

March 31, 1925.

1,532,084

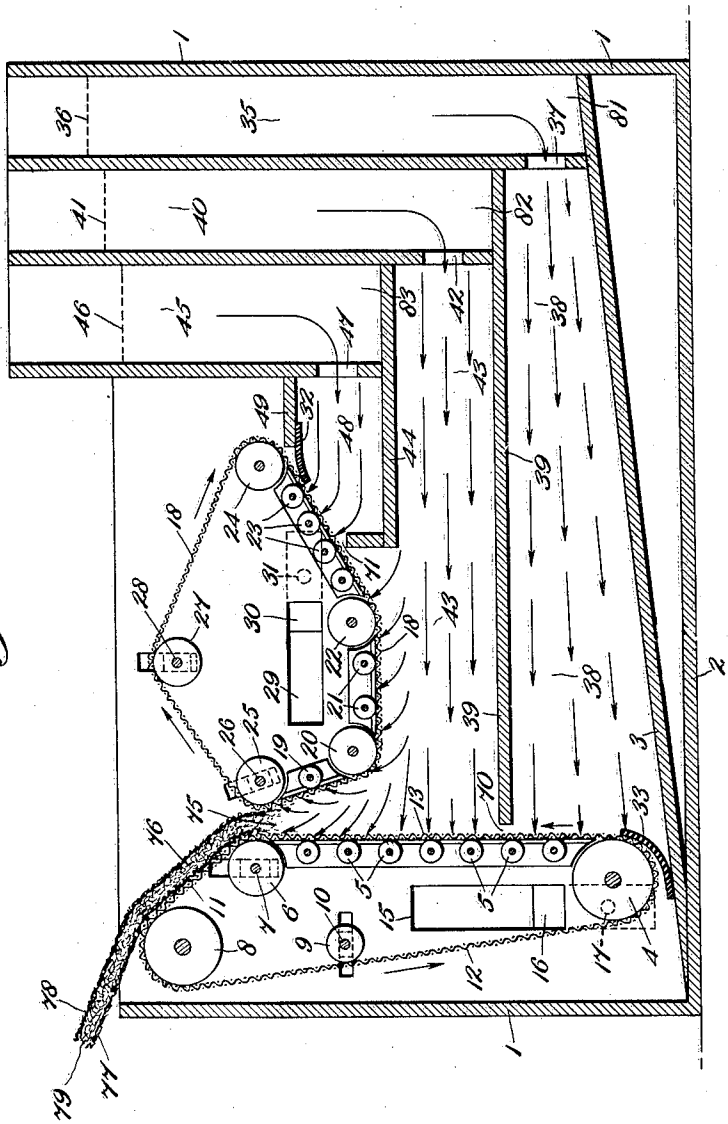
J. K. SHAW

BOARD COMPOSED OF INTERLACED FIBERS

Filed March 26, 1920

2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

Fig. 2.

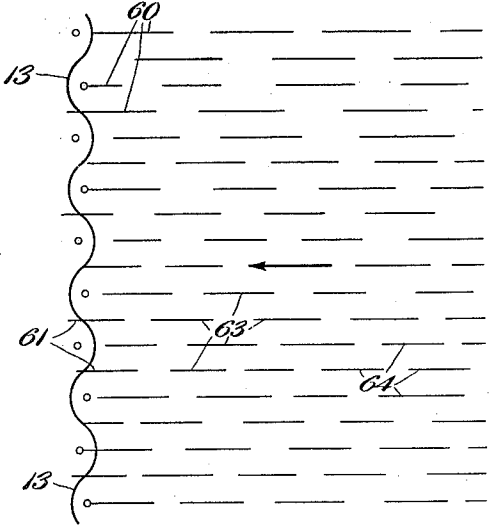


Fig. 4.

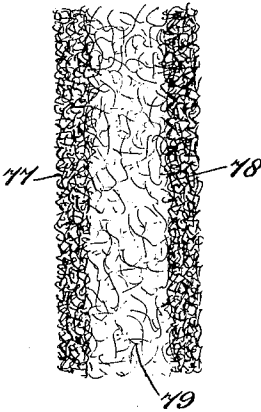


Fig. 3.

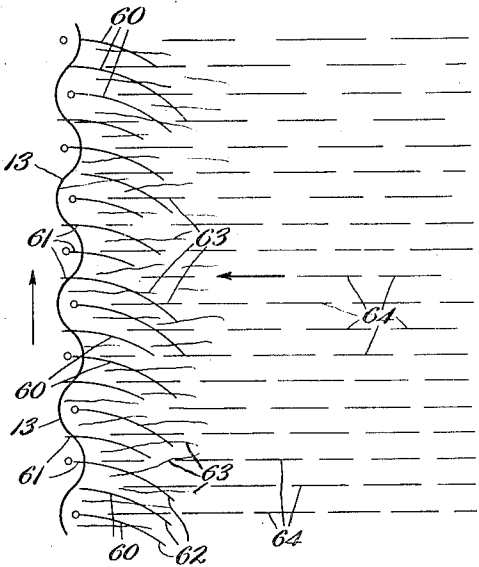
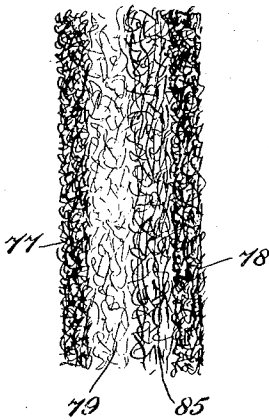


Fig. 5.



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UNITED STATES PATENT OFFICE.

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BOARD COMPOSED OF INTERLACED FIBERS.

Application filed March 26, 1920. Serial No. 368,991.

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 Boards Composed of Interlaced Fibers; 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 fiber board composed of interlaced fibers, and has for its object to provide a board which will be more efficient in use, and less expensive to produce 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 making the board;

Figure 2 is a diagrammatic view illustrating the disposition of the individual fibers before reaching the traveling surface, during the process of manufacture of the board;

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

Figures 4 and 5 are diagrammatic sectional views of fiber boards made in accordance with this invention.

In order that the precise nature of this new fiber board may be understood, and in order that it may be readily distinguished from other and somewhat similar prior boards, the process of making the present board is disclosed as follows:—

1 indicates any suitable tank for holding the stock consisting of water and any suitable fibers, 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 over 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 represents 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 fibers which may be maintained at any desired hydrostatic head 36, 37 an opening from the channel 35 into the chamber or tank space 38, 39 a top or partition separating said chamber or space 39 from the remainder of the tank. 40 represents a second channel for water and pulp fibers, 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 fibers having a head 46, 47 an opening into the chamber or 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 and apparatus is or may be the same as that disclosed and claimed in my copending application, Serial Number 368,990, filed March 26, 1920, entitled "Process of and apparatus for making fiber boards."

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

It is preferred to use long fibers, but of course, fibers of any usual length may be employed. By reason of the flow of the water through the restricted orifices 37, 42 and 47, the velocity of the fibers is increased while they are at the same time crowded more or less closely together.

Said fibers are then liberated in the relatively very large chambers 38, 43 and 48, and moved at a slower velocity, so that they are subjected to the lateral force or pressure of the water, to separate them. The result is, long before they reach the belt 11, or surface 13, they will be brought into positions more or less parallel to each other, and more or less perpendicular to the line of travel of said surface 13, while at the same time, said fibers will occupy positions more or less staggered with relation to their neighbors, as indicated in Figure 2, for the rear ends 62 of said fibers will have lagged behind the front ends 61, in the water, so that the front row of said fibers assume a somewhat curved or bent shape. The second row, or those fibers 63 immediately following, and which have not reached the surface 13, but have reached the rear ends 62 of the fibers 60, are now forced by the oncoming water to contact at their forward ends against the curved fibers 60. And as said fibers 63, originally, due to their parallel positions, as shown in Figure 2, were more or less staggered or interlaced with the fibers 60 before the latter became curved, it is evident that this interlacing or entangling action between the fibers 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 fibers 63 become themselves more or less curved, as indicated in Figure 3, due to the transverse movement of the fibers 60, and that a third row of fibers 64 will become in time curved and entangled with the fibers 60 and 63, that have preceded said fibers 64. It thus results that owing to the floating of the fibers into parallel, interlaced or staggered positions, and in a direction transverse to the traveling surface 13, the entanglement of the fibers is continuous between successive rows of fibers, 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 fibers more compact next to the wire than away from it. This mass is carried through the opening 70 into the space 43, with one or more partially curved and partially entangled layers similar to the fibers 60 and 63 clinging to it. In said chamber space 43, other fibers similar to the fibers 64 become interlaced and entangled with the layers on the belt, and the

process of entanglement and massing proceeds as before. In the meantime, layers of fibers 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 fibers 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 fibers 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 these parallel and staggered relations, the fibers in the space 43, constitute a third mass of fibers which are interlaced and entangled with each other, as well as with each of said first named masses.

As a result of the foregoing entanglements of the various fibers, and the motion of the surfaces 13 and 18, the mass of fibers is 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. It will now be clear that the fiber board resulting from the foregoing procedure will differ essentially from prior boards in that no such pronounced interlacing of the fibers has ever been accomplished in prior boards. In fact, the processes producing the latter have stirred or continuously agitated the stock, instead of floating it in comparatively quiet chambers, such as 38 and 43, and they have thus effectually prevented the kind of interlacing forming an important feature of this invention.

Another important feature of this invention, in addition to providing a board with its fibers thus interlaced, or entangled throughout the body of the sheet, is had by being able to vary the kind, size and class of fibers in different portions of the sheet. That is to say, I may feed to the channel 35, one kind of fibers, which may be relatively shorter or more expensive fibers than are those fed to the channel 40; and I may feed to the channel 45, the same class of fibers as are fed to the channel 35, or I may feed to said channel a totally different class of fibers. In other words, I may provide as many channels 35, 40 and 45, as there are different characters of fibers in the finished board, and I may place in the first channel 35, and in the last channel 45, any character of fibers I desire, whereupon the finished board will be provided with an outer layer 77 corresponding to the fibers that are fed to the channel 35, with another outer layer 78 corresponding to the fibers that are fed to the channel 45, and with one or more intermediate layers, such as 79 and 85, corresponding to the character of the fibers which are fed to the channel 40 and to any other channels which may be located inter-

mediate of the channels 35 and 45, as will be clear from Figure 5.

It will now be understood that the important feature of this invention is the fact that no matter how many kinds of fibers or how many layers of fibers that are present in the finished board, the fibers of each layer are interlaced or entangled with the fibers of its adjacent layers, or contacting layers, so that the board does not consist of separate and distinct layers somewhat like the leaves of a book that can be peeled off, as is the case with prior paper and other similar fiber boards, but its body portions consist of fibers that are firmly interwoven, and its outer layers are firmly interwoven with said body portions. I am thus enabled to produce a fiber board, or sheet, having comparatively inexpensive fibers on its interior and comparatively expensive fibers on its exterior, and with all of said fibers interlaced, so that a highly ornamental appearance can be imparted to the finished product of a maximum durability at a minimum of expense.

I do not wish to be limited to any particular character of fibers, in the making of these boards, for my boards may be made from any of the well known and usual class of fibers. It is only necessary to float the fibers, whatever their character, in the water to get them into parallel and staggered positions, as indicated in Figure 2, and to then entangle them, as is illustrated in Figure 3.

In order to provide a better board, I 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 division of the water, while maintaining the proper steady flows through the surfaces 13 and 18 to produce the desired results. But, of course, the proportions of water that escape through the two openings mentioned may be widely varied according to the particular 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 fiber board may be given any desired degree of porosity or density. In fact, by using relatively large fibers in the channel 40, and relatively fine fibers 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 heating 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 main-

tained as nearly equal as possible, and thus a minimum tendency of the fibers to fail to interlace is secured.

A further means of securing a more perfect interlacing of the fibers than heretofore, resides in the provision of the pockets 81, 82 and 83 below their corresponding openings 37, 42 and 47. These pockets cause a sort of churning action of the stock before passing said openings, and this said action loosens up any knots or lumps of fibers that may exist, thus causing them to more effectually separate after reaching the chambers 38, 43 and 48, and to therefore more effectually interlace upon reaching the surfaces 13 and 18.

It will now be clear that my new board may consist of different layers of different kinds of interlaced fibers of the same material. That is, it may consist of long and short wood fibers, for example, or of coarse and fine wood fibers, or of different kinds of fibers of any other material than wood. It may further consist of different layers of interlaced fibers of different characters, such for example, as one layer of cow's hair and another of long wood fibers and another of short wood fibers. It is further evident that the interlaced layers may consist of different classes of fibers of either the same material or of different materials, such for example, as long and short wood fibers, long and short bagasse fibers, expensive and inexpensive fibers, differently colored fibers, differently treated fibers, etc. One or more of the layers of fibers may be waterproofed, or fire proofed or both water proofed and fire proofed in any suitable well known manner. A convenient method is to apply the water proofing or fire proofing material to the fibers before they are fed in the compartments 35, 40 or 45. That is to say, one may add to the fibers when in the beaters a rosin soap thus thoroughly distributing said soap over the fibers. One may then add a material such as paper makers' alum, which will have the effect of precipitating this rosin soap as an insoluble compound of aluminum and rosin on the fibers. The fibers will be next formed into a board according to the disclosure above made, and this board will be subjected to the dryer having such a temperature that the deposited material will be fused down on the fibers. In other words, the fibers are covered individually by the procedure just outlined with an insoluble waterproof coating. The fibers are also fireproofed by proceeding as follows:

The fibers while in the beaters also may have added thereto any suitable fireproof salt such as aluminum chloride or aluminum phosphate or similar materials, or the fibers may have added thereto a water soluble salt and also next added thereto a suitable solu-

tion of another salt which will react with the first mentioned fireproofing salt to form an insoluble salt on the fibers and which last mentioned salt will constitute a fire retardent. These fireproofing compounds being well known and no specific compounds being claimed as novel herein, it is not thought necessary to give further details.

By the term "interlaced" found in the claims I mean that the fibers are intertangled in the manner illustrated in Figure 3, instead of being only mixed together as is done in paper making, or instead of being cemented or stuck together as is done when a plurality of layers of pulp are compressed between rolls.

It is obvious, therefore, that I do not wish to be limited to the above disclosure except as may be required by the claims.

What I claim is:—

1. A fiber board composed of different layers of different kinds of fibers interlaced with each other to form a mass devoid of laminae, substantially as described.

2. A fiber board composed of different layers of different kinds of fibers interlaced with each other throughout their mass, the fibers of an outer layer being of a higher quality than the fibers of the interior of the board, substantially as described.

3. A fiber board composed of different layers of different kinds of fibers interlaced with each other throughout their mass, the fibers of the outer layers being shorter and

of a different quality from the fibers of the interior of the board, substantially as described.

4. A fiber board composed of different layers of different kinds of fibers interlaced with each other throughout their mass, the fibers of an outer layer being of a different character and color from the fibers of the interior of the board, substantially as described.

5. A fiber board composed of different layers of different classes of fibers interlaced with each other, one of said layers composed of dark colored fibers, and one of said layers composed of light colored fibers, substantially as described.

6. A fiber board composed of different layers of different kinds of fibers interlaced with each other, one of said layers composed of water proofed fibers, substantially as described.

7. A fiber board composed of different layers of different kinds of fibers interlaced with each other, one of said layers composed of water proofed fibers, and one of said layers composed of fire proofed fibers, substantially as described.

8. A fiber board devoid of laminae and composed of vegetable fibers uniformly interlaced with each other throughout its body portion, substantially as described.

In testimony whereof I affix my signature.

JOHN K. SHAW.