July 10, 1923. 1,461,590

C. O. WALPER

WALL CONSTRUCTION

Filed July 24, 1922 2 Sheets-Sheet 1

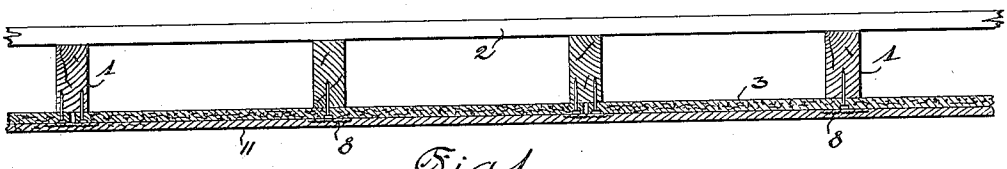



Fig. 1.

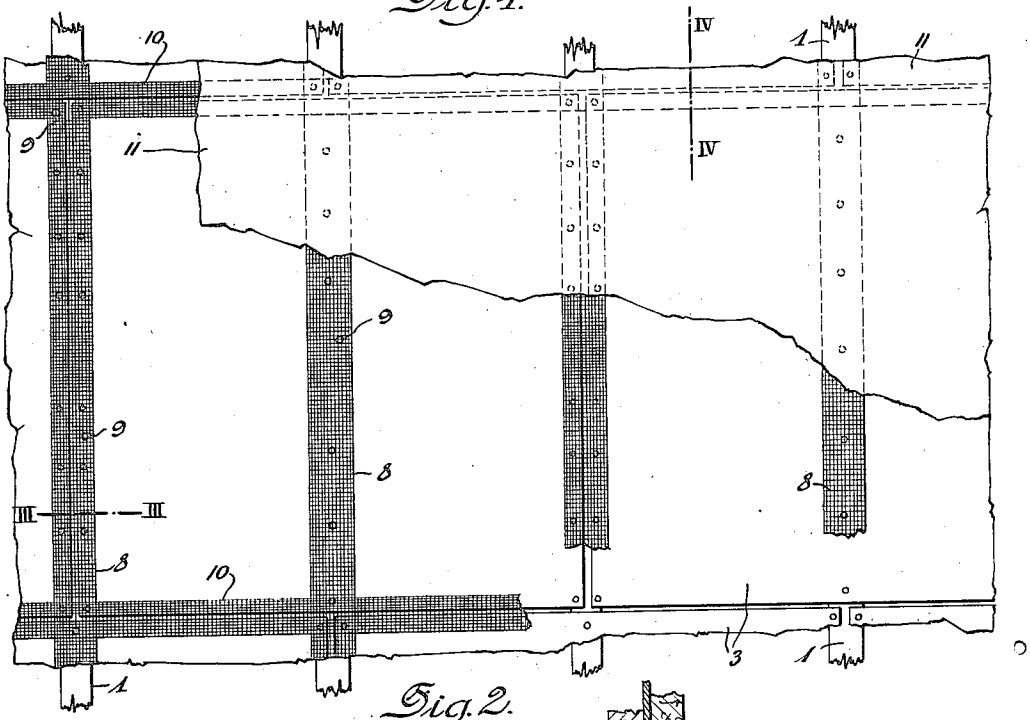



Fig. 2.

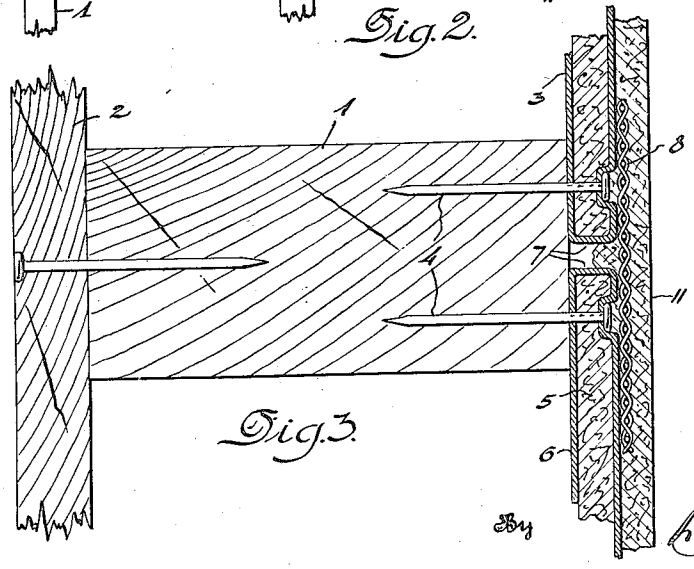



Fig. 3.

Inventor:

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Fig. 4.

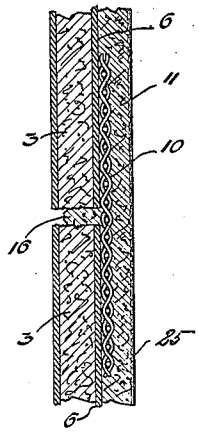



Fig. 5.

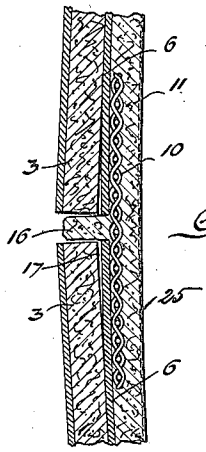



Fig. 6.

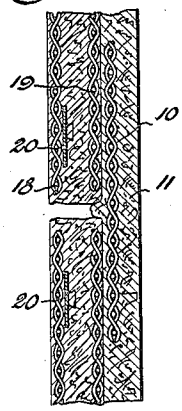



Fig. 7.

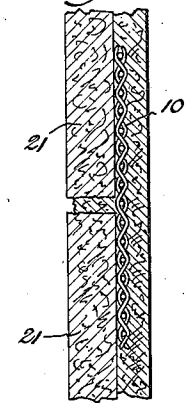



Fig. 8.

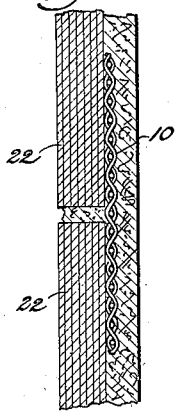
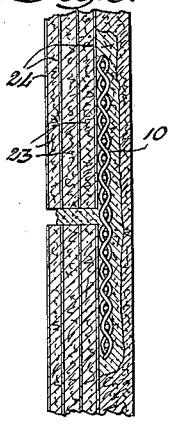



Fig. 9.




Inventor:

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By Robert W. Wright

Attorney.

Patented July 10, 1923. 1,461,590

# UNITED STATES PATENT OFFICE.

CURRY ORA WALPER, OF DETROIT, MICHIGAN, ASSIGNOR OF ONE-THIRD TO FRANK A. MASLEN AND ONE-THIRD TO BERNARD E. CLARK, BOTH OF DETROIT, MICHIGAN.

## WALL CONSTRUCTION.

Application filed July 24, 1922. Serial No. 576,968.

*To all whom it may concern:*

Be it known that I, CURRY ORA WALPER, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Wall Constructions, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to the construction of walls for buildings.

It has for its primary object the provision of a system of construction by which a satisfactory rigid and permanent surface may be formed upon ordinary wooden studding or upon metallic supports without using the ordinary wooden or metallic lath.

A further object of my invention is the provision of a system of constructing a finishing surface coating for use directly upon any of the various types of wall boards to obviate the necessity of the use of the ordinary rough coat.

A still further object of the invention is the provision of a method of reinforcing a surface coating across the joint at the unsupported meeting edges of wall board panels to prevent the formation of cracks either during the drying of the surface coating or under the influence of subsequent distortion of the wall surface.

The increasing cost of wooden lathing together with the other disadvantages of the ordinary method of constructing a plastered wall has led to many attempts to use other forms of material for the wall surface. It has been proposed to use wall boards consisting of a single sheet of pulp or formed of a plurality of laminations of paper secured together by various adhesives, but such boards commonly warp, shrink and expand under various conditions of humidity and it has been found difficult to conceal the joints where the various panels abut. The manufacturers of such boards therefore commonly recommend the use of panelling strips to conceal the joints at the meeting edges of the boards. There are however many walls in which it is undesirable to use such panelling strips and there have been placed upon the market a number of composition boards usually having a plastic composition of gypsum with some other ingredient such as sawdust or fiber with a surface protecting layer of thin pasteboard. These panels are usually fragile and where they have to be handled several times before being applied to studding or joists, the edges are likely to be damaged and irregular. Furthermore the ordinary finishing coat used upon plastered walls does not readily adhere to the paper surface and when it is applied to a wall consisting of such panels, cracks almost invariably form at each of the meeting edges, rendering the wall unsightly and unsatisfactory for first class work. To avoid this cracking at the joints where plaster boards are used it has been customary to use a rigid rough coat consisting of gypsum and sand, the rough coat being substantially as thick as the plaster board and upon this rough coat the ordinary finishing coat or putty coat is applied. This finishing coat consists of lime and gypsum, the lime usually comprising eighty-five per cent or more of the mixture.

With wall boards less rigid than the thick plaster boards it is impractical to use even this method of applying a rough coat followed by a finishing coat, the adhesion of the rough coating being slight and the pulp or paper wall boards usually being too much influenced by the action of moisture to form a satisfactory backing.

The present invention solves the problem of producing a satisfactory wall surface upon a plaster board backing by the conjoint use of a composition having the quality of great elasticity and the additional quality of adhering very firmly to a paper or other porous surface with a reinforcement preferably consisting of a metallic fabric across the joints where the plaster boards lie in abutting relation. In assembling wall boards upon their supports it is customary to leave a little space between the boards. It is not practicable to assemble boards to form an absolutely perfect joint since in the manufacture of the boards the angles will vary from a true right angle and where the edges have been struck or otherwise damaged during shipment or handling, the edges will not form a straight line. The expression "in abutting relation," is therefore intended to mean a relationship of two boards such that they lie in substantially the same plane with their edges in close proximity even though the joint may be irregular and though the

boards may not lie in actual contact with each other.

In the accompanying drawings,

Figure 1 is a horizontal section through a wall showing one embodiment of my invention;

Fig. 2 is a fragmentary front elevation of the structure shown in Fig. 1, parts being broken away;

Fig. 3 is a horizontal section on the line III—III of Fig. 2 but on a larger scale;

Fig. 4 is a vertical section on the line IV—IV of Fig. 2;

Fig. 5 is a section on the same line, the parts being shown as distorted by pressure;

Figs. 6, 7, 8 and 9 are vertical sections similar to that of Fig. 4, showing other forms of wall boards.

In Figs. 1 and 3 are shown sections of an ordinary outside wall construction in which wooden studs 1 have an outer sheathing 2 of wood which may consist of the ordinary clap-board or drop-side commonly used in wooden buildings. Upon the opposite end of the studs 1 from the wooden members 2 are nailed plaster boards 3 by means of nails 4 driven through the edges of the boards as they lie in abutting relation upon the end of the stud. As best shown in Fig. 3, the plaster boards consist of a filler 5 of a gypsum composition, the board being covered with a layer of paper 6 which extends around the vertical edges of the boards as indicated at 7.

As indicated in Fig. 2, the plaster boards are made in panels approximately thirty-two inches in width, this being twice the standard distance from center to center of adjacent studs in wooden buildings. The best results are secured by staggering the joints upon alternate studs so that the vertical joints of adjacent boards shall not lie in the same line. After the boards have been nailed in place upon the studs and joists to form a complete covering for the walls and ceiling, reinforcing strips 8 are placed along each stud upon the surface of the wall boards to cover the vertical joints where such exist and to form a reinforcement to prevent cracking opposite studs where no vertical joints between the boards exists.

Thus the necessity of cutting the strips into short lengths is obviated and the strips serve as an additional reinforcement for the central portion of the panel as well as a form of lathing to which the surface coating will adhere firmly. These reinforcing strips may be secured in place by tacks or small nails 9 before the plasterer arrives on the job or the plasterer may apply some of the material of the finishing coat or a similar puttying composition along the joints to partially fill in the crack and the strips may then be laid along the joints and pressed into this composition which will be adhesive enough to hold the wire strips in place.

As shown in Fig. 2, horizontal reinforcing strips 10, which may be the same in every respect as the strips 9, are used to cover the horizontal joints.

The preferred composition for a finishing coat consists of a mixture of gypsum from sixty per cent to seventy-five per cent; lime from twenty per cent to thirty per cent and for certain locations an additional filling or hardening material such as sand or fine asbestos which may be used up to about ten per cent of the total mixture. A composition having this high percentage of gypsum will cling very tenaciously to a paper or other porous surface, and while it is somewhat brittle it has great elasticity, permitting considerable bending without cracking. The mixture is prepared with a sufficient quantity of water so that it may be flowed smoothly upon the surface as in the application of the ordinary putty coat, a sufficient amount of commercial retarder being used to prevent the rapid setting of the composition. For best results the paper surface covering the plaster board should be sufficiently porous to absorb a considerable amount of water present, but should not have enough suction to dry out the plastic mixture to an extent preventing proper setting and hardening of the composition.

Plaster of Paris is a mixture of anhydrous, dihydrate, and hemihydrate, sulphate of calcium. In setting, this requires a sufficient amount of water to enable a recrystallization to occur, the plaster becoming converted into a mass of interlacing crystals of the dihydrate. This process of hydration is much more rapid and produces a different resulting product than the hardening which occurs when lime is used as a plaster. In the latter case it appears as if a colloidal calcium hydroxide is formed when lime is wetted, and this on drying sets by a process analogous with the drying of glue. The formation of calcium carbonate by the absorption of carbondioxide from the atmosphere occurs at a late stage in the setting. For the proper hardening of the lime mixture a certain quantity of moisture is necessary to facilitate the rapid absorption of carbondioxide and to prevent undue shrinkage of the surface during setting. This moisture is usually supplied by the giving up of water absorbed by the rough coat to which the finishing coat is usually applied. In the case of plaster boards having a paper surface there is not enough moisture absorbed and retained to cause a proper setting of the lime and it is therefore impossible to use the ordinary finishing or "putty" coat consisting of a very large per-

centage of lime with a very small percentage of plaster of Paris, upon paper coated wall boards. By the use of the mixture containing a high percentage of gypsum a coating having very different qualities is obtained. This coating adheres to the paper surface sets rapidly, requires only such moisture for its setting as may be obtained from the moistened paper covered wall board and by the end of about twenty-four hours has formed an elastic and resilient surface containing so little excess moisture that the wooden trim about doors, windows and the like may be applied without injury. After the ordinary finishing coat has been applied upon the surface of the rough coat a period of several days is usually required to permit hardening and drying out before wooden trim may be secured in place in contact with the finishing surface.

As shown in Fig. 4, a reinforcing strip 10 extends across the space between the abutting edges of the plaster boards 3. This strip will preferably be made of a wire mesh fabric provided with a coating of some rust preventing composition. Upon the outer paper surfaces 6 of the meeting boards is applied a surface finishing coat 11 of the adherent elastic plastic composition just described which clings to the paper at both sides of the strip 10 and which passes through the meshes of the metallic fabric into contact with the paper behind the fabric. A certain amount may be forced through the fabric at the joint as indicated at 16 but this is unimportant and is not relied upon to close the joint or as a reinforcing means. If pressure is applied upon the finished surface 11 after it has become dry it will bend outward on a curve as indicated in Fig. 5. The composition boards 3, having a rigid center, will bend about the nearest studs and the boards being rigid will tend to preserve their plane configuration. The adhesion of the surface coating 11 for the paper surface 6 is greater than the adhesion between the paper and the plastic composition core of the wall board. At the edge of each board adjacent to the joint if sufficient pressure is applied the paper will loosen from the composition core as indicated at 17 in Fig. 5 but the finishing coat 11 reinforced by the metallic fabric 10 will not crack but will simply become flexed in a curve and when the pressure is removed the surface 11 will return because of its elasticity to its original position.

By this construction there is provided a wall having a finishing surface of a plastic material which is resilient and which has a movement independent of the movement of the rigid wall sections lying behind it at the unsupported joints. By the use of an independent elastic surface coating provided with a reinforcement at the point where the greatest yielding of the panels behind it can occur, it is possible to use a single thin finishing coating upon any ordinary wall board without the formation of cracks at the meeting edges of the panels.

In Fig. 6, the reinforcing 10 and surface coating 11 is shown applied across the joint at the abutting edges of two wall boards containing wire reinforcements 18 and 19 and metallic nailing strips 20, this form of fireproof board being shown and described in my co-pending application, Serial No. 493,921, filed August 20, 1921.

In Fig. 7 the wall boards 21 may consist of single layers of a fibrous composition such as wood pulp or other compressed fiber.

In Fig. 8 the panels 22 are shown as laminated sheets of pasteboard held together by any suitable adhesive.

In Fig. 9 the wall boards consist of a plurality of layers 23 of a plastic composition separated by sheets of paper 24. These are all familiar forms of composition boards now upon the market. In general the present system of wall construction may comprise any form of rigid composition panel having a surface to which an elastic finishing coat of plastic material will strongly adhere when used in conjunction with a reinforcement across the joint at the meeting edges which will form with the elastic finishing composition a surface movable independently of the movement of the free edges of the wall boards.

It will be evident that many modifications may be made in the various details of construction without departing from the principle of my invention or sacrificing any of its advantages. For example the finishing coat 11 may obviously be constructed of more than a single layer if desired. In some circumstances it has been found advantageous to apply a coating of the composition described over as large an area as the workman can conveniently reach from his scaffolding, the surface being made only as smooth as is convenient with a wooden float and then after the portion first applied has received its set and while it is still wet a thin surface coating indicated at 25 in Figs. 4 and 5 is applied to give the desired smoothness of finish. This finishing coat has little or no structural value, but is primarily for the purpose of enabling the workman to work more rapidly than he would be able to if he attempted to give a very smooth finish to the first layer. By applying the first layer rapidly a large surface can be quickly covered and as the mixture sets it will have a great suction even though wet so that a very thin finishing coat preferably with a higher percentage of lime than of gypsum can be applied to the surface and quickly trowelled to form a very smooth surface. However this surface coating 25 together with the primary coating 11 forms substantially a

single layer and the coating 25 will not be needed if the workman choses to work somewhat more slowly in order to give the coating 11 a very smooth finish as the work proceeds.

As a further modification the reinforcing fabric 10 may obviously be of any suitable metal other than iron in which case no rust proofing coating will be necessary. In cases where there is no likelihood of strains due to pressure as upon the upper portion of walls or on ceilings, the fabric 10 may consist of any suitable equivalent for the metal fabric such as heavy cloth or of any other flexible material capable of acting as a reinforcement and providing sufficient adhesion for the material of the surface coating. The invention is therefore not limited to the specific details shown but is claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

I claim:

1. A building structure comprising a plurality of supporting members, wall boards secured to said members with their abutting edges having portions capable of movement, a reinforcing material extending across the joint at the abutting edges of said panels opposite the portions capable of movement, and a surface coating of an elastic plastic material covering the reinforcing material and adhering to the wall boards on opposite sides of the reinforcement, said surface coating and wall boards being capable of relative movement adjacent to their abutting edges.

2. A building structure comprising a plurality of supporting members, a plurality of wall boards secured to said supporting members, with their edges in abutting relation, a flexible reinforcing material extending across the joints at the abutting edges of said wall boards, and a finishing coat consisting of a single layer adhering to the surface of the wall boards and to the reinforcing material at their abutting edges, said finishing coat and said wall boards being capable of relative movement adjacent to the abutting edges of said boards.

3. A building structure comprising wooden supporting members, plastic composition wall boards nailed thereto with their edges in abutting relation, reinforcing fabric arranged opposite the joints at abutting edges of the boards, and a finishing surface coating consisting of a single layer of an elastic plastic composition adhering to the surface of said wall boards and to said fabric, said wall boards and said finishing coating being capable of relative movement adjacent to the abutting edges of said boards.

4. A building structure comprising supporting members, a plurality of composition wall boards having a paper surface secured to said supporting members with their edges in abutting relation, flexible reinforcing fabric arranged across the joints between the abutting edges of said boards, and a finishing coating covering the surface of said wall boards, said coating having the qualities of strong adhesion to a paper surface and of elasticity, said finishing coating and said composition boards being capable of separation when pressure is applied adjacent to the meeting edges of said boards.

In testimony whereof I affix my signature in presence of two witnesses.

CURRY ORA WALPER.

Witnesses:

CHARLES W. STAUFFIGER,

ARTHUR MINNICK.