

July 29, 1924.

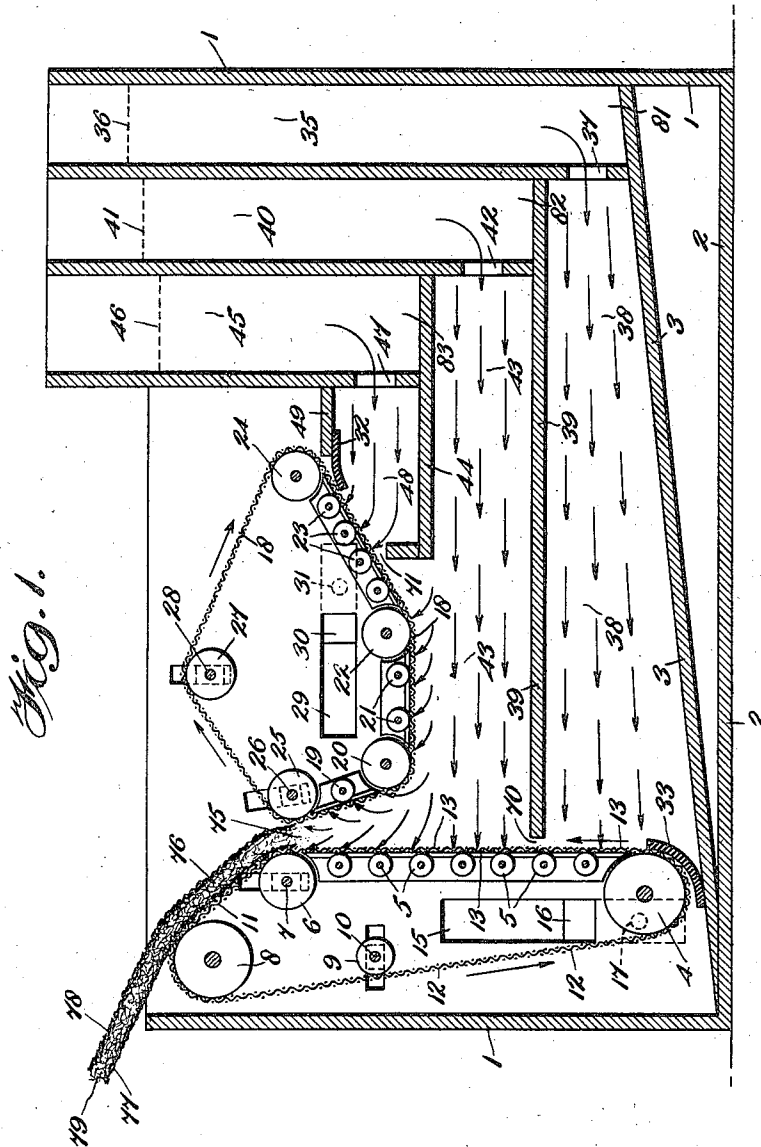
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J. K. SHAW

### PLASTER BOARD HAVING HARD AND SOFT PORTIONS

Filed March 26, 1920

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

*Fig. 2.*

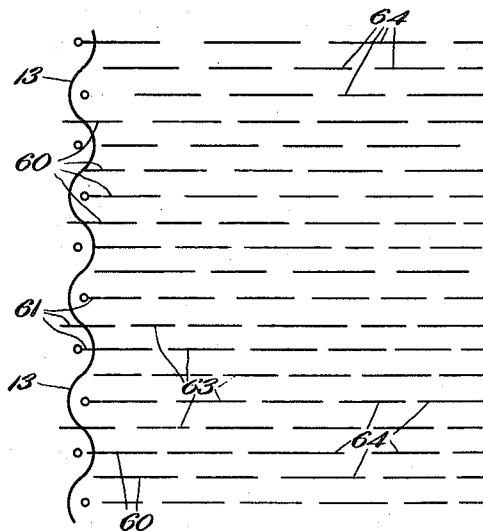


*Fig. 3.*

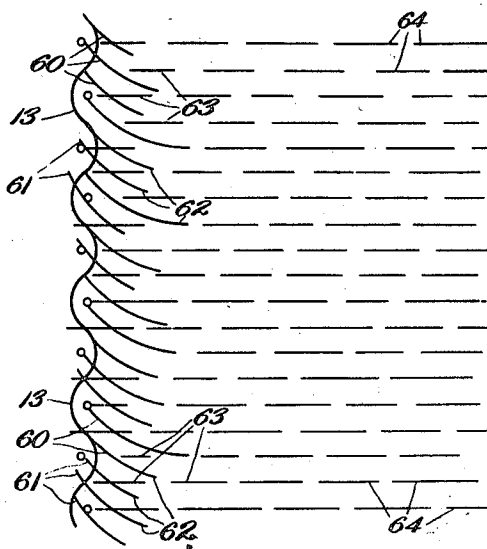
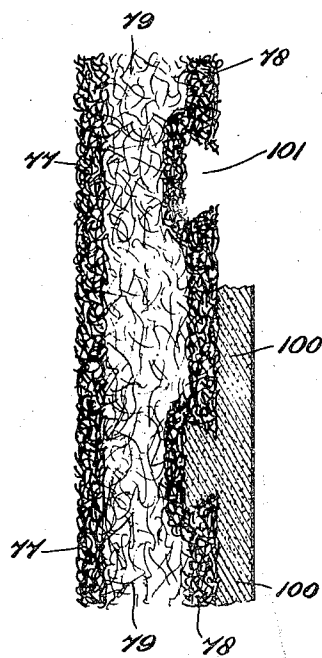


*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

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## PLASTER BOARD HAVING HARD AND SOFT PORTIONS.

Application filed March 26, 1920. Serial No. 368,994.

*To all whom it may concern:*

Be it known that I, JOHN K. SHAW, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Plaster Board Having Hard and Soft Portions; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a plaster board having hard and soft portions and composed of interlaced fibres. It has for its object to provide a board of this character which will be more efficient in action and less expensive to manufacture than those heretofore proposed.

With these and other objects in view the invention consists in the novel parts and combinations of parts constituting the board, all as will be more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals designate like parts in all the views:—

Figure 1 is a diagrammatic sectional view of an apparatus suitable for interlacing the fibres in accordance with this invention;

Figure 2 is a diagrammatic view illustrating the disposition of the individual fibres during the interlacing operation and before reaching the traveling surface;

Figure 3 is a view similar to Figure 2 illustrating the action of the traveling surface upon the individual fibres; and

Figure 4 is a diagrammatic sectional view of a plaster board made in accordance with this invention.

In order that the character of this board may be the more readily distinguished from the somewhat similar prior boards made of paper, fibre and other substances it is said: This board is composed of different layers of interlaced fibres, one of which layers is a hard relatively unyielding and relatively very strong layer, which serves to give rigidity and strength to the board as a whole. But its unyielding nature renders it unsuitable for the composition of the entire board owing to the strains produced by the setting of the plaster, and which requires a yielding

material to accommodate the same. Therefore I provide one or more layers of fibres interlaced with said first mentioned fibres and with each other, which layers are of a soft or yielding nature and thus accommodate said strains. It has been proposed heretofore to provide fibre board with felted fibres, but such boards were made of the same kind of fibres, throughout, usually wood fibres; their felted relations did not involve the pronounced interlacing of the fibres that are possessed by this board, and therefore their strength has been found to be very inferior to this said new board. Other inventive differences between this board and the prior boards can be best brought out by a disclosure of the process of making this board which will be understood from the following.

1 indicates any suitable tank for holding the water and fibres, 2 the bottom of said tank, 3 an inclined false bottom located above the bottom 2, 4 a roll or drum near the lower end of said false bottom 3, 5 a plurality of supporting rolls, 6 a guide and compression roll adjustable on the slide, or other movable means 7, 8 a guide roll similar to the roll 4, and 9 a guide and tensioning roll adjustable on the means 10. Passing over the rolls just mentioned is the endless foraminous belt or surface 11, conveniently made of wire cloth, and having the oppositely moving portions or runs 12 and 13.

Between the runs 12 and 13 is located the water outlet 15, provided with the controlling means or gate 16 which may be suitably manipulated as by the handle or other device 17.

Coacting with the foraminous surface or belt 11, and in close proximity thereto as regards one portion thereof, is the foraminous belt 18, passing over and around the series of guide rolls 19, 20, 21, 22, 23 and 24. Said belt 18 also passes over the compression and guide roll 25 coacting with the compression roll 6, and adjustably mounted on the movable means 26. 27 represents a tension and guide roll, adjustably mounted on the means 28, and 29 an outlet for the water passing through the belt 18, controlled by the gate 30 and adjustable through the handle 31. 32 and 33 represent suitable water seals made of flexible material for the belts 11 and 18 respectively.

35 represents a channel or passage for water and fibres which may be maintained at any desired hydrostatic head 36, 37 an opening from the channel 35 into the tank space 38, and 39 a top or partition separating said space 39 from the remainder of the tank. 40 represents a second channel for water and pulp fibres, 41 the head thereof, 42 an opening from said channel into the tank space 43, and 44 a partition which with the partition 39 serves to separate said space 43 from the rest of the tank, 45 represents a third channel for water and fibres having a head 46, 47 an opening into the tank space 48, and 49 a partition coacting with the partition 44 to segregate said space 48 from the remainder of the tank.

The foregoing construction is, or may be, substantially the same as that disclosed in my copending application, Serial Number 368,990, filed March 26, 1920, and entitled Process of and apparatus for making fibre boards.

The operation of this machine will be understood from what follows:

It is preferred to use long bagasse fibres but of course fibres of any usual length may be employed. Said fibres by reason of the direction of flow of the water through the belt 11, or surface 13, will be brought into positions more or less parallel to each other, and more or less perpendicular to the line of travel of the surface 13, while at the same time all of said fibres will occupy positions more or less staggered with relation to their neighbors as shown. Accordingly a large percentage of the forward ends 61 of said fibres will first contact with said surface 13, and will be carried along by the belt from the positions shown in Figure 2 to those shown in Figure 3, wherein the rear ends 62 of said fibres are illustrated as having lagged behind the front ends 61, in the water, so that the front row of said fibres have assumed a somewhat curved or bent shape. The second row, or those fibres 63 immediately following, and which have not reached the surface 13, but have reached the rear ends 62 of the fibres 60, are now forced by the oncoming water to contact at their forward ends against the said curved fibres 60. And as said fibres 63, originally, due to their parallel positions as shown in Figure 3, were more or less staggered or interlaced with the fibres 60 before the latter became curved, it is evident that this interlacing or entangling action between the fibres 60 and 63 will be enhanced or increased by the oncoming water after said curvature takes place. It results from the actions just described that said fibres 63 become themselves more or less curved, as indicated in Figure 3, due to the transverse movement of the fibres 60, and that a third row of fibres 64 which are also

interlaced or staggered with the fibres 63 will become in time curved and entangled with the fibres 60 and 63 that have preceded said fibres 64. It thus results that owing to the floating of the fibres into parallel, interlaced or staggered positions, and in a direction transverse to the traveling surface 13, the entanglement of the fibres is continuous between successive rows, and the pressure of the water causes the whole to be very loosely assembled in their interlaced positions on said surface, thus forming an open mass of fibres more compact next to the wire than away from it, which mass is carried through the opening 70 into the space 43, with one or more partially curved and partially entangled layers similar to the fibres 60 and 63 clinging to it.

In said space 43, other fibres similar to the fibres 64 become interlaced and entangled with the layers on the belt, and the process of entanglement and massing proceeds as before. In the mean time layers of fibres in all respects similar to the layers 60, 63 and 64 are interlaced, entangled and massed on the traveling belt 18 from the space 48. This second mass of fibres are carried through the opening 71 by the belt 18 in a condition similar to the first mentioned mass that passes the opening 70, and the fibres in the space 43 interlace, and become entangled with said second mass in a manner similar to that described in connection with said first mentioned mass. The result is, owing to the parallel and staggered relations of the fibres in the space 43, they constitute a third mass of fibres which are interlaced and entangled with each other, as well as with each of said first named masses.

The action of the smoothly flowing water in separating and rendering parallel the oncoming fibres is in marked contrast with the stirring or agitating action of the water in prior processes, and the difference results in a great difference in the strengths of the boards produced.

As a result of the foregoing entanglements of the various fibres and the motion of the surfaces 13 and 18, the mass of fibres are carried through the opening 75 between the compression or compacting rolls 6 and 25, and is formed into the sheet or board 76, all as will be readily understood.

An important feature of this invention therefore resides not only in being able to thus positively interlace, or entangle, the fibres in the body of the sheet, but also in being able to vary the kind, size, or class, of fibres in different portions of the sheet. That is to say, I may feed to the channel 35, one kind of fibres, and I may feed to the channel 45, the same class of fibres as are fed to the channel 35, or I may feed a totally different class of fibres. In other words I may provide as many channels 35,

40 and 45, as there are different characters of fibres in the finished board, and I may place in the first channel 35 and in the last channel 45 any character of fibres I desire, whereupon the finished board will be provided with an outer layer 77 corresponding to the fibres that are fed to the channel 35, with another outer layer 78 corresponding to the fibres that are fed to the channel 45, and with one or more intermediate layers 79 corresponding to the character of the fibres which are fed to the channel 40 and to any other channels which may be located intermediate of the channels 35 and 45.

But the important feature to be emphasized in this invention is the fact that no matter how many kinds of fibres or how many layers of fibres that are present in the finished board, the fibres of each layer will be interlaced or entangled with the fibres of its adjacent layer, so that the board will not consist of separate and distinct layers somewhat like the leaves of a book, that can be peeled off, but its body will consist of fibres that are firmly interwoven, and its outer layers will be firmly interwoven with said body portion.

The interlacing process is facilitated by the fact that the openings 37, 42 and 47 are of a less area than are the spaces 38, 43 and 48 into which the fibres are led. In other words the fibres must pass through the opening in a comparatively close relation to each other, and they are then immediately released into a wider space, whereupon they naturally pass along with the non-agitated water while spreading out and assuming the parallel relations indicated in Figure 2.

In order to produce a stronger board I further prefer to permit a very large proportion of the water, say 90% of the same to escape through the opening 15, while a very much smaller proportion, say 10% escapes through the opening 29. The gates 16 and 30 are conveniently manipulated to effect this result, and by so proportioning the water may be enabled to maintain the proper steady flows through the surfaces 13 and 18 to produce the desired result. But of course the proportions of water that escape through the two openings mentioned may be widely varied according to the results sought in the finished board.

The rolls 6 and 25 are readily adjusted by the means illustrated to produce any desired compression in the openings 75 between said rolls, so that the fibre board may be given any desired degree of porosity. In fact, by using relatively large fibres in the channel 40, and relatively fine fibres in the channels 35 and 45, I am enabled to control the air spaces in the body of the board, and thereby to control its heat-insulating qualities.

The heads 36, 41 and 46 of the liquid in

the channels 35, 40 and 45 are so maintained that there will be a minimum tendency of liquid to flow between the spaces 38, 43 and 48. In other words, the pressures of the liquid in the last mentioned spaces are maintained as nearly equal as possible, and thus a minimum tendency of the fibres to fail to interlace is secured.

In order to produce the board of this invention I prefer to treat the fibres in the channel 35 with any suitable waterproofing solution to prevent the caustic action of the plaster that is to be later applied to the surface 77 from injuriously affecting the finished board. In the channel 45 I may introduce any suitable hardening solution that will give strength to, and harden the surface 78, so that the finished board will be yielding and more or less soft on its interior and strong and hard on its surface 78. A suitable water repellent is found in the well known mixture of rosin and aluminum sulphate, in common use and in some cases this is supplemented by a water proof coating on the outside of the finished board such as a mixture of oil and pitch. A suitable hardening and strengthening solution is found by boiling bagasse fibre in a relatively weak solution of caustic soda. The soda forms compounds with the coatings of the bagasse fibre which are readily precipitated on the fibres of the board upon the addition of aluminum sulphate. Therefore by adding such hardening solution to the channel 45, I am enabled to produce a hard, strong and relatively smooth surface 78 on the finished board. In some cases, I prefer to apply to the surface 78 whether treated with said bagasse fibre solution, or not, a thin coating of a cementitious material, such as Portland cement, or one of the oxy-chloride cements, such as magnesium oxy-chloride, and thus produce a more pronounced hardening of said surface.

In all cases whether this board is provided with grooves or not it will now be clear when a layer of plaster such as 100 is applied thereto, it will possess a hard, strong fibre layer, or surface 78, a soft and yielding fibre portion such as 79, and another plaster holding surface 77 which is yielding and may be waterproofed if desired. Further the board being composed of interlaced fibres it is a great deal stronger than prior boards.

I prefer to provide grooves 101 or other indentations in the board to give a better hold to the plaster, which grooves may be conveniently formed during the making of the board by well known means.

I further prefer to employ bagasse or pith carrying fibres in the making of this board, for when said fibres constituting the layer 78 are coated with the above mentioned precipitated compounds that were

previously dissolved off the fibres, they take on an exceedingly smooth and hard surface, with a minimum of expense; and further when the middle layer is composed of said bagasse fibres, owing to their pith like protuberances they intertangle in such a way as to form a board having an unusual tensile strength as well as an unusual breaking strength. A further advantage of employing bagasse fibres resides in the fact that by regulating the beating action in the beating engine, I can produce aggregates consisting of a plurality of fibres bound together, which aggregates on being fed to the channel 40, will constitute the middle resilient layer 79 with relatively very large air spaces, so its heat insulating properties will be greatly enhanced. due to these air cells, in addition to the heat insulation afforded by their natural pith while not affecting its yielding nature. This is an important advantage in plaster boards.

It is obvious that those skilled in the art may vary the details of the invention without departing from the spirit thereof. Therefore, I do not wish to be limited to the above disclosure except as may be required by the claims.

What I claim is:—

1. The herein described heat insulating plaster board comprising a relatively unyielding hard and strong layer of bagasse fibres interlaced with a relatively soft and yielding layer of bagasse fibres, all said fibres being associated with their natural pith; and a layer of plaster attached to said board, substantially as described.

2. The herein described heat insulating

plaster board comprising a relatively unyielding hard and strong layer of bagasse fibres interlaced with a relatively soft and yielding layer of bagasse fibres, the latter layer interlaced with a third layer of water proofed fibres, all said fibres being associated with their natural pith; and a layer of plaster attached to said board, substantially as described.

3. The herein described plaster board comprising a relatively hard and strong layer of fibres interlaced with a relatively soft and yielding layer of fibres; and said board provided with means to hold plaster thereto, whereby said hard layer affords a strengthening means for the board, and said soft layer affords a means adapted to yield as said plaster expands, substantially as described.

4. The herein described plaster board comprising a relatively hard and strong layer of fibres interlaced with a relatively soft and yielding layer of fibres; said soft layer being provided with depressions to receive plaster; and an outside layer of fibres interlaced with one of said first mentioned fibres and provided with a water proofing material, substantially as described.

5. The herein described plaster board comprising a relatively unyielding, hard layer of pith carrying fibres associated with a waterproofing material interlaced with a relatively yielding, soft layer of fibres; and means associated with one of said layers to bond plaster thereto, substantially as described.

In testimony whereof I affix my signature.

JOHN K. SHAW.