

Nov. 4, 1952

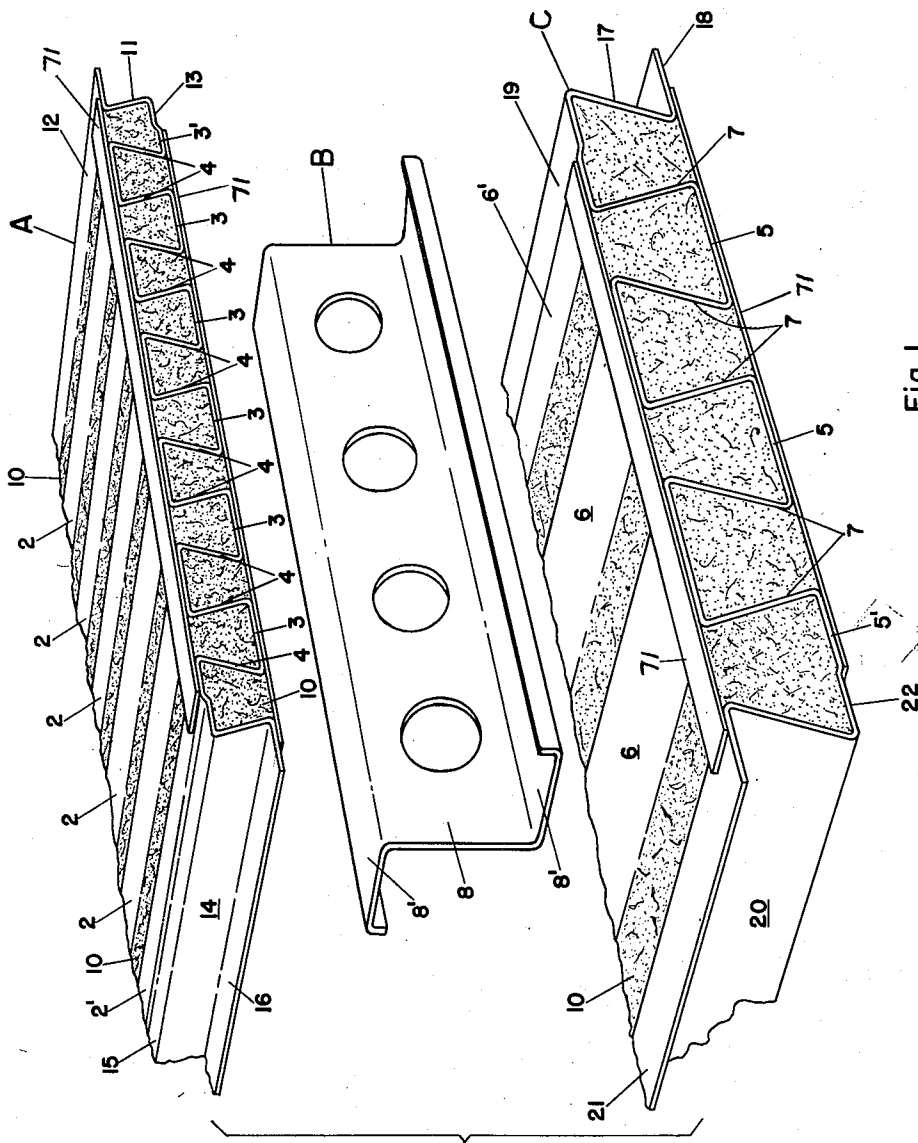
W. P. BRANSTRATOR ET AL

2,616,283

BUILDING UNIT

Filed May 3, 1946

6 Sheets-Sheet 1



INVENTORS.
Wayne P. Branstator
Arthur G. Mess,
Hubert J. Habb.
BY
Harness, Dickey & Pince.
ATTORNEYS.

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W. P. BRANSTRATOR ET AL

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6 Sheets-Sheet 2

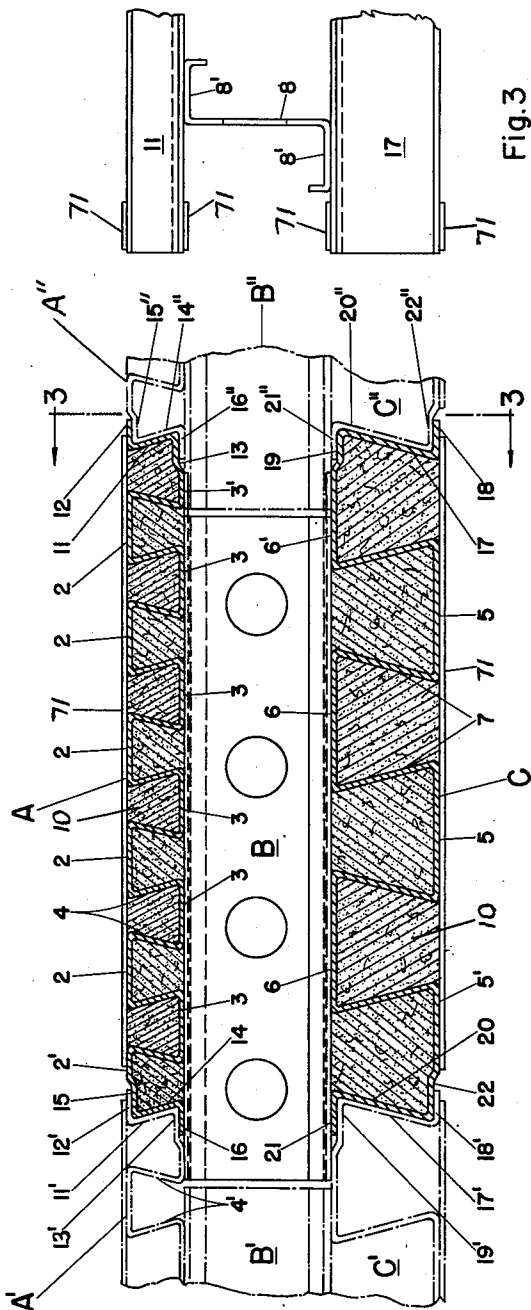


Fig. 2

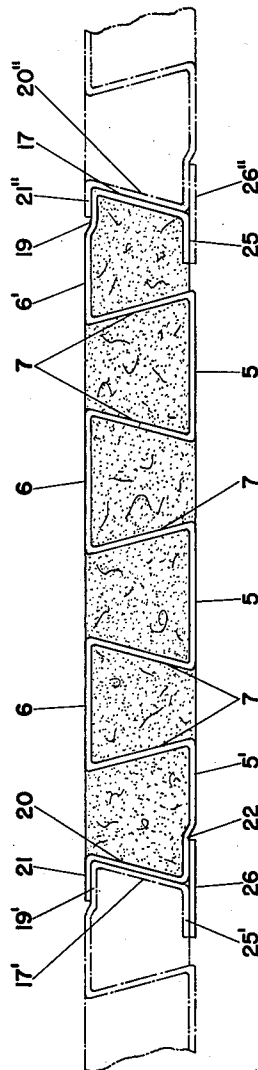


Fig. 4

INVENTORS,
Wayne P. Branstrator,
Arthur G. Mass,
Hubert J. Habb
BY
Harness, Dickey & Pierce.
ATTORNEYS.

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6 Sheets-Sheet 3

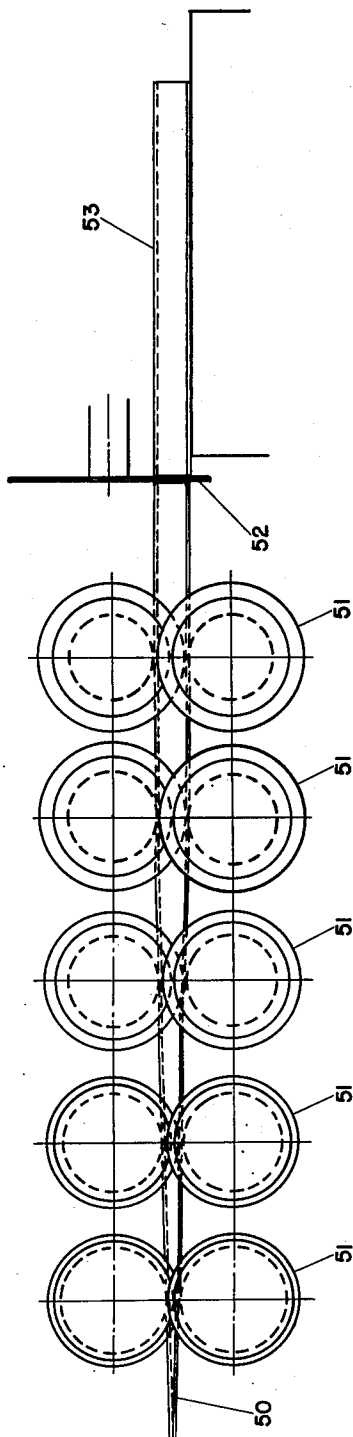


Fig. 5

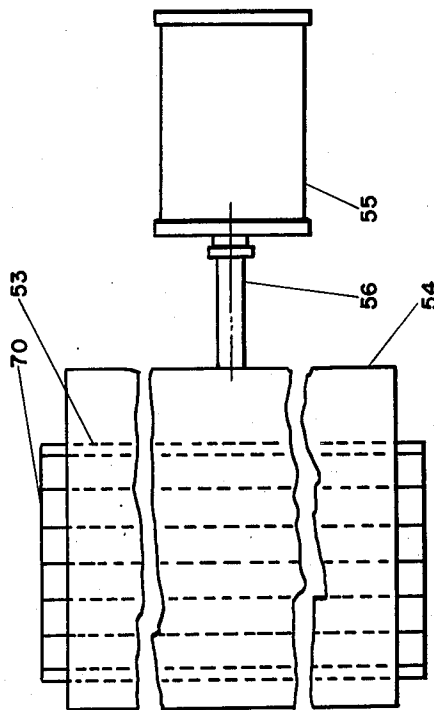


Fig. 6

INVENTORS.
Wayne P. Branstrator,
Arthur G. Mess,
BY Hubert J. Rabb.
Harness, Ricker & Pierce.
ATTORNEYS.

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6 Sheets-Sheet 4

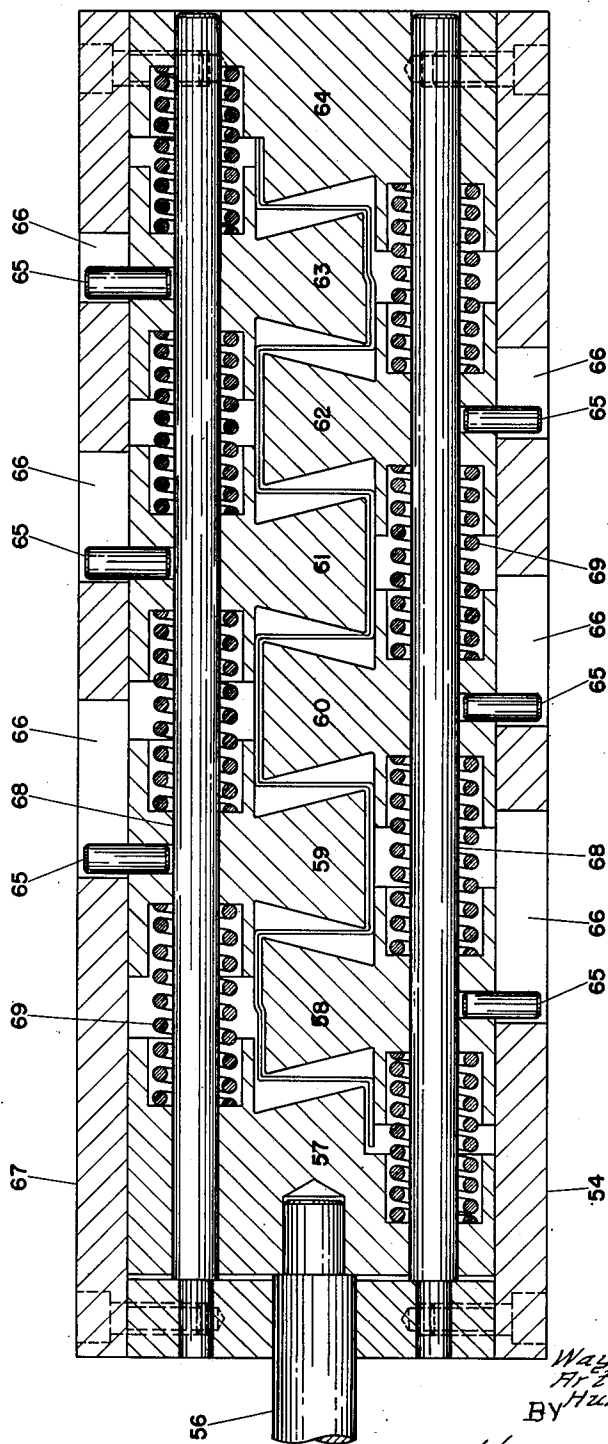


Fig. 7

INVENTORS,
Wayne P. Branstrator,
Arthur G. Mess,
By Hubert J. Habb

Harnett, Dickey & Paine
ATTORNEYS.

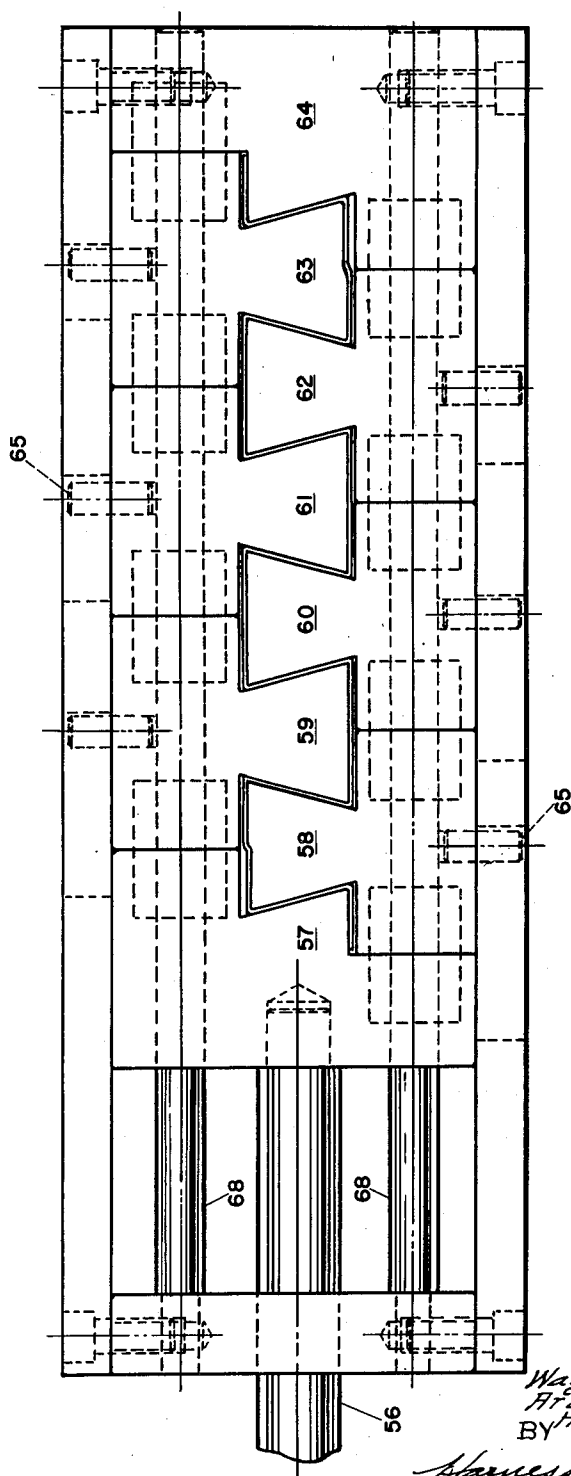
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W. P. BRANSTRATOR ET AL
BUILDING UNIT

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Filed May 3, 1946

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INVENTORS
Wayne P. Branstrator,
Arthur G. Mess,
By Hubert J. Rabb.

Harness, Dickey & Rince.
ATTORNEYS.

Nov. 4, 1952

W. P. BRANSTRATOR ET AL
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6 Sheets-Sheet 6

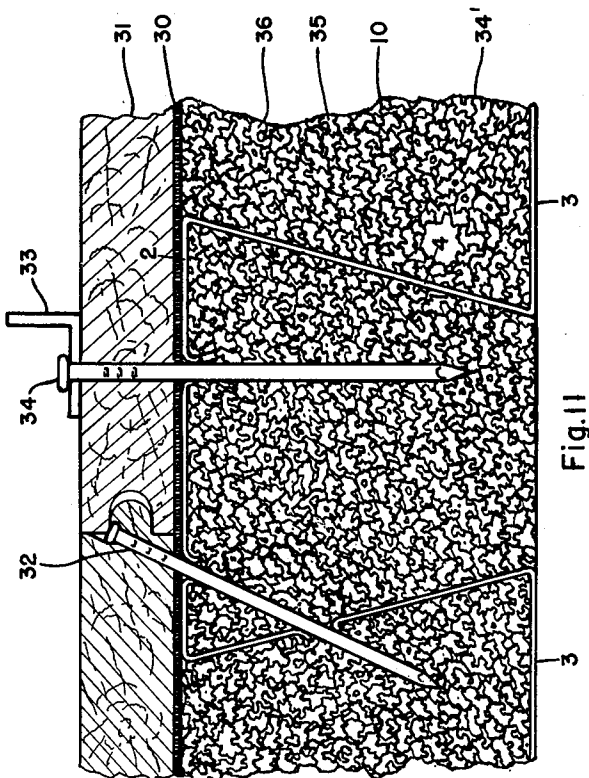


Fig. 11

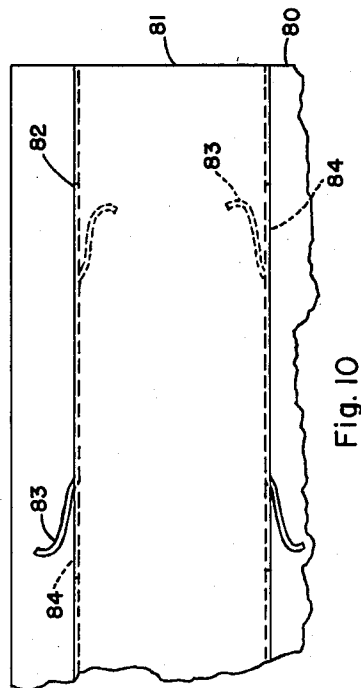


Fig. 10

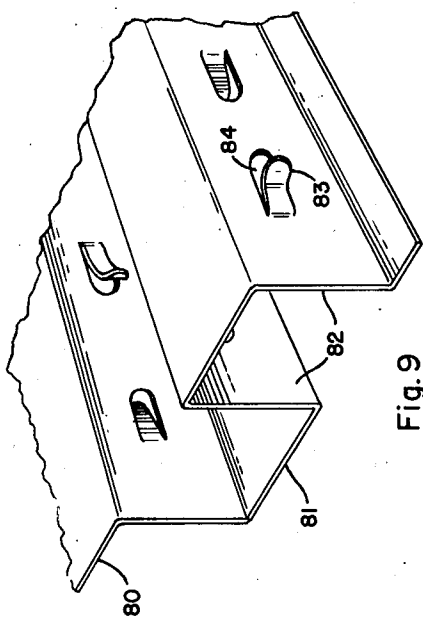


Fig. 9

INVENTORS
Wayne P. Branstrator,
Arthur G. Mass,
By Hubert J. Rabb,
Attorneys,
Dickinson, Dickey & Pierce,
ATTORNEYS.

UNITED STATES PATENT OFFICE

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BUILDING UNIT

Wayne P. Branstrator, Fort Wayne, Ind., Hubert J. Rabb, Detroit, Mich., and Arthur G. Mess, Dayton, Ohio; said Mess assignor to said Branstrator and said Rabb

Application May 3, 1946, Serial No. 666,914

1 Claim. (Cl. 72-68)

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This invention relates to improvements in construction units that can be assembled together to form the walls and roofs of residences and other buildings and to a method of making and assembling the same.

An object of the invention is to provide construction units that are light in weight but when assembled into a building are self-supporting without the use of beams, uprights, and rafters.

A second object of the invention is to provide a wall, floor, and roof structure that will provide high heat insulation properties.

A third object of the invention is to provide a fireproof building construction composed of steel or other metal contiguous channels and a solidifying material such as cement or gypsum into which nails can be driven at any point in the structure at will wherein the baseboard and other fixtures attached to the walls or flooring in a house or other building can be readily nailed into place.

A fourth object of the invention is to provide a fireproof building construction unit composed of steel and a solidifying material such as cement or gypsum which can readily be cut to fit by sawing.

An illustrative embodiment of the invention is shown in the accompanying drawings in which:

Fig. 1 shows an isometric section of the component parts of one of the construction units;

Fig. 2 is a transverse sectional view of the assembled construction unit and illustrating how the section is connected with adjacent sections;

Fig. 3 is a side view along the line 3-3 of Fig. 2;

Fig. 4 shows how the channel units are connected with adjacent units;

Fig. 5 shows a diagrammatic layout of the means to form the metal reinforce into channels;

Fig. 6 shows the means of forming inwardly converging channel walls;

Fig. 7 shows the squeeze dies before operation;

Fig. 8 shows the squeeze dies after operation;

Fig. 9 shows an isometric section of an alternate means of retaining the filling material in the metal channels;

Fig. 10 shows a plan view of the alternate means of retaining the filling material;

Fig. 11 shows a nail penetrating one of the units.

As shown in Fig. 1 the construction unit is composed of three component parts and is described as used in a floor construction. The unit is composed of a floor member A, spacer member B, and a main supporting member C.

The floor member or channel unit A is consti-

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tuted of a metallic reinforced structure formed of thin sheet metal shaped so as to provide parallel channels 2 and intervening contiguous channels 3. The channels 2 are open at the bottom and the channels 3 are open at the top. The walls 4 are common with respect to the corresponding adjacent channels, and tops 2 of the open-bottom channels lie in a common plane, and the bottoms 3 of the open-top channels lie in a common plane. The side walls 4 are arranged to converge toward the open end of said channels.

In each of the open-bottom channels 2 and open-top channels 3 is deposited a filling material 10, preferably consisting of a self-solidifying material such as cement, asphalt, gypsum, Gilsomite, etc. It is desirable to add to the above solidifying material a porous material, such as Waylite, Haydite, ground corncob, or any other similar material to form the filling aggregate, described in more detail later. This self-solidifying filler is smoothed in with a rubber squeegee so that the filler and the upper and lower metal channel surfaces form smooth, even surfaces.

Similarly the main supporting member or channel unit C is formed of thin sheet metal shaped so as to provide parallel channels 5 and intervening contiguous channels 6. The channels 5 are open at the top and channels 6 are open at the bottom. The walls 7 are common with respect to the corresponding adjacent channels, and in each of the open-bottom and open-top channels is deposited the filling material 10 of the same composition as used in the floor member A, previously described.

The spacer members B can be of any convenient shape, but in Figs. 1 and 2 a Z bar is shown. In order to insure proper ventilation, holes or other apertures are punched in the web 8 of the Z bar. Although only one spacer member B is shown, these members will be spaced along the structure according to the load carried. These spacers form a lateral binding means between the channels and prevent them from spreading and wherein the converging side walls firmly lock the filling material in the channels.

The component parts are clamped together, and the metal channels 3 of the floor member A and the metal channels 6 of the main supporting member C are fastened to the spacer member B, such as by electric welding to the flanges 8' of the Z bar.

We have found that construction units made as described above can be readily cut to fit, since the thin steel walls of the channels are firmly

backed by the filler and will not strip off the saw teeth as will often happen when cutting thin steel sheets is attempted.

In constructing the floor, the construction units are cut to such length as to extend from foundation to foundation and it can be seen that the floor member and main supporting member separated by the spacer members form a bridge construction of great strength.

The entire floor is built up of a plurality of these construction units locked together as follows: The spacer B is offset from the center line of members A and C as shown in Fig. 2. The wall 11 of member A (Fig. 1) terminates in a flange 12 and the end channel 3' is recessed at 13. On the opposite side the wall 14 terminates in a flange 16 and the end channel 2' is recessed at 15.

Similarly, the wall 17 of member C terminates in a flange 18 and the end channel 6' is recessed at 19. On the opposite side the wall 20 terminates in a flange 21 and the channel 5' is recessed at 22.

In Fig. 2 the construction unit shown in solid line is illustrated as locking with two adjacent units wherein the flanges and recesses of the adjacent units are numbered the same as for the unit shown in solid line and also in Fig. 1.

On the left the offset spacer member B projects under the first channel to the wall 4' of the floor member A'. In this position, flange 16 of the floor member A fits into recess 13' of the floor member A', wall 11' fits against wall 14, and flange 12' fits into recess 15.

Similarly, flange 21 of the main supporting member C fits into recess 19' of the main supporting member C', wall 17' fits against wall 20, and flange 18' fits into recess 22.

On the right, spacer member B'' projects under the first channel to the wall 4 of the floor member A. In this position, the flange 16'' of the floor member A'' fits into the recess 13 of the floor member A, wall 11 fits against wall 14'', and flange 12 fits into recess 15''.

Similarly, flange 21'' of the main supporting member C'' fits into recess 19 of the main supporting member C, wall 17 fits against wall 20'' and flange 18 fits into recess 22''.

Thus, it can be seen that the floor of a house can be rapidly constructed by fitting together pre-cut lengths of these construction units upon the foundation of the building into a rigid floor construction without cutting and fitting on the job.

One of the features of these construction units is that the thin common walls with respect to the corresponding adjacent channels are rigidly braced against buckling by the filling material in the adjacent channels. It has been found that, while the filling material of the type described above has a relative low tensile strength, it firmly resists compression and thereby firmly clamps and supports the thin common walls under heavy loads under which the thin steel channels alone would collapse. Thus it can be seen that by locking the units together in the above-described manner the end side walls of the various channels of the construction units are firmly braced one against the other, and, by reason of the double side walls, the flooring is even stronger at the locked joint than in the center of the construction unit. If desired, the construction units can be additionally locked by nailing through flanges 12', 18', 12 and 18 into the filling material

10, or the seams along the interlocking flanges can be intermittently welded as at 22.

Having described our invention for a floor construction, it is obvious that the walls of the building can be constructed of similar construction units placed in the upright position with suitable sections cut out for the windows and doors and that a similar floor construction for a second floor will form the ceiling of the first-described floor.

For the roof construction, which has to support only a maximum uniform load of snow, a construction built up of sections of the main supporting members C (Fig. 1) is sufficient. These members are connected together as shown in Fig. 4 wherein corresponding parts are numbered as in Figs. 1 and 2. In this modification the flange 25 formed on the end of wall 17 is turned in at the same level as the bottom of the recess 22. A flange 26 is fastened into the recess 22 as by spot welding. The units are then assembled as shown in Fig. 4 where, on the left, flange 21 fits in recess 19', flange 26 overlies flange 25', and wall 17' fits against wall 20. On the right, flange 21'' fits into recess 19, flange 26'' overlies flange 25, and wall 17 fits against wall 20''.

The outside walls and roof are coated with a rust protecting material, and the entire structure can be protected if desired for decorative purposes by a standard roofing such as shingles and the sides covered with clapboards giving the appearance of a house constructed of wood. One of the many advantages of the construction of this invention is that the required strength is obtained with a gage of steel sheet of sufficient thinness that nails can be readily driven through the channels and into the solidifying filling material and aggregate of the type described above and described in more detail later. This roofing material and clapboards can, therefore, be nailed on in the standard manner.

Similarly the baseboard around the rooms and any other desired fixture can be readily nailed in place as well as permitting the tenant to insert nails for hanging pictures, etc.

While we have described our invention in connection with a building, it is obvious that these construction units can be used for other types of construction such as roadways, airfield runways, and factory flooring. In such use, and especially where the units are continuously supported on a sub-foundation, extra strength against a concentrated load is obtained by using a hard aggregate, such as crushed stone, with the self-solidifying material to form the filling material for the channels.

We have found the following to be a desired formula for the filling material:

2 parts by volume crushed steel slag (Waylite)
1 part by volume ground corn cob, treated chemically to make fireproof
1/6 part by volume commercial crushed resin
1 part by volume commercial gypsum
1/20 part by volume glue retarder to retard setting

The above is mixed with water into a homogeneous mass and is fireproof, porous, and a good heat insulator.

In Fig. 11 we have shown the flooring nailed to the floor member or channel unit as shown in Fig. 1 wherein the upper channel 2 and lower channels 3 and common side walls 4 and filler 10 are indicated by the same numbers. Over this is placed a layer of felt paper 30, and the flooring 31 is laid with finishing nails 32. Also is

shown an angle 33 firmly fastened in place by nails 34 for connecting a fixture in place.

On solidifying we have found that the gypsum forms a hard relatively incompressible wall structure 34' which surrounds the Waylite 35 and corncob 36, materials, which relatively incompressible wall structure is sufficiently thin to permit the nail to readily penetrate, and that the porous materials are sufficiently compactable that the relative incompressible wall material displaced by the nail can be received in the space occupied by the porous filler material.

We have further found that the crushed steel slag (Waylite) is porous, as of an exploded nature, which is rotten enough to allow the nail to penetrate but hard enough along with the relative hard wall structure to firmly hold the nail once it is in place.

We have further found that this aggregate is highly resistant to compression and will stand the amount of flexure required of such structures.

In the manufacture of the channel reinforce for our preferred fireproof construction the contiguous channels with vertical side walls are rolled from flat sheet steel 50 (Fig. 5) passing through a series of rollers 51 where the channels are formed while allowing the sheet to contract laterally with a minimum of drawing. As the channel structure leaves the rolls it is cut into standard lengths 53 by the radiac cut off 52. All of these operations are performed with standard rolling equipment as is well known in the steel rolling art.

The standard lengths of channels are then passed into dies 54 (Fig. 6) to form the walls to converge to the open ends of the contiguous channels. This die is operated by a compressed air cylinder 55 operating on push rod 56.

A cross section of this die is shown in Fig. 7. This forming die consists of mating dies 57, 58, 59, 60, 61, 62, 63, and 64 which are constrained to move horizontally by guide pins 65 moving in horizontal slots 66, in casing 67 and by reason of their sliding on cross rods 68. These dies are normally positioned in the position shown by springs 69. These dies are so shaped that upon compression by movement of plunger 56 to the right the desired convergence of the channel walls is obtained.

Fig. 8 shows the dies in the fully compressed position. During operation the channels contract laterally and to a small extent in the vertical direction. The vertical contraction is provided for by allowing the required clearance between the upper face of dies 58, 60 and 62 and the channels and the lower face of dies 59, 61 and 63 and the channels as shown in Fig. 7 so that in the contracted position shown in Fig. 8 the channels tightly embrace the dies. After compression the air pressure is released from cylinder 55 and the projecting ends 70 of the contiguous channels are clamped by an extractor, and the channels are pulled out of the dies against the force of springs 69 which are not of sufficient strength to distort the formed channels.

After withdrawal, narrow plates 71 (Figs. 1, 2

and 3) are fastened across the channels, as by spot welding to prevent the channels from spreading. The filling material is then deposited in the channels. These plates 71, as well as the spacer members B when used, serve as a lateral binding means between the channels so that the converging side walls of the contiguous channels firmly lock the filling material in the channels.

In Figs. 9 and 10 is shown an alternate method of binding the filling material in the channels. In this method the parallel channels 80 and intervening contiguous channels 81 are shown with a vertical common side wall 82. In the common side walls 82 are punched a series of tabs 83 which provide apertures 84. On filling the channels with the filling material the tabs will lock with the filling material, and the filling material in the alternate channels will unite in apertures 84, thus allowing the solidifying material in the filling material in adjacent channels to form a common structure.

What is claimed is:

A fireproof construction including a first channel unit comprising a thin sheet metal provided with longitudinal alternate open-bottom and open-top contiguous channels having substantially vertical common side walls between said open-bottom and open-top channels, a hard, solidifiable filling material in said channels firmly confining therebetween said common walls, lateral binding means fastened to the sheet metal and extending across the channels to prevent their spreading, said sheet metal formed at the outer side edge of one of the side channels with an outwardly extending flange, a second outwardly extending flange fastened to the side channel opposite said first outwardly extending flange and an inwardly extending flange formed from said sheet metal on the other side channel, a second of said channel units assembled with said first channel unit with the outwardly extending flanges of said first unit firmly embracing said inwardly extending flange of said second unit and the channel to firmly lock them together against relative movement in either direction.

WAYNE P. BRANSTRATOR.
HUBERT J. RABB.
ARTHUR G. MESS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,564,264	Murray	Dec. 8, 1925
1,791,881	Yarwood	Feb. 10, 1931
2,042,438	Wells	May 26, 1936
2,063,115	Neergaard	Dec. 8, 1936
2,104,506	Coddington	Jan. 4, 1938
2,131,652	Young	Sept. 27, 1938
2,177,036	Greulich	Oct. 24, 1939
2,284,229	Palmer	May 26, 1942
2,356,309	Garbe	Aug. 22, 1944