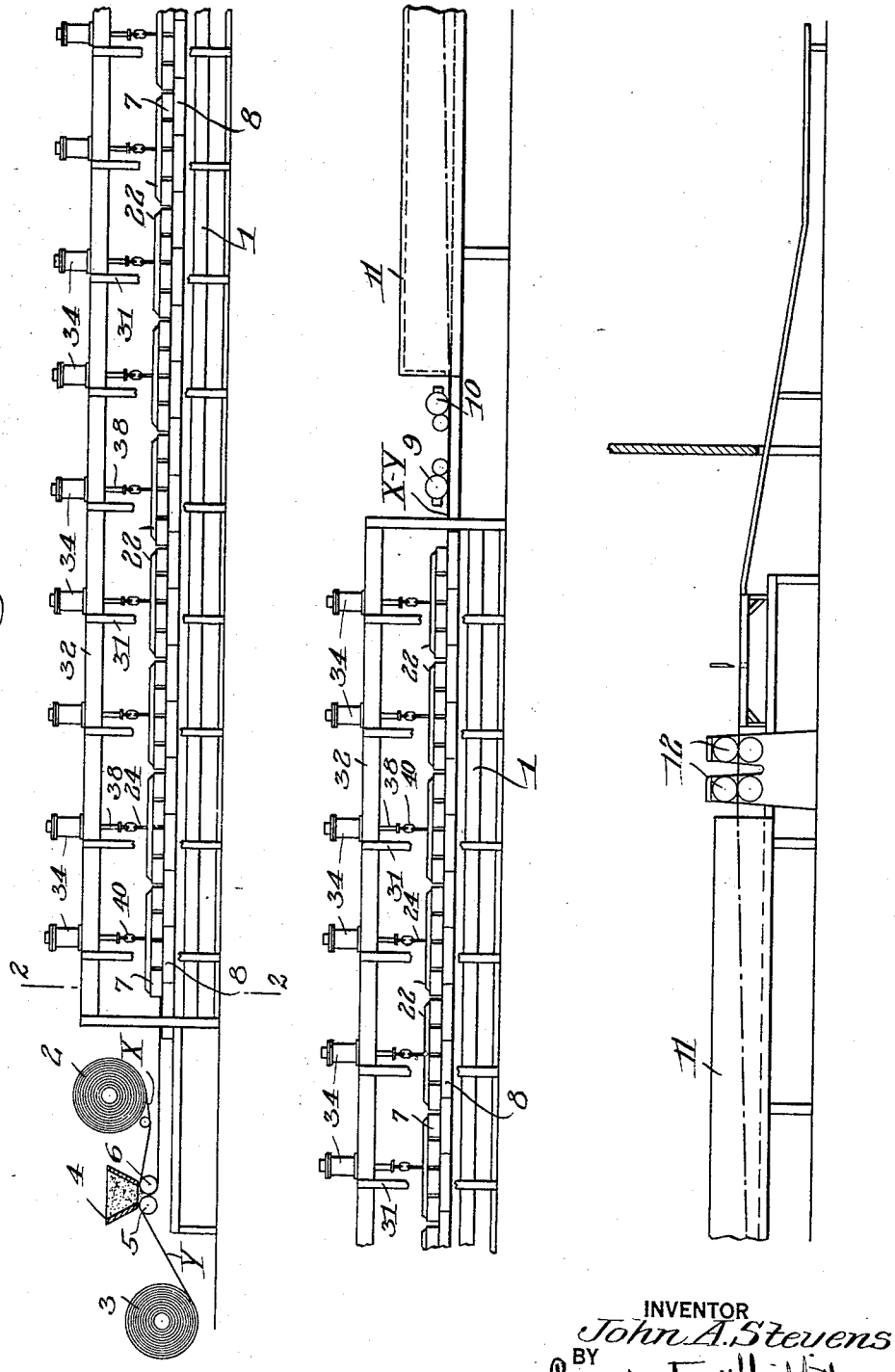
Sept. 16, 1930. J. A. STEVENS 1,775,950

HEAT PROCESSING MACHINE FOR SHEETS AND BOARDS

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Fig. 1



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HEAT PROCESSING MACHINE FOR SHEETS AND BOARDS

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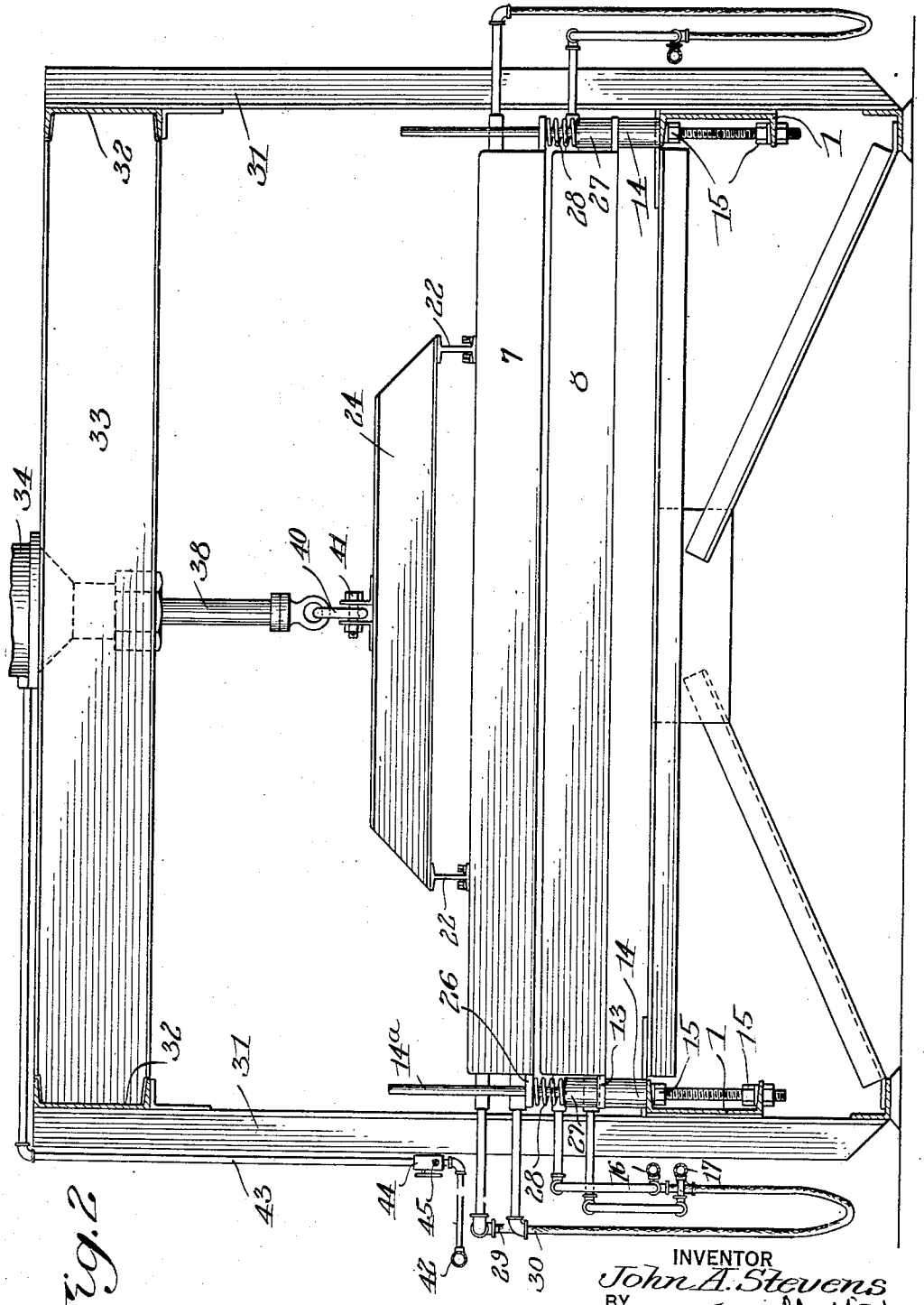



Fig. 2

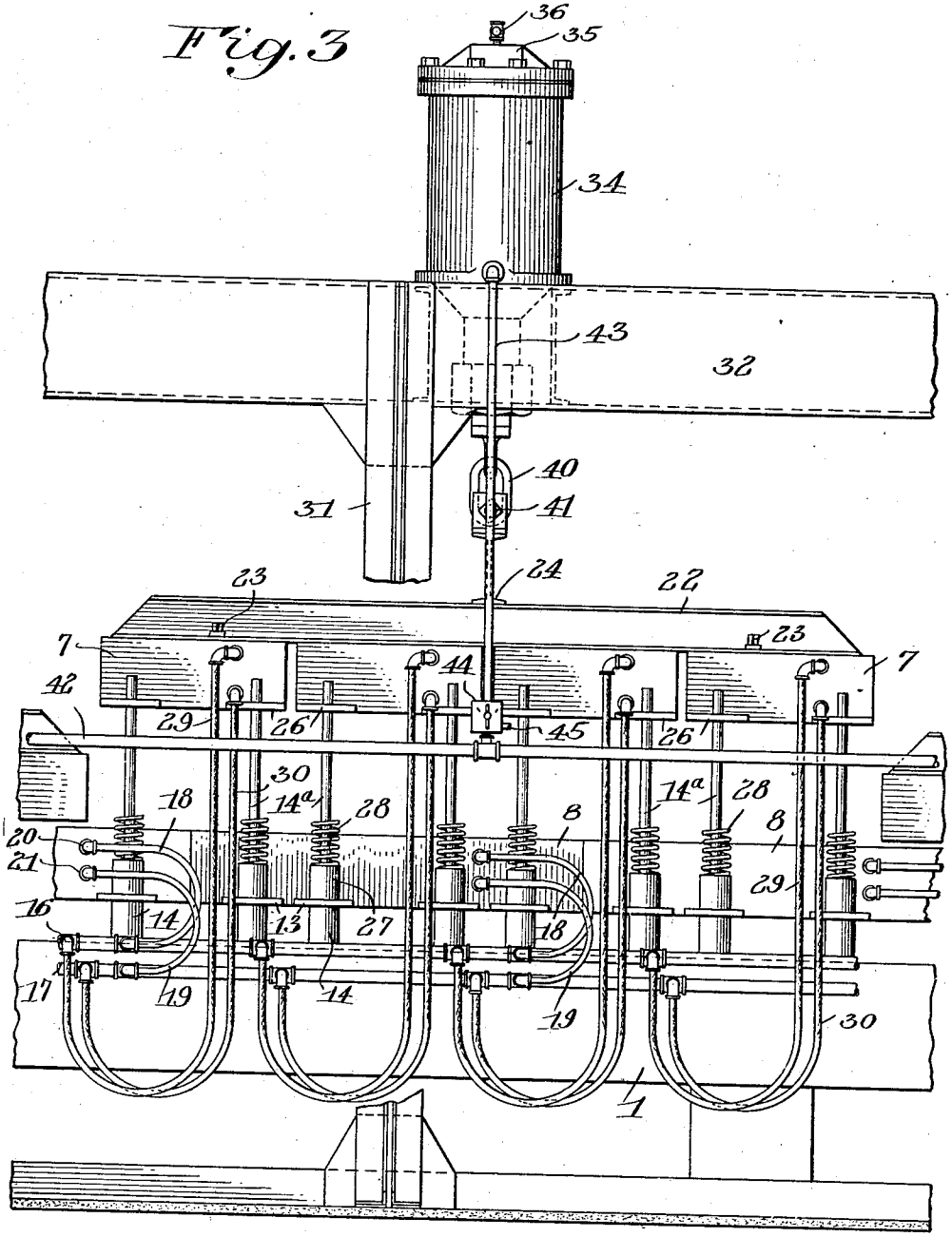
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HEAT PROCESSING MACHINE FOR SHEETS AND BOARDS

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Fig. 3




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HEAT PROCESSING MACHINE FOR SHEETS AND BOARDS

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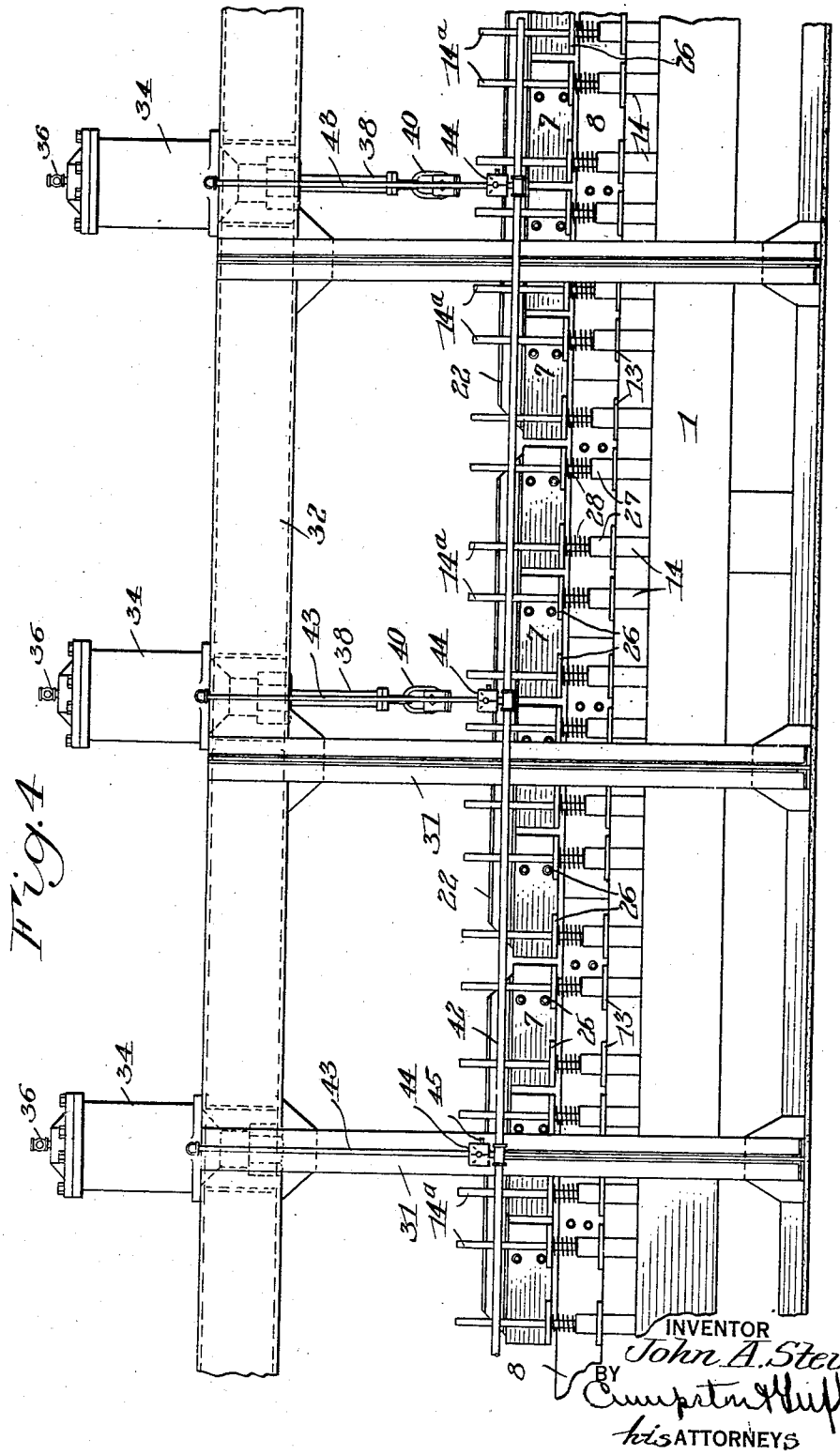



Fig. 4

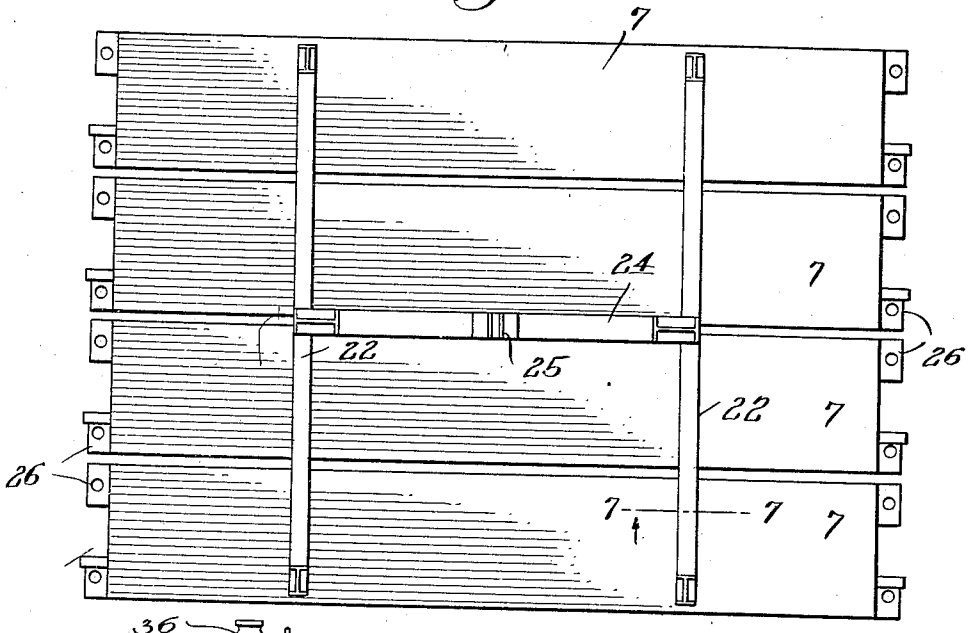
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Sept. 16, 1930. J. A. STEVENS 1,775,950

HEAT PROCESSING MACHINE FOR SHEETS AND BOARDS

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Fig. 5



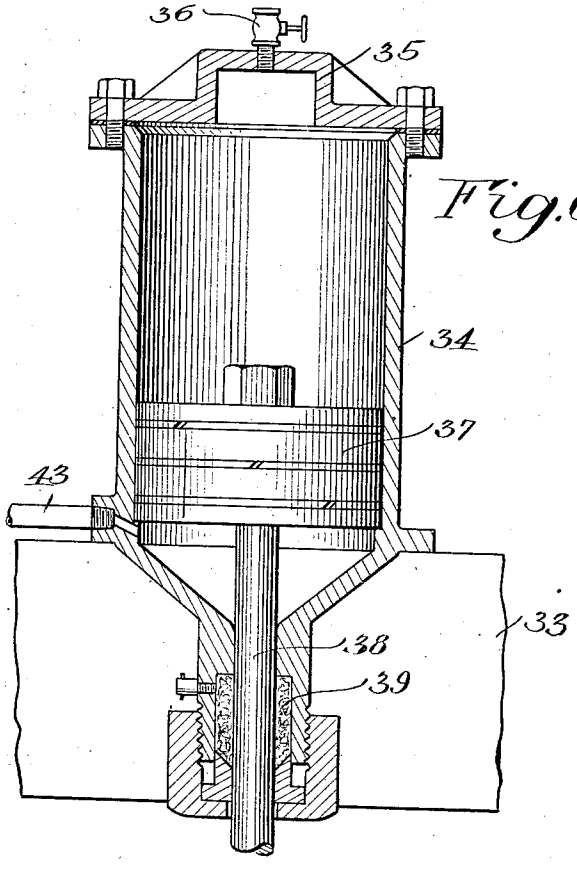
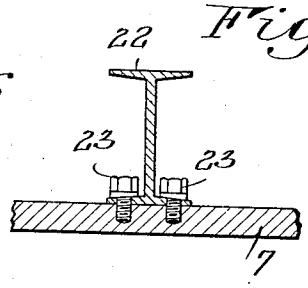




Fig. 6

Fig. 7




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Patented Sept. 16, 1930 1,775,950

# UNITED STATES PATENT OFFICE

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## HEAT-PROCESSING MACHINE FOR SHEETS AND BOARDS

Application filed August 14, 1928. Serial No. 299,563.

My present invention relates to the manufacture of sheets, slabs, boards, and similar products, particularly when composed in whole or in part of material originally in the plastic state, and which requires an application of heat and pressure during its formative stage, and the invention has for its object to provide a simple, economical, efficient and convenient machine for accomplishing this work. The improvements are directed in part toward the provision of opposed upper and lower heating elements, and more particularly to means for regulating the relationship between such elements so that they may cooperate properly to perform the work in hand.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of this specification.

In the drawings:

Fig. 1 is a rather diagrammatic side view or outline view of the sheet forming machine showing the application thereto of heating and pressure elements constructed in accordance with and illustrating one embodiment of my invention;

Fig. 2 is an enlarged transverse section through the machine, partly broken away taken on the line 2—2 of Fig. 1;

Fig. 3 is a side view of a unit of the machine (adjoining units being shown broken away) being that view of the parts appearing in Fig. 2;

Fig. 4 is a fragmentary side view of the heating and pressing portion of the machine showing the relationship of several units;

Fig. 5 is a plan view of one of the gangs of upper platens detached;

Fig. 6 is a section, broken away, through one of the pneumatic lifting cylinders, and

Fig. 7 is an enlarged detailed section taken on the line 7—7 of Fig. 5.

Similar reference numerals throughout the several views indicate the same parts.

Although its advantages and functions are not necessarily limited to such use, the present machine representing one embodiment or application of the invention, has been specially designed for the manufacture of a special wallboard, preferably composed of two outer paper facings, or "liners", as they are called, and a cellular fire-resisting and insulating mineral body of substantial thickness therebetween. It has been discovered that a mixture having as the principal ingredients sodium silicate and a filler of finely comminuted or powdered dolomitic limestone provides a suitable body between the paper walls for the purposes of producing such a product. Such a mixture is intumescent in character, and puffs up into a cellular or sponge-like consistency when confined and subjected to a proper degree of heat. It can later be hardened and dried and assumes a solid texture, in which state it is hard and relatively stiff without being brittle. My invention contemplates producing such a board continuously in a moving strip or sheet that is finely cut into lengths.

To first describe in general the mode of manufacturing such a board in accordance with my invention, and assuming that a board with two facings or liners is to be made (though one liner alone may be used or none at all resulting in a solid plastic product) I provide a supply of paper consisting of two strips which are brought together one upon another and a suitable amount of the plastic material fed between them. This laminated mass is passed between a pair of upper and lower heated platens which presents smooth walls of considerable extent and whose separation regulates the thickness of the product. These platens are heated by steam or otherwise, but if by steam, then a pressure of from 125 to 200 pounds per square inch may be used, the speed of passage of the material between them being a factor in determining the steam pressure employed. From the platens the sheet passes in a formative and relatively soft state immediately into a closely adjacent hardening oven where it is treated by direct contact with a heated gas. I prefer to use hot air. In this oven the sheet hardens and it becomes set sufficiently so that it can be manipulated without danger of injury or distortion. I am,

therefore, able to place and do place just beyond this hardening oven a feeding device preferably in the form of a pair of driven feed rolls, which draw the material all the way from its source at the feed end of the machine through the platens, past a slitting and trimming device located between the platens and the hardening oven, and through the hardening oven. Just beyond the feed rollers the sheet may be severed by a suitable cutting device into the desired lengths. With its manipulation from this point on this invention is not concerned, and hence only such portion of the machine is shown.

Referring more particularly to the drawings, and to Fig. 1 thereof, 1 indicates a suitable bed or base frame having at the feed end thereof paper rolls 2 and 3 for the supply of liners. The plastic material is fed from a conventionally shown hopper 4 between rolls 5 and 6 beneath it. The paper from roll 2 passes over the top of roll 6 and thence around and under it in a reverse direction. The paper from roll 3 passes over roll 5 and thence under roll 6 continuing in the same direction, so that the plastic material is deposited in suitable quantities between the two liners X and Y, and is held between them as the three-ply mass passes into the platen section.

The platens of this section are made of a plurality of upper units 7 and lower units 8 spaced apart for the desired thickness. As the sheet emerges as shown at XY from the end of this section, its edges are trimmed by suitable trimming devices 9, and it may be slit by another cutter indicated conventionally at 10 in Fig. 1 into two strips, if desired. It then immediately passes into the oven, where the hardening takes place. Just beyond this oven are the feed rollers 12 suitably driven, which pull the sheet through all of the travel above described to this point.

As before indicated, my invention is particularly concerned with the construction, arrangement, and manipulation of the platen elements 7 and 8 relatively to each other to regulate both the thickness of the sheet or board and the amount of pressure applied thereto. Referring more particularly to Figs. 2 and 3, the lower platens 8 are laid side by side to present a substantially continuous table or under surface. They extend transversely of the machine and are supported at their ends by projecting perforated lugs 13 resting on sleeves 14 surrounding upstanding guide rods 14ª which pass through the lugs and which guide rods are suitably adjustably bolted to the main frame 1 by suitable lag and lock nuts 15. These under platens may be leveled and aligned by means of shims or washers placed beneath the sleeves 14.

These lower platen elements are hollow and are maintained at a desired steam pressure and hence temperature from intake and exhaust steam pipes 16 and 17 to which they are respectively connected by individual flexible pipes 18 and 19 fitted to suitable nipples 20 and 21. These pipes may be made of any suitable soft or pliable metal.

The upper platens 7 are preferably slightly separated from each other as shown and are arranged to be raised and lowered in parallelism with reference to the table constituted by the lower platens 8. For this purpose they are made in sections, as best shown in Figs. 3 and 5. As indicated in the latter figure there are in the present instance four platens to a unit, and they are connected together by a pair of relatively transverse I-beams 22 bolted thereto at 23. Connecting these I-beams at an intermediate balancing point is a cross beam 24 provided with a central lifting eye 25 for the attachment of raising and lowering connections, hereinafter described.

These upper platens 7 are similar to the lower platens 8 except that they are, of course, finished off on the lower side instead of the upper side. They are provided with perforated lugs 26 at their ends which also engage over and are adapted to slide vertically upon the guide rods 14ª. Above the lugs 13 of the lower platen are provided sleeves 27 on the rod upon which rest compression coil springs 28 surrounding the rod and which in turn support the lugs 26 of the upper platens 7. These springs are of such tension as to support the weight of the upper platens and the upper platen section at a minimum degree of separation from the lower platens 8, and again shims may be used to regulate this separation by interposing them either between the sleeves 27 and the lower platen lugs 13 or between the ends of the springs and their abutting surfaces. I prefer the latter position.

Each of these upper platens 7 is connected by preferably metallic flexible intake and exhaust pipes 29 and 30 respectively with the steam intake and exhaust lines 16 and 17 in the same manner as the lower platens 8, except that these pipes are longer to give the range and flexibility necessary for the raising and lowering movements of the upper platen section about to be described.

This raising and lowering of the several units is accomplished individually by means of a pneumatic lift. Uprights 31 on the main frame 1 support girders 32 connected by bridge pieces 33 at intervals centered over the successive platen units (Figs. 2 and 4). Supported centrally on each bridge piece is a cylinder 34 having a head 35 (Fig. 6) provided with a pet-cock breather 36 that may also be used for lubricating purposes. A piston 37 operating this cylinder has a connecting rod 38 operating through a suitable gland 39 and attached at its lower end by a

link 40 and bolt 41 with the lifting eye 25 of the platen unit on the cross beam 24 thereof. This link connection 40 provides a lost motion connection between the upper platen unit and the lifting mechanism whereby said unit may ride on its spring supports without affecting or suffering interference from the lifting mechanism.

An air line 42 runs the length of the machine from which lead laterals 43 to the base of each cylinder 34 to admit and exhaust air under pressure beneath the pistons. Each lateral is provided with a three way valve conventionally shown at 44. In one position of this valve all ports are closed, as usual. In another position air is admitted to the lateral 43 to raise the pistons in the cylinders and hence lifting the platen unit to any desired extent, the same being guided to maintain a horizontal position on the rods 14ª. A third position of the valve 44 closes the pressure line 42 and opens the laterals to the atmosphere at 45, whereby the compressed air is exhausted from the cylinders and the platen unit descends to again rest on the springs 28.

By this arrangement and construction the platens may be raised at any point for cleaning and other purposes, and if any trouble occurs at any point in the travel of continuously forming sheet or board it may be quickly located and that particular unit raised to straighten out the difficulty, all with very little effort on the part of the operator.

I claim as my invention:

1. In a heat processing machine for sheets and boards, the combination with a lower platen element, an upper platen element and means for drawing sheet material continuously between the same, of a spring support for the upper platen element to maintain it properly spaced from the lower platen element and means for raising and lowering the upper platen element onto and off of said support.

2. In a heat processing machine for sheets and boards, the combination with a lower platen element, an upper platen element and means for drawing sheet material continuously between the same, of a support for the upper platen element to maintain it properly spaced from the lower platen element and means for raising and lowering the upper platen element onto and off of said support, said means comprising a pneumatic cylinder, a piston operating therein and a piston rod attached to the upper platen element.

3. In a heat processing machine for sheets and boards, the combination with a lower platen element, an upper platen element and means for drawing sheet material continuously between the same, of a support for the upper platen element to maintain it properly spaced from the lower platen element and means for raising and lowering the upper platen element onto and off of said support, said means comprising a pneumatic cylinder, a piston operating therein, a piston rod attached to the upper platen element, an air supply and a valve connected with the latter to introduce and exhaust pressure to and from the cylinder.

4. In a heat processing machine for sheets and boards, the combination with a lower platen element, of an upper platen element comprising a plurality of platens jointed together in units, a pair of beams so joining the platens of a unit, a cross beam connecting the first mentioned beams and raising and lowering mechanism for the unit connected to the cross beam.

5. In a heat processing machine for sheets and boards, the combination with a frame, upper and lower platen elements supported on the frame in spaced relationship, a bridge beam spanning the frame, a pneumatic cylinder supported on the bridge beam, a piston operating therein and a piston rod attached to the upper platen for raising and lowering the same.

6. In a heat processing machine for sheets and boards, the combination with a lower platen element, an upper platen element and means for drawing sheet material continuously between the same, of a spring support for the upper platen element to maintain it properly spaced from the lower platen element and means for raising and lowering the upper platen element onto and off of said support, said means having a lost motion connection with the said upper platen.

7. In a heat processing machine for sheets and boards, the combination with a lower platen element, an upper platen element and means for drawing sheet material continuously through the same, of a support for the upper platen element to maintain it in properly spaced relationship to the lower platen element, means for raising the upper platen element onto and off of said support, steam supply and exhaust lines and connections between each of said lines and the respective platen elements, those to the upper platen element being flexible.

8. In a heat processing machine for sheets and boards, the combination with a lower platen element, an upper platen element, and a spring support for the latter to maintain it properly spaced from the lower platen element, of lifting mechanism for raising and lowering the upper platen element onto and off of said support.

9. In a heat processing machine for sheets and boards, the combination with a lower platen element, an upper platen element, and a spring support for the latter to maintain it properly spaced from the lower platen element, of lifting mechanism for raising and lowering the upper platen element onto and off of said support, said lifting mech-

anism having a lost motion connection with the upper platen element.

10. In a heat processing machine for sheets or boards, the combination of upper and lower platens spaced apart to permit the sheets to be continuously drawn therebetween, means for supporting the platens in spaced relation at a predetermined distance apart, guide means for one of the platens permitting it to shift from said position in a direction away from the other platen, mechanism for moving the shiftable platen laterally from said position, means at one side of the platens for supporting the material to be advanced therebetween, and means at the opposite side of the platens for advancing the material through the machine.

11. In a heat processing machine for sheets and boards, the combination with a lower platen, of an upper platen divided into a plurality of units each independently movable toward and away from the lower platen to vary the spacing between said platens, independent elevating means for each of said upper platen units, said elevating means comprising a fluid pressure cylinder associated with each unit, and means independent of said platens for drawing sheet material through the space between said upper and lower platens.

12. In a heat processing machine for sheets and boards, the combination with a lower platen, of an upper platen divided into a plurality of units each independently movable toward and away from the lower platen to vary the spacing between said platens, independent elevating means for each of said upper platen units, said elevating means comprising a fluid pressure cylinder associated with each unit, control means adjacent each unit for operating the elevating means associated with that unit, and means independent of said platens for drawing sheet material through the space between said upper and lower platens.

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