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PLASTER WALL BOARD.

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To all whom it may concern:

Be it known that I, JOSEPH F. HAGGERTY, a citizen of the United States, residing at Batavia, in the county of Genesee, State of New York, have invented certain new and useful Improvements in Plaster Wall Board; 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.

Wall board for use in place of lath and plaster in the construction of buildings is now made with a gypsum core lined on both sides with heavy paper. The board is made in large panels usually three-eighths of an inch thick. Sawdust is sometimes mixed with the gypsum to decrease the weight of the board and also to decrease the liability to chipping when nails are driven through the board to secure it to the studding of the building. The longitudinal edges of the board may be sealed with paper as by bending up the edges of one or both of the liners.

The gypsum while still wet and plastic is rolled into shape on the lower liner and the natural adhesiveness of the gypsum when it crystallizes or sets is relied on to secure the paper liners to the board. Unfortunately this natural adhesiveness of the gypsum is variable. It depends in large measure on the amount of moisture present in the gypsum when the plastic mass is being shaped. It depends on the amount and character of the sawdust or other foreign material added. It depends on the fibrous structure, the moisture content, the surface characteristics and the thickness of the paper liners. The result is that in regular commercial practice much material is produced in which there is not good adhesion between the paper liners and the gypsum core. Such a lack of adhesion materially reduces the strength of the board for the liners are relied on to stiffen the board and any lack of adhesion results in lines or areas of weakness. Ordinarily the defective adhesion does not become apparent until after the board has been dried in the kiln and is ready for shipment. Very often the defect does not become apparent until the board has been shipped and is ready for use by the consumer. Replacements of gypsum boards rendered defective through lack of proper adhesion of the liners is an item of large importance in regular commercial manufacture.

It is an object of the present invention to secure better adhesion of the paper liners to the gypsum through the use of an appropriate amount of carbohydrate material in the mixture, as for instance starch or the like, while the board is being made. Thus by adding cooked starch paste, for instance, to the dry gypsum the natural adhesiveness of the gypsum is augmented by the adhesiveness of the starch with the result that the liner or liners stick tenaciously. Furthermore, a larger percentage of water can be used in the mixture, when starch or other carbohydrate is used. In the usual practice, the difficulties of securing adhesion of the liners increases with an increase in the amount of water used. While it is possible to use as high as 50% or 60% of water, in the usual process it is impracticable, because the mixture must be stirred to so near the point of setting before it is delivered to the liners that the liners will not adhere. The use of starch has other advantages as hereinafter briefly pointed out.

The procedure followed by me in practice of the preferred embodiment of the present invention consists in adding 2 lbs. of starch to 6 lbs. of cold water to form a suspension in which the starch granules are separated one from another. The starch may be corn starch, potato starch, or equivalent gelatinizable material. This suspension is then added to 52 lbs. of water heated preferably to about the boiling point. The hot water bursts the granules of starch and cooks or gelatinizes the starch. The result is a thin and somewhat clouded liquor. 40 lbs. of dry powdered gypsum is then added to the liquor and thoroughly mixed therewith. The best way known to me for securing the desired intimate mixing is to agitate the mix thoroughly for about two minutes in a tank having a vertical rotatable shaft with blades or propellers. After this agitation, the thoroughly mixed mass in a plastic condition is ready for delivery to the board machine to be rolled out into a thin sheet in conformity with standard practice.

A paper liner suitable for use with this board may be made from ground wood fibre or from waste paper beaten to a pulp and formed into sheets, or may be made from mixtures of these. A proper liner has a

caliper of 25 points, that is to say, it is .025 of an inch in thickness. Such a paper weighs about 75 lbs. per 1000 square feet.

In the board machine the plastic gypsum and starch mixture is rolled into intimate contact with the bottom liner, and likewise with the top liner, if one is used, and some of the moisture from the gypsum soaks into the paper liner rendering it soft and plastic and facilitating the bonding of the paper to the gypsum core when the latter crystallizes or solidifies. When gelatinized starch is present in the gypsum mix as above described the starch prevents the water of the gypsum from going too freely into the paper. The chemical affinity of the starch for the water holds the moisture in the gypsum and prevents the paper from becoming mushy. A soft mushy paper greatly increases the difficulty of handling gypsum board in the mill prior to drying.

In conformity with usual practice, the gypsum layer is formed in a continuous sheet and while still moist is cut to approximately finished dimensions. The moist sheets or panels so formed are then dried in kiln as usual at 140 to 190° F. for about 24 hours. I find it expedient to make the boards with a finished thickness of seven-sixteenths of an inch, this being one-sixteenth of an inch thicker than the usual practice. I am able to do this and still keep the weight of the board within permissible limits because of the gelatinized starch which seems to separate the crystals of the gypsum and so yield what might be regarded as a more porous and consequently lighter board. With starch present in the proportion above mentioned the finished board seven-sixteenths of an inch thick weighs approximately 1,250 lbs. per 1000 square feet as against usual weights of 1,750 to 2,000 lbs. per 1000 square feet three-eighths of an inch thick when gypsum alone or a mixture of gypsum and sawdust is used as the core of the board. This addition to the thickness with simultaneous saving in weight is an important commercial consideration in the transportation and marketing of this relatively heavy product.

The gypsum board with the starch addition as above described is easier to saw than ordinary gypsum board, presumably because of the slight separation of the gypsum crystals by the intervening starch jell, or more strictly speaking the residue of that jell. The product saws more like lumber while the material of the prior art saws much like a soft rock with resultant heavy wear on the carpenter's tools even when sawdust is present. With the boards of my present invention sawdust can be omitted entirely and yet the boards can be nailed to the studding without serious chipping or splitting of the gypsum. This result is no doubt due in part to the improved crystalline structure of the gypsum core, but is also due in part to the increased adhesion between the paper liners and the board. The paper sheet or liner is intimately bound to the surface of the gypsum not only by the crystallization of the gypsum, but also because of the adhesiveness of the starch held in the interstices of the gypsum. Furthermore the gypsum while setting has not been drained of its proper moisture content through diffusion and dissipation of the water into the paper liner where its presence serves no useful purpose and materially increases the difficulty of handling the boards on their way to the kiln. Such a close bond between the paper and the gypsum materially reduces breakage in handling at the kiln and the finished board is stronger because use is made of the full strengthening value of the paper uniformly distributed over the entire board.

The strength of the board as above made, may be materially increased, and the tendency to breakage reduced by the addition of fiber, as for instance, asbestos fiber, wood fiber, sulfite fiber, jute and the like. The asbestos fiber is preferably in some respects, being fire-proof and of a mineral nature. When fiber, as for instance, asbestos fiber, is added to the paste and thoroughly distributed so that the fiber is completely separated, each individual fiber becomes covered with the paste, which being adhesive, causes the gypsum to adhere more tenaciously to the fiber when the board is dried.

The relative quantity of starch above indicated is the best known to me for the purpose set forth, but I am aware that the percentage can be varied to some extent without substantial sacrifice and similarly that details of the procedure of compounding the plastic mixture of gypsum with starch can be varied without departing from the spirit of my invention as defined by the appended claims.

I claim:

1. A wall board consisting mainly of gypsum and having a paper liner, cooked starch being incorporated with the gypsum, to insure secure adhesion of said paper liner.

2. A wall board consisting mainly of gypsum and having a paper liner, cooked starch being incorporated with the gypsum in about the proportion of 2 lbs. of starch to 40 lbs. of gypsum, to insure adhesion of said paper liner.

3. A wall board consisting mainly of gypsum and having a thickness of about seven-sixteenths of an inch and having paper liners on both sides, cooked starch being uniformly distributed throughout the gypsum in about the proportions of 2 lbs. of starch to 40 lbs. of gypsum, to secure better adhesion of said paper liners than is to be had

from gypsum alone; substantially as described.

4. The method of making a paper lined gypsum board which consists in intimately mixing cooked starch with dry gypsum and then rolling into shape on a paper liner; substantially as described.

5. The method of making a paper lined gypsum board which consists in cooking starch in water, adding gypsum thereto, thoroughly agitating and then rolling into shape on a paper liner; substantially as described.

6. The method of making a paper lined gypsum board which consists in mixing 2 lbs. of starch with 6 lbs. of cold water to form a suspension, adding said suspension to 52 lbs. of hot water to burst the starch granules and gelatinize the starch, adding 40 lbs. gypsum, mixing thoroughly and then rolling into shape on a paper liner; substantially as described.

7. The method of making a paper lined gypsum board which consists in mixing 2 lbs. of starch with 6 lbs. of cold water to form a suspension, adding said suspension to 52 lbs. of hot water to burst the starch granules and gelatinize the starch, adding 40 lbs. of gypsum, agitating thoroughly in a blade mixer for about two minutes and then rolling into a sheet about seven-sixteenths of an inch thick between paper liners; substantially as described.

8. A wall board consisting mainly of gypsum and having a paper liner, cooked carbohydrate being incorporated with the gypsum to insure secure adhesion of the paper liner, fiber being thoroughly distributed throughout the carbohydrate to strengthen the board.

9. A wall board consisting mainly of gypsum and having a paper liner, cooked starch being incorporated with the gypsum to insure secure adhesion of the paper liner, fiber being thoroughly distributed throughout the starch to strengthen the board.

10. A wall board consisting mainly of gypsum and having a paper liner, cooked carbohydrate being incorporated with the gypsum to insure secure adhesion of said paper liner.

11. A plaster board, or the like, comprising a body portion of plaster, mixed with a starch product and a covering of paper, adhering thereto.

12. A plaster board, or the like, comprising a body portion of plaster, mixed with a finely comminuted starch product and a covering of paper adhering thereto.

In testimony whereof I affix my signature.

JOSEPH F. HAGGERTY