June 8, 1926. 1,588,243

H. S. LEWIS

COMPOSITE SHEET

Filed April 16, 1923

Fig. 1.

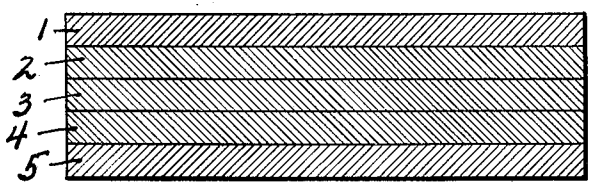


Fig. 2.

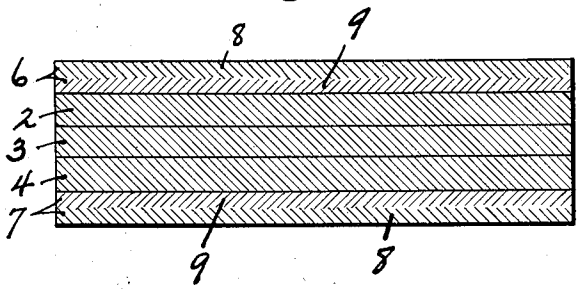
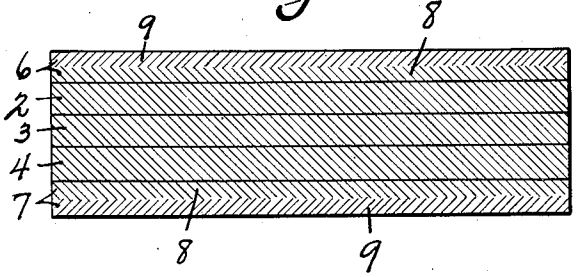


Fig. 3



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UNITED STATES PATENT OFFICE.

HARRY S. LEWIS, OF BEAVER FALLS, NEW YORK.

COMPOSITE SHEET.

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This invention relates to centain improvements in a composite sheet, capable of use for various purposes, but peculiarly designed and adapted for use as wall board.

The manufacture of wall board, as practiced today, consists of building up by the use of suitable adhesive, two or more plies of so-called wood pulp board manufactured from either ground wood pulp or from so-called paper stock board manufactured from waste papers, each ply being usually from .030 to .055 of an inch in thickness according to the number of plies desired for a certain desired thickness of the finished product, such product being usually from $\frac{3}{16}$ to $\frac{1}{4}$ of an inch thick.

Some grades of wall board are at present made entirely of board manufactured from ground wood pulp made from soft wood, such as spruce, balsam, hemlock, pine and poplar wood, while other manufacturers, to reduce the cost of production, use in the finished product center plies of board manufactured from old paper stock which board commands much lower price in the market than that manufactured direct from the ground wood pulp, but the combined or finished board frequently lacks the rigidity and strength of the wall board manufactured from all fresh ground wood pulp.

Rigidity is a characteristic of considerable importance in connection with the product known as wall board, and I have experimented extensively in an effort to produce a wall board of greater rigidity and strength as compared with the commercial wall board made today. My experiments have led to a development quite remote from the present day manufacture of wall board and to the use of material heretofore considered impractical for that purpose, viz: the use of ground wood made from hard wood, such as beech, birch, maple, elm, chestnut, oak, etc. adequately steamed or boiled preliminary to grinding.

The pulp board of this invention is more rigid than ordinary pulp board of the same number of plies formed of wood pulp manufactured from soft wood or so-called paper stock board manufactured from waste papers, and by reason of the solidity and non-porous nature of the surface, it is better adapted for certain uses, particularly where finishing material is to be applied to the board. Further, the board is characterized by considerable non-conductivity and is particularly suited for use where bulk is required without excessive rigidity, and for these reasons has considerable advantages for particular uses.

My early experiments demonstrated that when hard wood was ground in the usual manner of grinding soft wood for the production of wood pulp, a product was obtained which was of very short fiber amounting to practically a wood flour, having very little strength, impractical for handling on a paper machine without admixture of other stock and commercially useless for the purpose at hand.

I have found, however, that if hard wood is properly and adequately steamed or boiled prior to grinding in the usual manner of grinding wood pulp, that a wood pulp is produced which when manufactured into board has the desired characteristic of unusual rigidity and strength.

Therefore, in the process of manufacturing wood pulp from hard wood, the wood is subjected to steaming and boiling preliminary to grinding and purely as illustrative of a suitable operation of that character the wood in a closed chamber may be subjected to the action of steam under pressure as, for instance, fifty pounds for a period of eighteen hours. It is then ground and formed into single ply in the usual manner of treating soft wood pulp.

The composite wall board is then built up of any desired number of plies or laminations of ordinary pulp board such as board manufactured from soft wood or from paper stock. These center plies may be any ordinary desired board. An outer or facing ply is secured upon each side of the composite structure already formed. Each of these facing plies consists of or comprises wood pulp manufactured from ground cooked hard wood.

I, therefore, claim as new and original, the manufacture of a composite or built-up board suitable for wall board or for other purposes the center plies of which may be ordinary soft wood pulp board or paper stock board, while the outer or facing plies consist of and comprise either wholly or in part, wood pulp manufactured from ground cooked hard wood.

In the manufacture of the single plies of board which are afterward laminated or built up into the plural ply or finished wall board, a single ply sheet or web is built up on the so-called board machine in two or more layers by the use of two or more cylinders, these layers adhering to each other because of the pressure exerted upon the web while it is still in a moist state. In this manner it is possible to manufacture a web or sheet of single ply board for use as the two outside plies, sheets or laminations for the finished composite board, with as many cylinders as desired running on the pulp produced from steamed or boiled hard wood and with one or more cylinders running on pulp of other character, such as that produced from soft woods, so that the finished single ply sheet may consist of any desired number of layers formed from wood pulp manufactured from soft wood or other material and the finished single ply sheet may, therefore, have any desired shade or color upon either or both sides while the center or either or both sides may consist entirely of board containing any percentage desired of the pulp made from the steamed or boiled hard wood of characteristic brown color.

In the drawings I have illustrated various forms that my invention may take.

Figure 1 is a sectional view through a board of my invention.

Figure 2 is a sectional view through a board of a somewhat modified construction.

Figure 3 is a sectional view of a further modified form of board.

In Figure 1 I have illustrated a board consisting of five plies, laminations or sheets No. 1, 2, 3, 4 and 5 respectively. The plies —2—, —3— and —4— may be the ordinary wood pulp board of commerce, such as board manufactured from soft wood pulp or from waste papers, while the outer or facing plies —1— and —5— consist of or comprise a substantial percentage of wood pulp manufactured from ground cooked hard wood. The intermediate or center plies afford the desired bulk and non-conductivity to the board, while the outer plies produce unusual rigidity with a relatively hard non-porous surface for exposure or for the reception of a finishing material.

The structure of Figure 2 differs in that the outer or facing plies —6— and —7— each consist of a single ply which embodies an outer layer or series of layers —8— formed of wood pulp made from soft wood or other material such as waste paper and the inner layer or series of layers —9— are formed of or embody a substantial percentage of wood pulp manufactured from ground steamed or boiled hard wood. These facing plies —6— and —7— can be manufactured on the usual and well known board machine with as many cylinders as desired, running on pulp produced from ground, steamed or boiled hard wood, and one or more cylinders running on pulp produced from soft wood or other material producing a single ply or sheet consisting of a plurality of layers in the usual manner.

In this form of board the advantage of having a comparatively hard non-porous surface is lost, but for certain purposes it is desirable that the board should be of the color characteristic of wood pulp manufactured from soft wood, and for that reason the layers —8— are formed of wood pulp manufactured from soft wood, while the layer or layers —9— are manufactured from ground cooked hard wood.

Figure 3 embodies the same elements as Figure 2. The central plies —2—, —3— and —4— in each of Figures 2 and 3 corresponding to the plies —2—, —3— and —4— in Figure 1, while the outer or facing plies of Figures 2 and 3 are in construction exactly the same. They are assembled with the central plies —2—, —3— and —4— in a reverse manner, that is, the layer —9— is placed at the outer side instead of the inner side adjacent the central plies —2— and —4—. With this construction some rigidity is sacrificed as compared with the structure of Figure 1, but the solidity and non-porous nature of the exposed surface is retained. The formation of plies —6— and —7— in the manner illustrated permits, as shown in Figures 2 and 4 of their assemblage with the ordinary plies —2—, —3— and —4— in either the manner shown in Figure 2 or the manner shown in Figure 3, dependent upon the particular characteristics required for a particular use. The plies constituting the composite board may be united in any suitable manner as by an adhesive or cement, such as silicate of soda, to constitute a relatively rigid unitary sheet.

It will be understood that a percentage of soft wood pulp or paper stock pulp or other material may be added to the hard wood pulp during the beating or mixing process with perhaps somewhat less advantageous results and that the composite board may be formed of any desired number of plies or laminations and that such laminations, plies or sheets may be secured together in any suitable manner and that each sheet may consist of, or comprise any desired percentage of wood pulp manufactured from hard wood cooked by the steaming or boiling process, and that various modifications may be made in the details of the process and the product all without departing from the invention as set forth in the appended claims.

I claim:

1. A laminated board, the facing plies of which comprise wood pulp manufactured

from ground cooked hard wood and the center plies of which comprise pulp manufactured from other material.

2. A laminated board, the facing plies of which consist of wood pulp manufactured from ground, cooked hard wood and the center plies of which consist of pulp manufactured from other material.

3. A laminated board, the facing plies of which comprise wood pulp manufactured from ground cooked hard wood and the center plies of which comprise pulp manufactured from soft wood.

4. A laminated board, the facing plies of which consist of wood pulp manufactured from ground, cooked hard wood and the center plies of which consist of pulp manufactured from soft wood.

5. A laminated board, the facing plies of which include a layer comprising ground cooked hard wood and another layer of pulp manufactured from other material.

6. A laminated board, the facing plies of which include a layer consisting of ground cooked hard wood and a layer formed of pulp manufactured from other material.

In witness whereof I have hereunto set my hand this 9th day of April, 1923.

HARRY S. LEWIS.