M. J. O. MALLEY.

REINFORCED FIBROUS MATERIAL OF CONSTRUCTION.

APPLICATION FILED MAR. 20, 1916.

1,209,315.

Patented Dec. 19, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

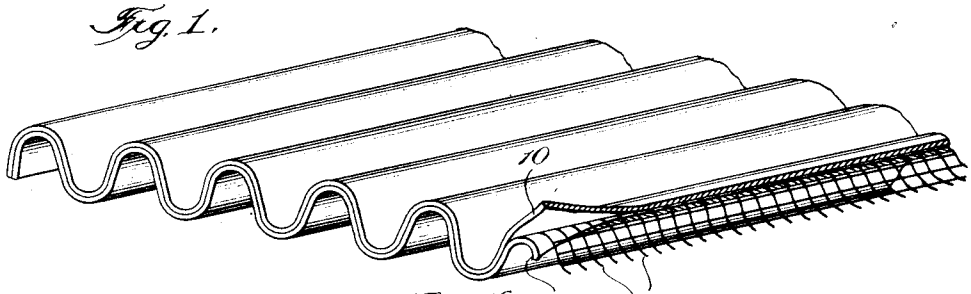


Fig. 2.

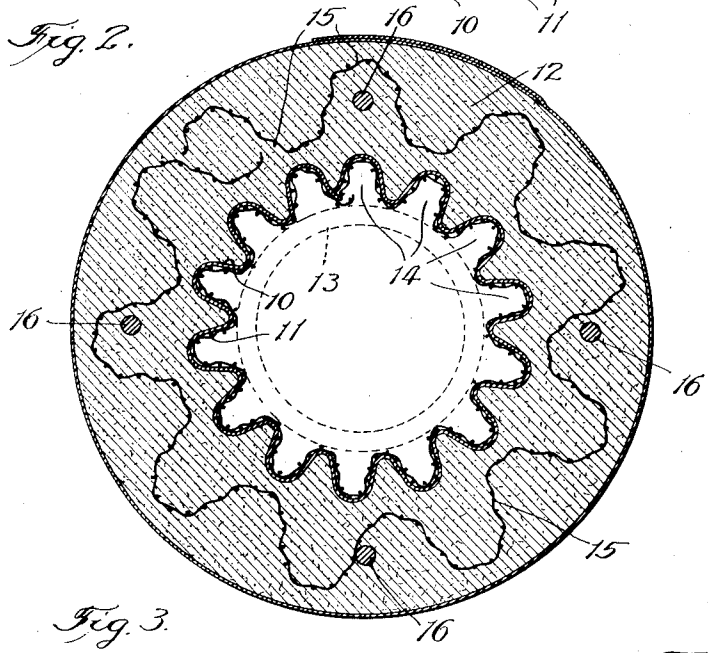


Fig. 3.

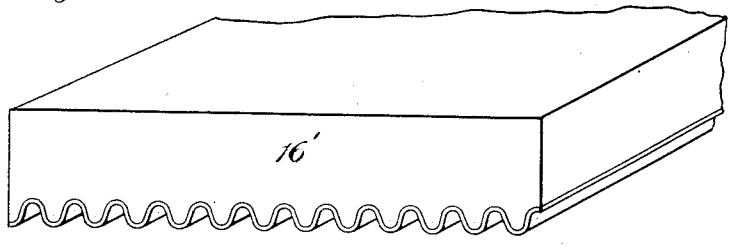
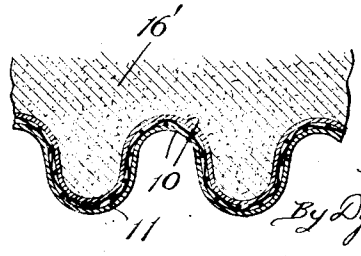


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 5.

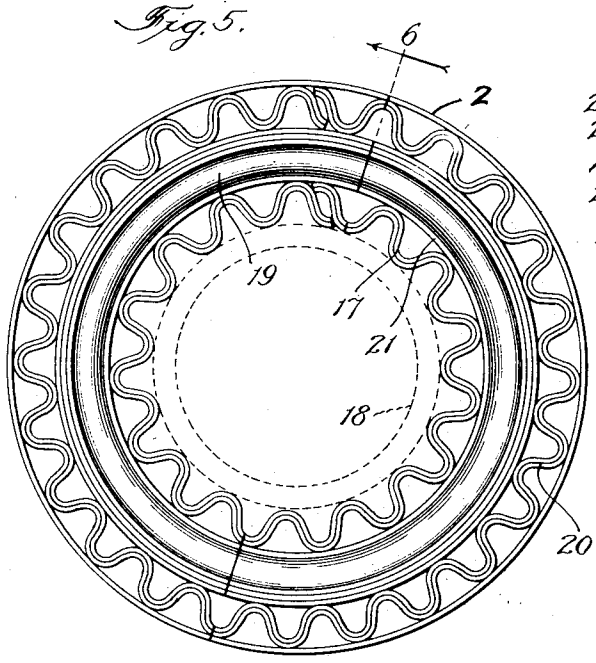


Fig. 6.

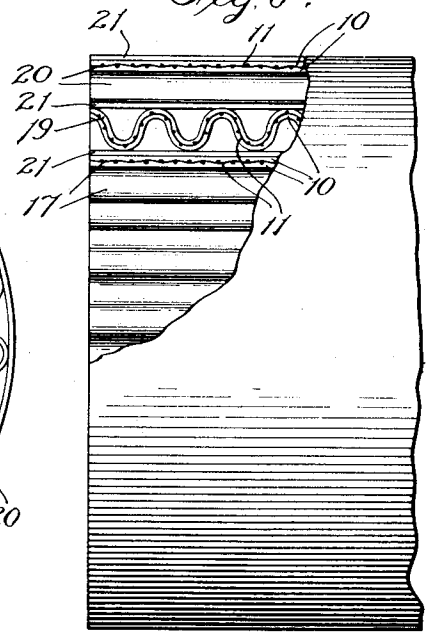


Fig. 7.

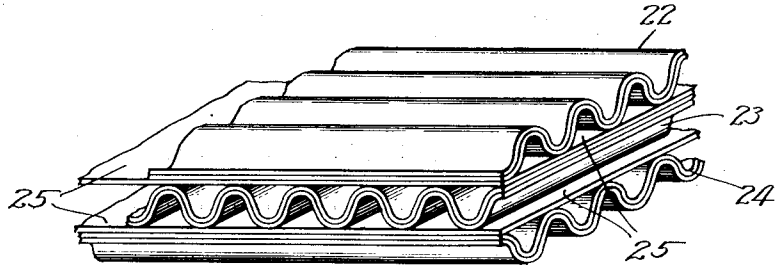
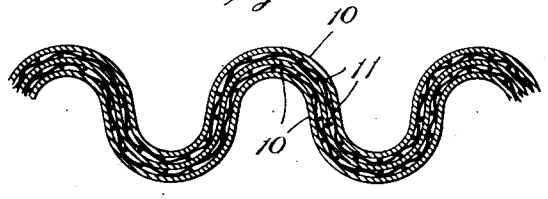


Fig. 8.



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UNITED STATES PATENT OFFICE.

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REINFORCED FIBROUS MATERIAL OF CONSTRUCTION.

1,209,315. Specification of Letters Patent. Patented Dec. 19, 1916.

Application filed March 20, 1916. Serial No. 85,330.

To all whom it may concern:

Be it known that I, MICHAEL J. O. MALLEY, a citizen of the United States, residing at 820 West Lake street, Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Reinforced Fibrous Material of Construction, of which the following is a specification.

My invention relates to certain new and useful improvements in materials of construction.

More particularly the invention is concerned with the use of fibrous substances of the nature of asbestos sheets, plates or blocks, building and roofing papers and fibrous composition shingles, felt sheets, etc. All of the substances named are alike in that they are of low tensile strength, the common grades of short-fiber asbestos sheets being in fact so poorly knit as to fall to pieces under any but the most careful handling. The building and roofing papers and felts are of various qualities and strengths, but are all deficient in rigidity and relatively easy to perforate or tear. So also the molded plates, pipe coverings, etc., composed of asbestos fiber and a filler and binder such as gypsum or magnesia are so fragile that no attempt is made in practice to make use of anything except small units. By my invention these materials may be formed into sheets, plates, blocks and molded shapes of high tensile and compressive strength and great rigidity, and having other noteworthy advantages over any material of construction now known. Briefly these results are obtained by reinforcing every part of the fibrous material with a woven wire fabric, binding the meshes of the fabric to the fibers of the base material, and the latter to each other, with a binding agent suited to the requirements of the service to which the finished product is to be put, and effecting a firmer union of the component parts by corrugating the laminated sheet thus produced before the binder has had opportunity to set.

The invention will be more fully understood from the following detailed description, taken in connection with the accompanying drawings in which:

Figure 1 is a perspective view of a corrugated sheet of asbestos, felt or the like, constructed in accordance with my invention, the edge of the sheet being opened to show the construction. Fig. 2 is a cross-section through a molded pipe-covering in which my corrugated sheeting is used. Fig. 3 is a perspective view of a plate or block molded upon one of my corrugated sheets. Fig. 4 is an enlarged broken section through the block of Fig. 3. Fig. 5 is an end elevation of a pipe-covering constructed entirely of my sheeting. Fig. 6 a broken section on the line 6 of Fig. 5. Fig. 7 is a perspective view of a built up block formed from my corrugated sheet and Fig. 8 is an enlarged section of a multiple-ply sheet formed in accordance with the invention.

Referring more particularly to the drawings, the numeral 10 designates a sheet of asbestos, felt, or the like fibrous material, and the numeral 11 designates a sheet of woven wire fabric which may be of any suitable gage and mesh. In Fig. 1, two such sheets 10 have sandwiched between them the wire mesh fabric 11, the complete laminated sheet having the corrugated form shown. To manufacture such a product, the preferred mode of procedure is to apply a coat of heat-resisting insoluble binder such as silicate of soda (water-glass) to one face of each of the sheets 10, to then immediately and before the binder has set, lay the wire sheet 11 upon the coated face of one of the sheets 10 and apply the other sheet 10 coated face inside. The three-ply sheet thus formed is at once passed through a set of corrugating rolls, which are preferably heated, and by the bending and working action of these rolls the fibers of the two sheets 10 become locked to each other through the meshes of the wire fabric.

The finished product is an integral corrugated sheet of exceedingly high tensile and compressive strength, rigid in one dimension, and flexible in the other, but capable of being bent or formed as desired without rupture. If the sheets 10 be of asbestos fiber the resultant product will be fire-resisting to a high degree and substantially waterproof as well, owing to the binder between the sheets. If water-proof felt, tar paper or other waterproofed sheets be used, the resultant product will be water-tight.

The reinforced sheets of my invention are particularly desirable as materials of construction by reason of their corrugated form which, when they are laid against flat surfaces affords a subdivided air blanket, thus providing the most effective insulation

against both heat and sound. As to both of these properties my product is superior to any known product of equal strength and toughness, for the reason that in spite of the reinforcement and binding material, the sheet produced is essentially of loosely knit fibrous construction, and therefore in itself a high grade insulator of both heat and sound.

In Fig. 1, the sheets 10 overlie both surfaces of the wire fabric 11, this being the preferred construction. It is possible, however, to omit one of the facings 10 in certain classes of service. Thus in Fig. 2 such a single-faced, or two-ply sheet is used as a liner for a molded gypsum-asbestos pipe covering 12, the wire mesh fabric lying directly against the pipe 13. The asbestos sheet 10 becomes integrally united with the body of the pipe-covering in the process of casting the latter and the wire reinforcement 11, therefore serves the purpose of strengthening the structure as a whole in addition to protecting the corrugated inner periphery from abrasion and crumbling by contact with the pipe. The air spaces 14 formed by the corrugations are clearly shown in this figure, and their usefulness as heat insulators is obvious.

I prefer to further reinforce the molded pipe covering of Fig. 2 with a sinuous band of wire mesh fabric designated 15 and integrally molded within the body of the covering as shown. Longitudinal reinforcing rods or wire 16 may also be employed to further stiffen the construction. I find that a pipe covering of the type shown may be readily formed and handled in lengths upward of ten feet, without serious danger of breakage. Ordinary pipe coverings of this type have been found to be so fragile that commercial practice does not justify the use of lengths greater than three feet. By my invention therefore the expense of joining sections is greatly reduced, and it becomes possible to sheath the entire length of a riser between floors with a single section of pipe covering.

In Figs. 3 and 4 I have shown a molded block or plate 16^1 of asbestos-gypsum, magnesia or the like, cast upon a corrugated sheet of the form shown in Fig. 1. Here also, as in the construction shown in Fig. 2, the inner asbestos sheet unites with the block to form a practically integral mass, while the corrugations provide air spaces for insulation against heat and sound when the block or plate is put into use.

In Figs. 5 and 6 I have shown a form of pipe covering constructed entirely from my reinforced sheeting. This construction including an inner layer 17 of corrugated sheet of the form shown in Fig. 1, the corrugations running longitudinally of the pipe 18; an intermediate layer 19 of similar sheeting with the corrugations running circumferentially, and an outer layer 20 with the corrugations running longitudinally. Between the layers 17 and 19 and 19 and 20 and also as an outer covering for the latter plain asbestos sheets 21 may be employed. The various layers may be cemented together at their points of contact with any suitable cement such as the sodium silicate mentioned. Such a pipe covering is light in weight highly efficient as a heat insulator and exceedingly strong.

In Fig. 7 I have shown a built-up block comprising three layers, 22, 23 and 24 of reinforced corrugated sheeting, the layers being arranged with their corrugations at right angles, and cemented together, preferably with interposed plain sheets 25, which aid in subdividing the air spaces and give a greater contact surface for the cement binder. Such blocks are designed for general structural and heat insulation or lagging purposes. They have a very high efficiency as sound and heat insulators, may be constructed entirely of fireproof material such as asbestos or of ordinary felt, according to their uses, have a compression resistance running up to several tons to the spare foot and sufficient tensile strength to fit them for any reasonable surfacing requirements.

In Fig. 8 I have shown a five-ply corrugated sheet having alternate layers of wire mesh and fibrous sheeting, the construction and method of manufacture being the same as that of the three-ply sheet of Fig. 1, except for the addition of a second layer of wire mesh 11, and a third layer of fibrous sheeting 10. Such multiple-ply sheets may be useful where great strength and rigidity is required.

In the foregoing specification I have set forth some of the various forms which my invention may take and some of the uses to which these forms may be put. It is to be understood however, that these are illustrative only and for the purpose of making my invention more clear, and that the invention is not to be regarded as limited to any of these structural formations or uses except in so far as such limitations are included with the terms of the following claims in which it is my intention to claim all novelty inherent in my invention as broadly as is permissible, in view of the prior art.

It will be understood also that while I use the term "wire mesh fabric" as descriptive of the metallic reinforcement used, this term is intended to include not only wire fabric *per se*, but expanded, perforated, or other foraminous metal sheets.

What I claim as new and desire to secure by Letters Patent is:

1. A compound sheet comprising a layer of asbestos sheeting and a layer of wire fabric united by sodium silicate.

2. A compound corrugated sheet comprising a layer of asbestos sheeting having one surface impregnated with a cementitious binder and overlaid by a sheet of wire fabric, the said fabric and binder being worked into the said surface.

3. A cast or molded mass of earthy material, having one face corrugated, the said corrugated face having wire fabric integrally united therewith.

4. A cast or molded mass of earthy material integrally bonded with a facing sheet of corrugated asbestos having a wire mesh fabric integrally bonded to its surface by an impregnating cement.

MICHAEL J. O. MALLEY.

Correction in Letters Patent No. 1,209,315.

It is hereby certified that the name of the patentee in Letters Patent No. 1,209,315, granted December 19, 1916, for an improvement in "Reinforced Fibrous Material of Construction," was erroneously written and printed as "Michael J. O. Malley," whereas said name should have been written and printed as *Michael J. O Malley;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of February, A. D., 1917.

[SEAL.]

F. W. H. CLAY,

Acting Commissioner of Patents.

Cl. 154—45.