Sept. 6, 1932. W. K. NELSON 1,876,071

HEAT AND SOUND INSULATING BLOCK

Filed March 14, 1928 3 Sheets-Sheet 1

Fig. 1.

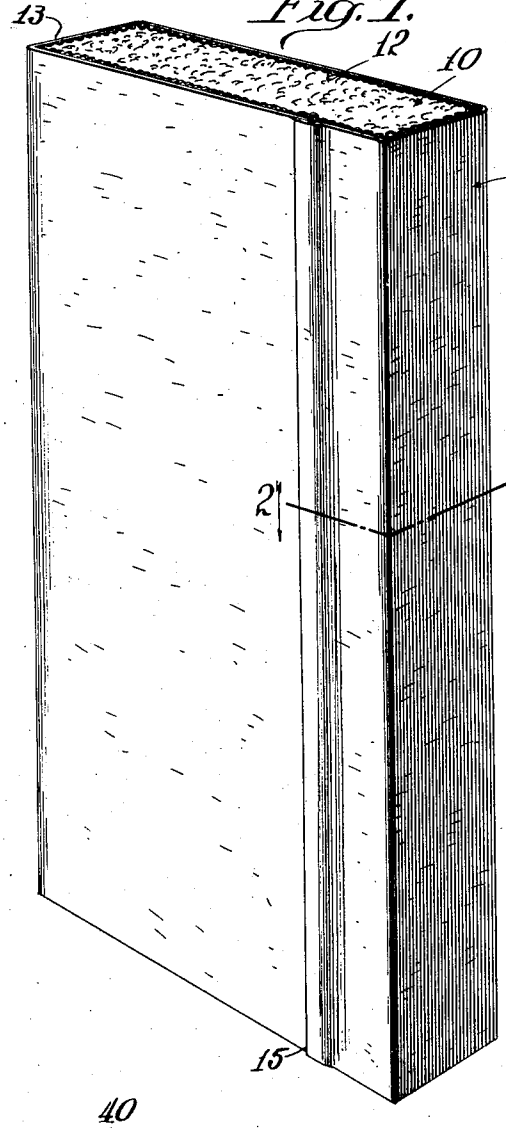


Fig. 2.

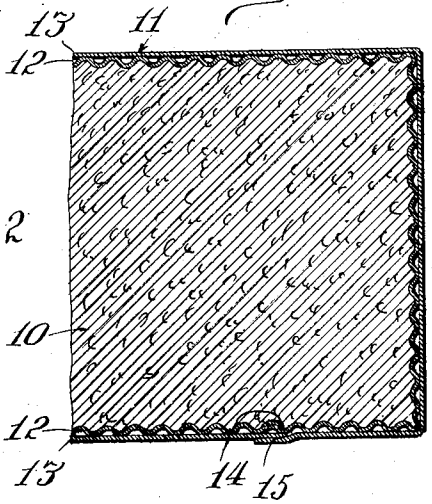
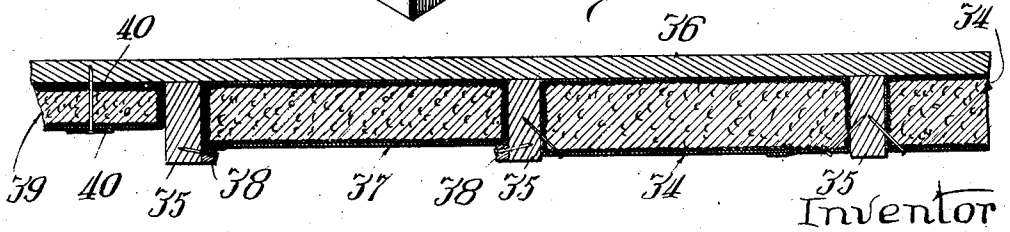


Fig. 7.



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Sept. 6, 1932. W. K. NELSON 1,876,071

HEAT AND SOUND INSULATING BLOCK

Filed March 14, 1928 3 Sheets-Sheet 2

Fig. 3.

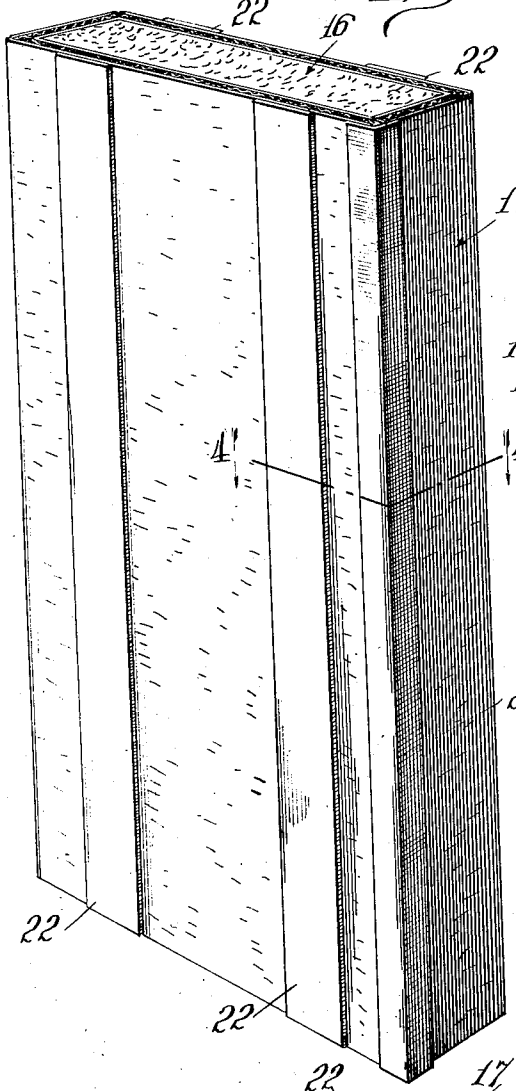


Fig. 4.

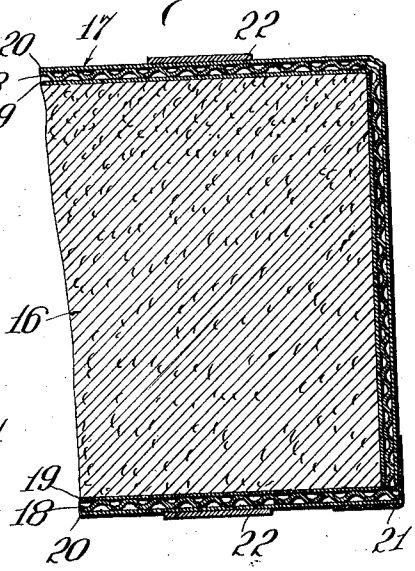
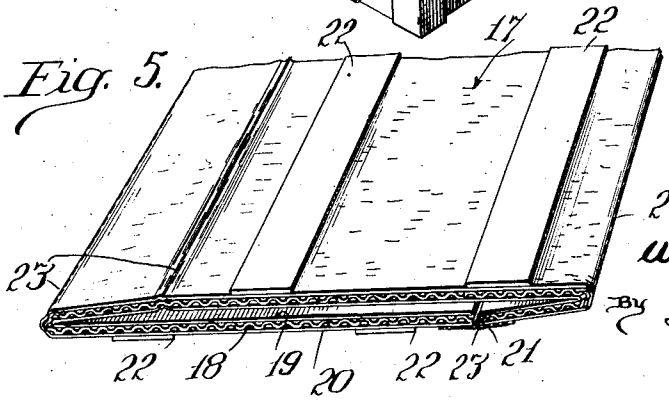


Fig. 5.



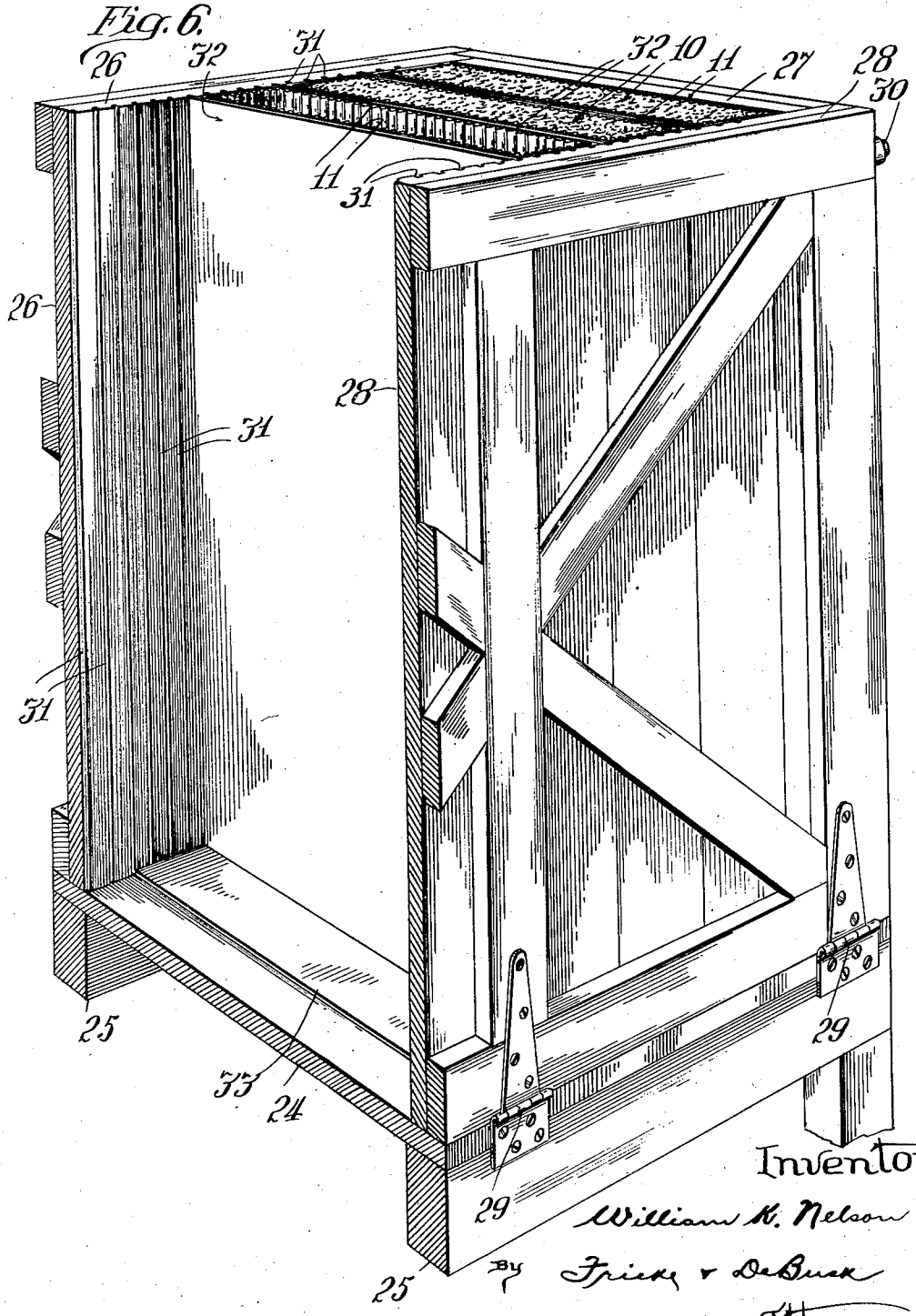
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Filed March 14, 1928 3 Sheets-Sheet 3

Fig. 6.



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UNITED STATES PATENT OFFICE

WILLIAM K. NELSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO UNIVERSAL GYPSUM & LIME CO., OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

HEAT AND SOUND INSULATING BLOCK

Application filed March 14, 1928. Serial No. 261,667.

My present invention relates to heat and sound insulating blocks and particularly to blocks the cores or body portions of which are formed of a composition material adapted to set or harden in cellular condition such, for example, as the material described and claimed in Ashenhurst Reissue Patent No. 15,952 of November 25, 1924, and that described and claimed in my Patent No. 1,641,641 of September 6, 1927.

One of the objects of my invention is the provision of a novel and improved block which shall be inexpensive and easy to manufacture of materials readily available in ample quantities at numerous places, require simple and inexpensive apparatus or equipment for its manufacture, be economical and convenient to handle, transport and install, not likely to be broken when handled or shipped, resistant to fire, not subject to disintegration, unattractive as a breeding place for pests, such as rats, mice and the like, and highly resistant to the transmission of heat and sound.

A further object of my invention is to provide for a block having a cellular gypsum core of the type mentioned, covering means extending over one or more of the sides or faces of the core and adapted to increase materially the insulation value of the block, to reenforce and strengthen the core and to cushion the core against any shocks it may be subjected to in handling or shipping, thereby protecting the core from breakage or serious damage. Preferably I employ covering means comprising two fibrous, superposed sheets secured together and so arranged that numerous voids or air spaces will be provided therebetween. I have found that a corrugated sheet secured to a plain or non-corrugated sheet provide a practical and efficient covering means for a fragile core of the type mentioned.

If a block of the type mentioned is to have satisfactory insulation value, the core thereof must be highly cellular and light in weight. Such a core in itself, however, has little strength, is very fragile and it must be reenforced and protected in some manner to make a practical structure. It is not possible to obtain satisfactory adhesion between a core, having the characteristics mentioned, and fibrous cover sheets which only extend over one face or side of the core; and, unless such sheets firmly adhere to the core, the resultant structure will be weak. It is another object of my invention to provide an efficient and practical covering means for the core of the block which shall be securely bonded to the core and adapted, in combination with the core, to provide a block of high insulation value, light in weight and capable of withstanding the shocks and strains to which it is likely to be subjected without being broken or damaged. This object of my invention can be attained by making the covering means in the form of a wrapper, sheath or envelop adapted to encircle or surround the core and to extend, preferably, completely over the two face sides and the two edge sides of the core. In making the block, preferably the wrapper is first made in the form of a rectangular tube, then placed on one end in a suitable mold, or other supporting means, in spread-out or opened-up condition and then the material for the cellular core is cast within the wrapper. In such a construction, the bonding action between the core and the wrapper is present in two planes at right angles to each other. The bonding effect mentioned prevents the core from becoming loose or slipping away from the wrapper; and it further results in strengthening and reenforcing the block by making the core and the wrapper in effect an integral or unitary construction.

Blocks of the type under consideration are ordinarily rectangular in shape and they are usually much longer than wide. When breakage does occur, the break usually extends transversely of the block. It is another object of my invention to provide a wrapper for the core of the block so constructed of corrugated and non-corrugated sheets that the corrugations will extend lengthwise of the block and thus insure maximum resistance to transverse breakage.

It is another object of my invention to improve heat and sound insulating blocks and the methods of producing them in sundry de-

tails hereinafter pointed out. Certain preferred types of blocks and suitable means for carrying out my improved methods are disclosed in the accompanying drawings and are hereinafter specifically described. That which I believe to be new and desire to cover by Letters Patent is set forth in the claims.

In the drawings,—

Fig. 1 is a perspective view of one type of heat and sound insulating block emboying certain principles of my invention;

Fig. 2 is a fragmentary sectional view, on an enlarged scale, taken on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of another type of heat and sound insulating block also embodying certain principles of my invention;

Fig. 4 is a fragmentary sectional view, on an enlarged scale, taken on the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of a fragmentary portion of the wrapper surrounding the block shown in Figs. 3 and 4;

Fig. 6 is a perspective view of a fragmentary portion of a mold suitable for making my improved blocks; and

Fig. 7 is a transverse sectional view, on a reduced scale, of a portion of a wall showing how different types of blocks made in accordance with my invention may be secured in place between the wall studs.

Like characters of reference designate like parts in the several views.

Referring first to Figs. 1 and 2 of the drawings, it will be seen that the block therein shown comprises a cellular core or body portion 10 disposed within a tube-like or sheath-like covering or wrapper 11 which extends around the core or body portion completely covering both side faces and both edge faces thereof. In this embodiment of my invention the covering or wrapper for the core comprises a corrugated fibrous sheet 12 in superposed relation and co-extensive with a plain or non-corrugated fibrous sheet 13, the sheet 13 being secured to the sheet 12 along the engaged corrugations by any suitable adhesive, such as glue. The sheets 12 and 13 extend completely around the core of the block and in the particular embodiment shown the free edges of the sheet 12 are overlapped and glued together at 14 while the free edges of the sheet 13 are overlapped and secured together at 15. The block described is intended for use in the insulation of the side walls or ceiling of a frame house and is approximately three inches thick, fourteen and three-eighths inches in width and thirty-six inches in length. It will be noted that the sheet 12 is disposed around the core so that its corrugations extend lengthwise of the block thereby insuring maximum resistance to transverse breakage of the relatively long, fragile core.

The block illustrated in Figs. 3 and 4 is similar in construction to that heretofore described, but the cellular core 16 thereof is surrounded by a wrapper 17 of considerably stronger construction than that shown in Figs. 1 and 2. As is clearly shown in Fig. 4, the walls of the wrapper 17 comprise cushioning means in the form of a corrugated sheet 18 interposed between and secured to inner and outer plain or noncorrugated facing sheets or liners 19 and 20, respectively. The sheets 18, 19 and 20 extend over both side faces and both edge faces of the core 16 and completely surround the core of the block. The free ends of said sheets 18, 19 and 20 are brought together at one corner of the wrapper and are secured by a strip of adhesive paper or cloth tape 21. In this embodiment of my invention, the sheet 18 is arranged so that its corrugations extend lengthwise of the block. The wrapper 17 is further reenforced by fastener-holding strips 22 which extend lengthwise of the block and which may be made from any suitable material such as heavy paper stock, said strips preferably being secured by a suitable adhesive to certain areas of the wrapper sheet 20.

The wrappers 11 and 17 are preferably made complete before the casting of the core material takes place. The wrappers may be made of any suitable sheet material at the place where the blocks are made or the wrappers may be made in a factory specializing in such products. The wrappers are preferably constructed so that they may be readily collapsed into flat form for convenience and economy of space in shipping, storing and handling. The wrapper 17, for example, is shown in collapsed form in Fig. 5 of the drawings. To facilitate collapsing the wrapper and obtaining smooth, square and true corners on the block, the walls of the wrapper are preferably scored, as indicated in Fig. 5 on the longitudinally extending dotted lines 23. I prefer the corrugations in the sheets 12 and 18 to be small rather than large, the smaller corrugations being more suitable in that they provide stronger surfaces. When the corrugations are relatively numerous and in direct contact with the core as shown in Figs. 1 and 2, the bonding action is greater due to the keying or locking effect produced. The corrugated and plain sheets forming the walls of the wrappers are preferably made of a material of a fibrous nature and they may be treated so as to possess moisture resisting and fireproofing qualities by any well known means.

In Fig. 6 of the drawings, I have illustrated a mold suitable for holding a plurality of the tube-like wrappers in spread-out or opened condition while the material for the cellular cores is poured within the respective wrappers. The mold illustrated comprises a bottom member 24 fastened on

supporting members 25, a back wall 26, end walls 27 (only one being shown), and a front wall 28. The back wall 26 and the end walls 27 are preferably secured in fixed relation to each other and to the bottom member 24 by any suitable means. The front wall 28 is swingingly connected to the bottom members 24 and 25 by hinges 29 and is held in upright position against the front edges of the end walls 27 by fastening members 30. The back wall 26 and the front wall 28 have aligned, vertically extending grooves or channels 31 adapted to receive partitioning plates 32. It will be apparent that vertical compartments of various widths may readily be formed by shifting one or more of the partitioning plates 32 from one set of grooves to another set. In preparing to cast the cellular gypsum cores, the front wall 28 of the mold is dropped down and each of the partition plates 32 is placed in its proper groove in the back wall. A thin metal plate 33 preferably of brass and of the width of the block to be formed is placed in the bottom of each compartment. The top surfaces of the plates 33 are then greased to prevent the core mixture from sticking thereto and then the front wall 28 is swung up into its vertical position and locked in place, care being taken to see that the front edges of the respective partition plates are disposed in the proper grooves of the front wall. A wrapper is then spread out or opened up and placed on end in each mold-like or vertical compartment, wrappers of the type illustrated in Figs. 1 and 2 being shown in place in three compartments of the mold. A sufficient quantity of the fluid mix to form the cellular gypsum core is then poured into each wrapper and is cast in bonding relation within the wrapper. The material for the cores readily rises to the top of the mold-like wrappers and is leveled off by a suitable tool by a screeding or trowelling action. After the core material has set or hardened sufficiently to hold its shape the side wall 28 of the mold is dropped and the green blocks may then be removed from the mold and stored where they may dry in the air, or they may be dried in a kiln, to eliminate the excess moisture from the body portions of the blocks.

I have illustrated in Fig. 7 of the drawings several ways in which the blocks may be secured in place between the studs of a wall. The blocks 34 are approximately equal in thickness to the width of the wall studs 35. It will be noted that the blocks are positioned from the inside, between the studs, against the sheathing 36 and are secured in place by toe-nailing, as shown. The block 37 is approximately three inches in thickness and is shown as being held in place by nailing strips 38. The block 39 is approximately two inches in thickness and is held in place by nails which pass through the longitudinally extending nailing strips 40 carried by the block.

The material described and claimed in the aforesaid Ashenhurst Reissue Patent No. 15,952 is suitable for the core or body portion of the block. I prefer, however, to use therefor a material made in accordance with the teachings of my aforesaid Patent No. 1,641,641. A satisfactory material for the production of a light weight, highly cellular core weighing in final cast form approximately twelve pounds per cubic foot can be made by compounding the following substances in substantially the following proportions: 100 lbs. calcined gypsum (substantially free of impurities), 9½ lbs. aluminum sulphate, 4¾ lbs. calcium carbonate, 1 oz. dry saponin (preferably in solution form), and 4 lbs. talc. The mixture of the aforesaid substances is gauged properly with water, agitated for a short time and then poured into the mold-like wrapper of the block and permitted to set. The solid substances set forth in the above formula may each be added specially to the mix or such of them may be made use of as happen to be present in the major ingredient as an impurity in its native state. Some of the substances may be either added to the mix in the form of a solution previously prepared or may be added to the compound in a dry state and then the compound added to the water or the water added to the compound, it being immaterial which course is followed.

When my improved block is made in accordance with the methods herein disclosed, the fluid mix forming the core, immediately upon being poured, expands and finds its way into every groove, recess or indentation in the inner surfaces of the walls of the wrapper thereby forcing the sides of the wrapper against the sides of the mold. A block of the desired shape and a block wherein an intimate and secure bond is present between the core and the wrapper is, therefore, insured. Casting the core material directly in contact with the inner surfaces of the wrapper avoids any disturbance to the green core when the block is handled in removing it from the mold to the place of drying. By using greased plates for the bottom of the mold to prevent sticking and by proper screeding or trowelling of the top surface of the core material, the block may easily be formed with smooth surfaces on its bottom and top ends which are flush with the ends of the wrapper and true or square with respect to the sides of the block. The surplus moisture held mechanically by the core material can be eliminated easily under suitable conditions due to the capillary action of the fibrous side walls having intervening voids or spaces and by the open ends of the block.

It will be apparent to those skilled in the

art that the manufacture of my improved block can be carried out economically. Casting the block on end within the sheath-like wrapper is a decided advantage. The walls of a wrapper made in accordance with the teachings of my invention, particularly when the corrugations extend vertically in the mold, or lengthwise with respect to the block to be formed, are self-supporting and remain in spread-out or opened condition when the wrapper is placed in the mold. While I have shown and described apparatus suitable for making a few blocks at a time, it will be obvious that production can be carried out on a large scale by the provision of apparatus similar to that shown and having several sections, each of which has a number of individual molds or block compartments. In such case, while the cores of the blocks in one section are setting and hardening, the wrappers may be inserted in the compartments of another section and the core material poured thereinto. By the time the pouring of the core material for the blocks in the second section is completed and the material screeded or leveled off, the core material of the blocks in the first section will have set and hardened sufficiently to permit the blocks therein to be removed for drying. In this way one or two men with a mold of small capacity, or a gang of men with a mold of large capacity, may carry on the manufacture of the blocks continuously.

Blocks may be made of uniform insulation value by following the teachings of my invention since the determining factors are easily controlled. Paper or other fibrous material for the walls of the wrappers of uniform quality, thickness and other desirable characteristics such as proper sizing, capacity for resisting fire and the absorption of moisture may be easily obtained. The character, porosity and thickness of the cores of the blocks are easily kept within close limits. The materials required for the manufacture of the block are readily available at numerous places.

The blocks are convenient to handle and install due to their light weight. The cost of transporting them is well within permissible limits. The blocks may be subjected to the abuse and knocks incident to handling and shipping without danger of breaking them due to their strong construction and light weight. The cooperating fibrous sheets comprising the wrapper, one of which is corrugated, provide an effective cushion around the block to protect it against shocks and strains.

While the cellular, light weight, gypsum core of the block is quite fragile, it is nevertheless rigid. Since the core is cast within the tube-like wrapper, is bonded thereto in two planes at right angles to each other and completely fills the wrapper, the block is capable of withstanding severe strains and shocks without danger of cracking or breaking. The fluid core material, in expanding and completely filling the wrapper, maintains the walls thereof taut and under some tension. The covering of the block cannot be peeled back without tearing the walls of the wrappers.

The blocks containing the cellular gypsum cores are highly resistant to fire, they are not subject to disintegration and they have no attraction as a breeding place for pests. In view of the character of the cellular core and the several layers of material present in the walls of the wrappers, with the intervening air spaces between said layers, the blocks are highly resistant to the transmission of heat and sound. The plurality of surfaces on each side or face of the block, with their relatively high surface resistance to heat and sound transmission, enhance materially the insulation effect of the block and also make it possible to reduce the thickness of the core. The sound-proofing value of the block is high, due to the several layers of fibrous, sound-absorbing material in the walls of the wrapper and the intervening air spaces.

The blocks are readily installed in the structure to be insulated. Since the blocks are completely dried when installed, no delay to subsequent building operations is incurred and no risk is involved due to residual moisture in the core structures.

The term "block" has been used throughout the specification in a broad sense and as including boards, panels or slabs varying in thickness, width and length, and I desire the term to be so understood and so construed in the appended claims.

I desire to have it understood that my invention is not to be restricted to the use of any particular type of apparatus for manufacturing the block, nor to any particular step in carrying out my methods of making the block, nor to any particular form or dimensions of the block, nor to any particular combination of materials used in the core of the block, except only in so far as the claims are so limited and so restricted by the state of the art, since it is evident that changes may be made in the block, in the methods of producing it and in the apparatus for manufacturing it without departing from the spirit of my invention.

I claim:—

1. In a heat and sound insulating block, the combination of a tubular wrapper comprising oppositely disposed wall panels hingedly connected together so as to form a rectangular mold, and a body of light weight, fragile material resulting from a mixture of calcined gypsum, water, and gas forming and gas retaining ingredients, said body being set and hardened in highly cellular condition in said wrapper in bonded relationship to its

inner faces so as to be locked firmly in position in the wrapper.

2. In a heat and sound insulating block, the combination of a tubular wrapper comprising angularly disposed wall panels hingedly connected together so as to form a mold, and a body of light weight, fragile material resulting from a mixture of calcined gypsum, water and gas forming and gas retaining ingredients, said body being set and hardened in highly cellular condition in said wrapper in bonded relationship to its inner faces so as to be locked firmly in position in the wrapper.

3. In a heat and sound insulating block, the combination of a tubular wrapper comprising angularly disposed wall panels hingedly connected together so as to form a mold, each of said panels comprising portions of corrugated and plain paper for providing a cushioning and an insulating effect, and a body of light weight, fragile material resulting from a mixture of calcined gypsum, water, and gas forming and gas retaining ingredients, said body being set and hardened in highly cellular condition in said wrapper in bonded relationship to its inner faces and filling irregularities in the inner faces of said wrapper so as to be rigidly anchored in the wrapper by reason of such irregularities.

4. In a heat and sound insulating block of rectangular shape and greater in length than in width, the combination of a tubular wrapper comprising angularly disposed wall panels hingedly connected together so as to form a mold, each of said panels comprising an outside portion of plain paper and an inside portion of corrugated paper, said portions being secured together for providing a cushioning and an insulating effect, the corrugations of said inside portion extending longitudinally with respect to the wrapper to reinforce the same, and a body of light weight, fragile material resulting from a mixture of calcined gypsum, water, and gas forming and gas retaining ingredients, said body being set and hardened in highly cellular condition within and about the corrugations of said inside portion thereby securely anchoring the body within its surrounding wrapper.

WILLIAM K. NELSON.