April 19, 1932. C. A. UPSON 1,854,872

MANUFACTURE OF SHEETS OR SLABS

Filed Jan. 12, 1928 3 Sheets-Sheet 1

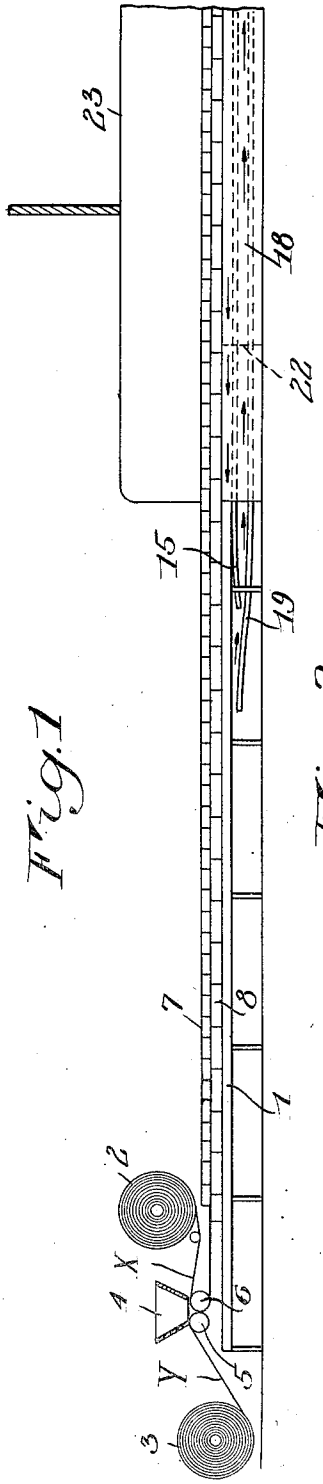

Fig. 1

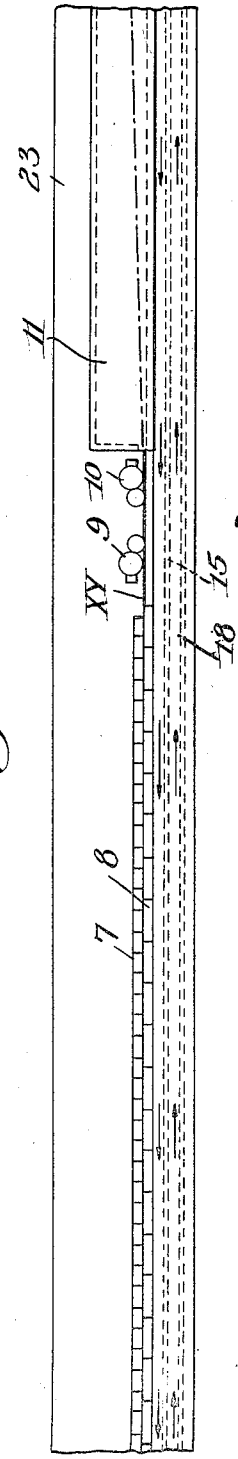

Fig. 2

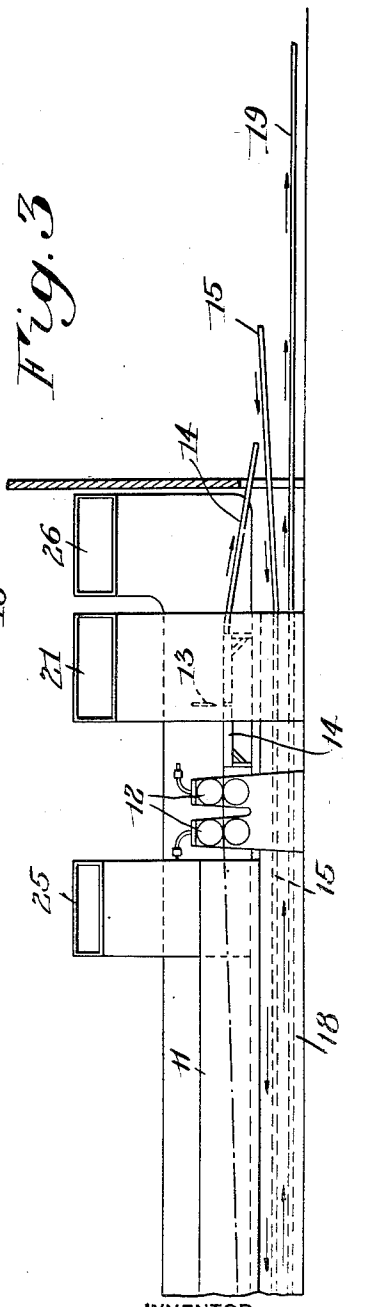

Fig. 3

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MANUFACTURE OF SHEETS OR SLABS

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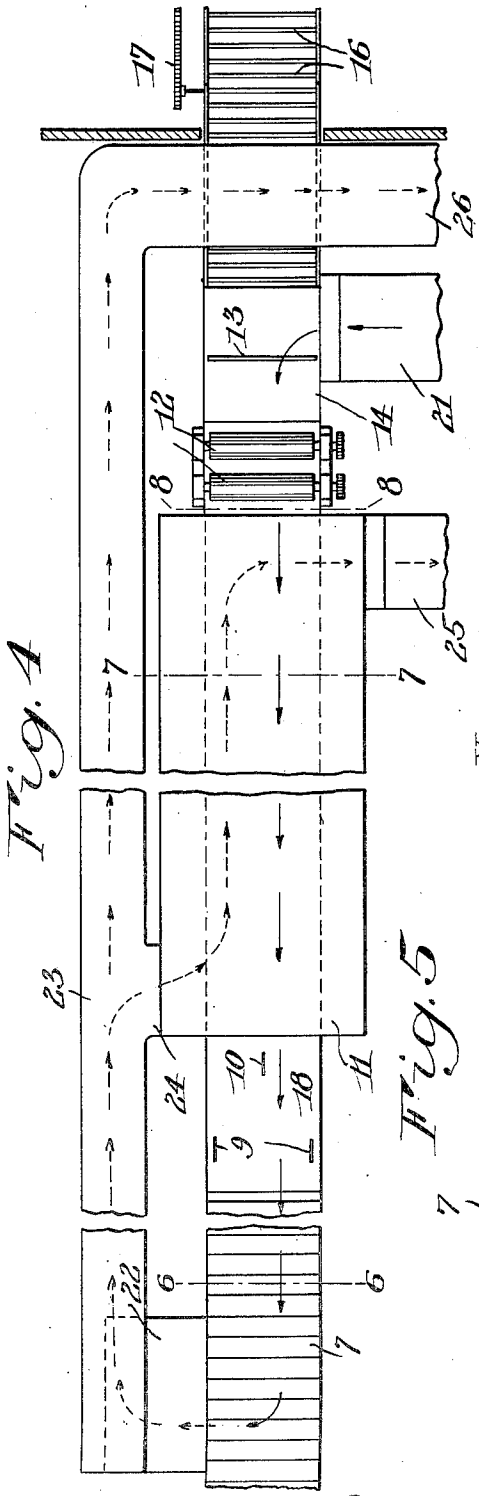

Fig. 4

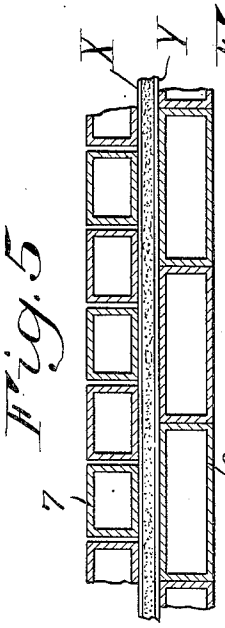

Fig. 5

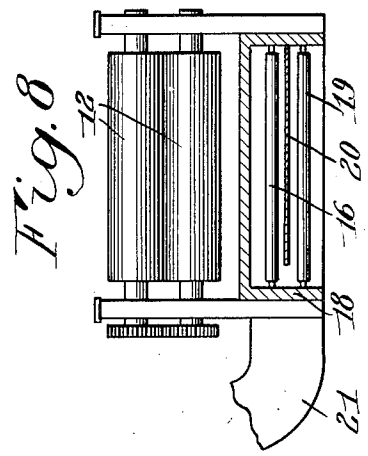

Fig. 8

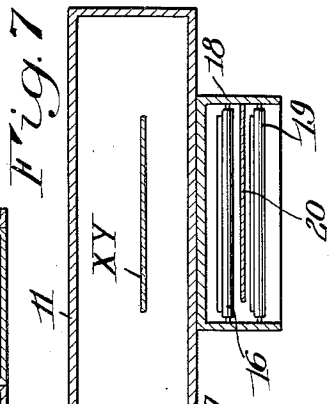

Fig. 7

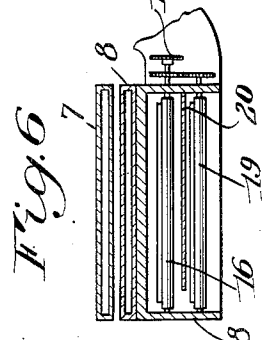

Fig. 6

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MANUFACTURE OF SHEETS OR SLABS

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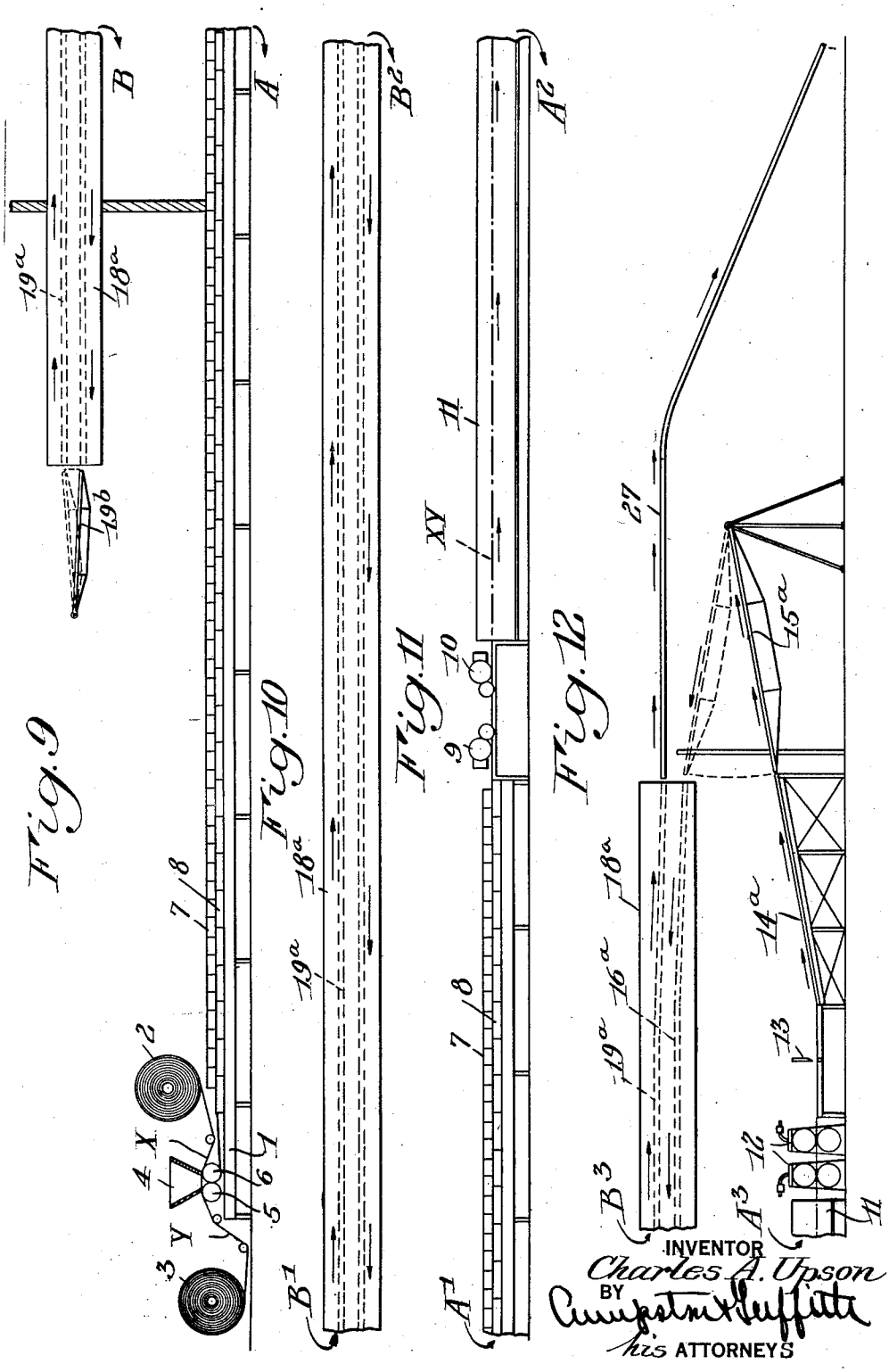

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Patented Apr. 19, 1932 1,854,872

UNITED STATES PATENT OFFICE

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MANUFACTURE OF SHEETS OR SLABS

Application filed January 12, 1928. Serial No. 246,345.

My present invention relates to the manufacture of sheets or slabs, particularly when composed in whole or in part of material originally in the plastic state, and it has for its object an improved process or method, and a simple compact and efficient machine for producing a product of this kind. A further object of the invention is to produce in an economical manner a high grade of wallboard for building constructions, and similar sheets, my invention contemplating their production as a continuous forming operation. The improvements are directed in part toward the provision of means for preliminarily hardening the product after it issues from the forming element, so that it can be safely and conveniently manipulated without injury in passing it to a drying and curing medium.

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 the specification.

In the drawings:

Fig. 1 is a side view of the feed and forming end of the machine broken away, and showing one embodiment of my invention;

Fig. 2 is a side view of the intermediate portion of the machine broken away at both ends and forming a continuation of Fig. 1;

Fig. 3 is a side view of the delivery end of the machine broken away at one end, and forming a continuation of Fig. 2;

Fig. 4 is a top view broken away of the portions of the machine shown in Figs. 1, 2 and 3, but condensed;

Fig. 5 is an enlarged fragmentary sectional view of a portion of the platen bed with a fragment of the product in formation therebetween;

Fig. 6 is an enlarged section on the line 6—6 of Fig. 4;

Fig. 7 is an enlarged section on the line 7—7 of Fig 4;

Fig. 8 is an enlarged section on the line 8—8 of Fig. 4;

Fig. 9 is a side view of the feed and forming end of a modified embodiment of the invention broken away;

Fig. 10 is a broken side view of an intermediate continuation of the oven shown at the top of Fig. 9, the two views being connected B to B′;

Fig. 11 is a broken side view of the intermediate portion of the lower platen section of Fig. 9, being connected A to A′ to the last mentioned figure; and

Fig. 12 is a broken continuation of both Figs. 10 and 11 continued B^2 to B^3 and A^2 to A^3, and showing the delivery end of the machine.

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 and method in the two embodiments shown, 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 finally 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 at a pressure of from 125 to 200 pounds, the speed of passage of the material between them being a factor. 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. The sheet, though severed, next passes and is pushed by the feed rollers into what is termned a "processing oven" for drying and curing. This oven also contains heated air, preferably in circulation. Upon emerging from this drying oven the sheet becomes a finished product, and is cooled and subject to safe manipulation. I preferably connect up the hot air supply so that the current therefrom heats both ovens serially, and I also prefer to arrange the platens and ovens in such manner that heat is conserved, and wasteful radiation avoided.

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, and the section is shown collectively in Figs. 1 and 2. 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. 4 into two strips, if desired. It then immediately passes into the oven 11 shown collectively in Figs. 2 and 3, 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. The sheet is now sufficiently hard, so that it is not injured by the rollers, and so that it is pushed under a severing device conventionally shown at 13 in Fig. 3 on a platform 14, which cuts it into lengths, and the severed sheets go on down an inclined ramp 14 on to a reversely inclined lower ramp 15 that changes their direction. These ramps heretofore and hereinafter referred to preferably consist of a series of rolls as shown at 16, Fig. 4, some of which may be idlers, and some of which may be driven as by the sprocket gearing shown generally at 17, or all of them may be driven to keep the sheet moving by frictional contact.

A continuation of the said lower ramp 15 within the processing or drying and curing oven 18 carries the sheet forwardly again through that oven, which is located immediately below the platen bed preferably in such manner that one tends to warm the other. Emerging at the forward end of oven 18 the sheet or board is again reversed by falling upon an incline of ramp 19 and carried on the latter back through the drying oven again. Its upper and lower paths in a reverse direction are shown in section in Fig. 6, 20 indicating a baffle between the two ramps. This lower ramp 19 issues from the opposite end of the oven, and finally delivers the board as a finished product at the rear end of the machine.

Aside from heat conservation, the object sought in placing the ovens and platens one above another, and carrying the product back and forth through these at different elevations (and this is a very important advantage) is to reduce the overall length of the machine and the building which it occupies, and to render it compact and accessible as to its several elements. These board making machines are built on very large scales to make wide sheets of heavy boards, and were it not for this condensing of parts, a building hundreds of feet long would ordinarily be required.

The hot air supply for the oven is best shown in Figs. 3 and 4, and consists of an intake conduit 21 connected with a suitable heater and blower (not shown) which delivers into the drying oven 18. From thence it passes through a connection 22 into a conduit 23 and part of it goes through a connection 24 into the hardening oven 11, from which it emerges, all as shown by the arrows, at 25. This exhaust may be used in preliminarily treating some of the materials, or may go back to the heater. The remainder of the air current continues to traverse the conduit

23 emerging at 26, at which point it may be led back to the heater.

In Figs. 9, 10, 11 and 12, I have shown a modified form of machinery which, up to the severing points 13, is substantially the same as the first embodiment. In this machine, however, I place the processing or drying oven 18*a* above the platen bed and hardening oven 11 instead of below. This prevents the close contact of the two, however, because opportunity must be had to raise and lower the upper platen, though the machine is shortened up as before. The board in this case passes up an inclined ramp 14*a* (Fig. 12) onto a shifting or tilting ramp 15*a*, the two positions of which are shown in full and dotted lines. This ramp carries suitably driven rollers, and delivers a length of board first to a lower ramp conveyer 16*a* in the dryer 18. It is reversed at the opposite end onto an upper ramp conveyer 19*a* by another tilting ramp 19*b* as shown in Fig. 9. It is delivered at the rear end onto the platform 27, and there disposed of.

It is to be understood that I contemplate my invention, including both method and machine, to be useful in the manufacture of slabs or sheets composed of other materials or constituents than those named specifically herein.

I claim as my invention:

1. In a machine for forming sheets from plastics, the combination with a pair of heated platen walls of substantial area, of means for feeding plastic material between said walls, a hardening oven associated with the platens and closely adjacent thereto, a drying and curing oven, and a feeding device located between the two ovens adapted to draw the hardened sheet from the first and to move it into the second, one of said ovens being relatively arranged to overlie the other.

2. In a machine for forming sheets from plastics, the combination with a pair of heated platen walls of substantial area, of means for feeding plastic material between said walls, a hardening oven associated with the platens and closely adjacent thereto, a drying and curing oven, and a feeding device located between the two ovens adapted to draw the hardened sheet from the first and to move it into the second, one of said ovens and the platens being relatively arranged to overlie each other.

3. In a machine for forming sheets from plastics, the combination with a pair of heated platen walls of substantial area, of means for feeding plastic material between said walls, a hardening oven associated with the platens and closely adjacent thereto, a drying and curing oven, a feeding device located between the two ovens adapted to draw the hardened sheet from the first and to move it into the second, a source of hot gas supply and conduits connecting the ovens therewith and with each other whereby a circulation is created and gas from one oven is driven through the other.

4. Apparatus for forming sheets of building material substantially continuously, comprising means for forming a continuous strip of material, platen means for confining and heating a moving strip of said material, oven means for additionally heating said material, mechanism for pulling a continuous strip of said material through said platen means and oven means, severing mechanism beyond said pulling mechanism for severing said continuous strip into a plurality of separate panels, a treating chamber arranged in overlapping relation to said oven means so that the total length of said apparatus is reduced, and mechanism for moving said separate panels through said treating chamber.

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