

# UNITED STATES PATENT OFFICE.

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## COMPOSITE BOARD AND METHOD OF TREATING THE SAME.

1,334,637.

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No Drawing.

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*To all whom it may concern:*

Be it known that I, CHARLES G. ROBINSON, residing at Buffalo, in the county of Erie, State of New York, have invented certain new and useful Improvements in Composite Board and Methods of Treating the Same; 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.

The present invention relates to composite board composed of a plurality of plies of paper stock, such as wood fiber stock, cemented together by means of an appropriate adhesive.

Composite board, such as the well known wall board of commerce, is composed of two or more sheets or plies of paper stock cemented together with an adhesive, such as silicate of soda. The plies of paper stock, usually about four plies, are suitably fed from rolls into the pasting machine, where the adhesive is applied and the plies forced together by compression, usually by passing the plies with a layer of adhesive between them through compression rolls. The resulting composite board is then usually cut into panels of appropriate size.

The paper stock may be made from wood fiber or wood pulp, either ground wood pulp, waste paper, or cooked pulp, or from other suitable fibrous materials, used alone or intermixed. While the composite board may consist of a single layer of material of appropriate thickness, it is ordinarily built up of a plurality of layers or plies of material as hereinbefore described. Generally, it is marketed in substantially rigid sheets or panels, and is used, generally, as a building material by nailing or tacking it directly to the studding of a room, so that it may serve in place of lath and plaster as the inner wall of the room, being usually ornamented with paint, or the like, as desired.

Wall board, as manufactured, contains a certain percentage of moisture and also has the characteristic of changing in its moisture content in accordance with the humidity of the surrounding air; these changes ordinarily being slow but nevertheless appreciable. Such changes in moisture content are sometimes very troublesome in new buildings where the moisture initially present in the lumber, particularly green lum-

ber, gradually works through into the wall board, causing expansion and sometimes warping and buckling. The characteristic of wall board to absorb moisture extends also to paints, stains and similar decorative liquids, and if not counteracted leads to excessive waste of the decorative agent, as well as to unsatisfactory effects.

The absorption of moisture and paint by wall board can be reduced by surface sizing. Thus, it has heretofore been customary to surface size wall board by applying a solution of gums, resins, and other materials. Heretofore, the usual sizing compounds for wall board have consisted essentially of resins, gums, or similar substances, treated for various purposes, and cut in some suitable solvent or solvents. Such sizing compounds while they may moisture proof the board to the necessary extent and may present a surface suitable for subsequent painting or decoration do not of themselves render the board fire resistant.

The present invention contemplates the provision of a composite board having a surface coating which is not alone moisture proof, but is at the same time fire resistant. This provision of a fire resistant coating for composite board is of particular importance, since one of the disadvantages most persistently urged against the use of composite board, and particularly wall board, as heretofore ordinarily manufactured, is its liability to rapid combustion. Composite board treated in accordance with the present invention is practically non-combustible, and can be exposed to relatively high temperatures, such as are encountered in ordinary fires, without burning.

The invention contemplates no change in the manufacture of the unsized board, or in the pasting or cementing together of the various plies thereof, but involves in lieu of the heretofore customary sizing compounds the application to the board of a surface coating which is both moisture proof and fire resistant. I accomplish this result by treating the surface or surfaces of the board with a compound of cellulose which dries or hardens after its application to the exposed surfaces of the board into a moisture proof and fire resistant film coating. I have found cellulosic compounds of organic acids particularly well adapted for the purpose, and in particular I have found the cellulosic

esters or compounds of acetic acid, such as the ordinary cellulose acetates, especially well suited for the purposes of the invention.

5 In carrying out the invention the exposed surfaces of the board may be coated with the cellulosic compound in any appropriate manner. I have employed the solutions or so-called lacquers of cellulose acetate which  
10 are used for coating the fabric on the wings or planes of aeroplanes with great success in carrying out the invention, and throughout the remaining descriptive portions of this specification I shall refer to cellulose  
15 acetate, and its solutions, as the coating agent now preferred by me in practising the invention, although I wish it to be understood that I do not intend thereby to limit the invention to this particular coating agent.

20 Cellulose acetate as it is usually encountered in commerce is a tough solid product. For the purposes of the invention this product is dissolved in a suitable solvent, usually a volatile organic solvent, as will be well  
25 understood by those acquainted with the production of the cellulose acetate lacquers aforementioned. The cellulose acetate solution, as I now prefer to use it in practising the invention, is a thin liquid only slightly  
30 more viscous than water.

I have discovered that the desired penetration of the cellulose acetate solution is materially improved and aided by subjecting the board to pressure directly after the  
35 application of the coating solution. This compression may advantageously be of such a degree or magnitude as to appreciably diminish the thickness of the board. Thus, for example, the ordinary four-ply board of  
40 commerce may be subjected to such a degree of compression as to diminish its thickness by approximately  $\frac{1}{16}$  of an inch.

The application of the coating solution and the compression of the board may be  
45 advantageously accomplished by passing the board through suitable rolls which will spread a coat of the cellulose acetate solution on the exposed surface or surfaces of the board and at the same time will suitably  
50 compress the board to secure the desired penetration of the solution. These rolls thus perform the dual functions of the ordinary coating and compression rolls of the paper making art and embody in their design the characteristic features of these two  
55 well known types of rolls. When adjusted to subject the composite board to a pressure of about 500 pounds per lineal inch such compression rolls will produce the desired penetration of the cellulose acetate solution.

After the application of the cellulose acetate solution to the exposed surfaces of the board, the removal and recovery of the volatile solvents of the solution may be effected  
60 in any appropriate manner. Thus, I have

found it satisfactory to place the board directly after the coating operation in a closed chamber from which the volatilized solvents may be withdrawn and collected. The volatilization of the solvents from the liquid  
70 coating on the board and the withdrawal of the volatilized substances may be expedited by maintaining a vacuum in the chamber, or by suction, if desired.

The resulting film of cellulose acetate remaining on the surface or surfaces of the board is a hard tenacious coating absolutely proof to moisture as well as a practical fire-resistant medium. The paper stock of which the board is made is more or less  
80 porous or absorbent and the cellulose acetate solution penetrates into the pores of the stock to a sufficient degree to provide a substantially continuous film or coating over the entire surface of the board to which the  
85 solution was applied. When exposed to fire, a board so coated will not burn, and at most will only char or slowly smolder.

The cellulose acetate coating possesses the further advantage of imparting rigidity to  
90 the board. A single thin coating of the cellulose acetate will produce a marked improvement in this respect, and the degree of rigidity thus secured can be increased by applying two or more coatings of the cellulose  
95 acetate. This matter of rigidity is of particular importance in wall board, since the more rigid is the board the more highly is it esteemed by the trade. The cellulose acetate coating produces a remarkable increase in the rigidity of the board, and for  
100 this reason a very superior product for the purposes in hand results from the practice of the invention.

The thickness of the cellulose acetate  
105 coating may be controlled by employing solutions of suitable concentration or by applying a suitable number of coats to the surface of the board. The thickness of the coating will be determined by the particular  
110 uses to which the finished board is to be put.

The dry or hardened coating of cellulose acetate lends itself satisfactorily to subsequent decoration by the ordinary painting or decorating agents. Thus, the usual painting materials can be readily applied to the coating, and will adhere thereto in  
115 satisfactory manner.

From the foregoing description it will be  
120 seen that by the present invention I produce a water-proof, fire-resistant board possessing increased rigidity. These are important features in a commercial product of this character, and the quality of the product is largely determined thereby. As far  
125 as I am aware, no wall board has heretofore been produced in which these features are so satisfactorily embodied as in the product of the invention. Furthermore these desir- 130

able properties are secured without prejudice to the decoration of the board, and this is an additional advantageous feature of the invention.

5 I claim:—

1. A composite board composed of a plurality of plies of paper stock cemented together and having a surface coating containing cellulose acetate.
- 10 2. A composite board composed of a plurality of plies of wood fiber paper stock and having a surface coating of cellulose acetate for imparting increased rigidity to the board.
- 15 3. A composite board composed of a plurality of plies of wood fiber paper stock cemented together and having a fire-resistant and water-proof surface coating containing a cellulose ester.
- 20 4. A composite board composed of a plurality of plies of wood fiber paper stock cemented together and having a surface coating containing a cellulose ester of an organic acid.
- 25 5. A composite board composed of a plurality of plies of wood fiber paper stock cemented together and having a surface

coating containing a fire-resistant cellulosic compound.

6. The improvement in the manufacture 30 of composite board made up of a plurality of plies of paper stock which comprises applying a surface coating of a solution containing cellulose acetate to the board and simultaneously subjecting the board to sufficient pressure to appreciably reduce its 35 thickness; substantially as described.

7. The improvement in the manufacture of composite board made up of a plurality 40 of plies of paper stock which comprises treating a surface of the board with a solution containing a cellulose ester of an organic acid in a volatile solvent, subjecting the board to compression while said cellulose ester is still in solution to secure effective 45 penetration of the liquid coating solution, and removing the major portion of the volatile solvent from said coating and thereby imparting to said surface a film coating of the cellulose ester; substantially 50 as described.

In testimony whereof I affix my signature.

CHARLES G. ROBINSON.