Feb. 19, 1929. 1,702,706

K. R. SCHUSTER

FIREPROOF CONSTRUCTION

Filed April 14, 1926 2 Sheets-Sheet 1

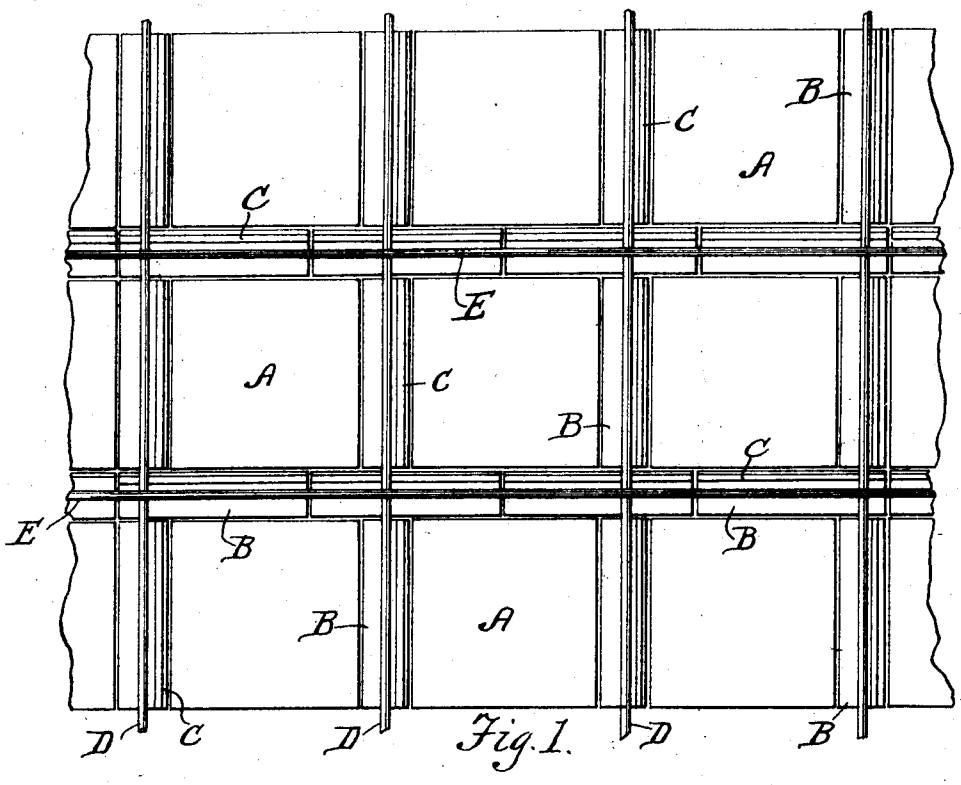


Fig. 1.

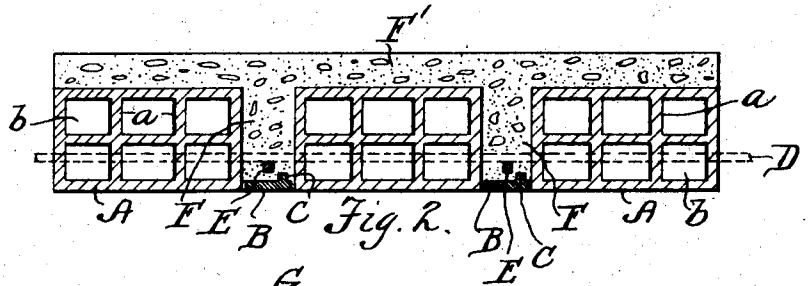


Fig. 2.

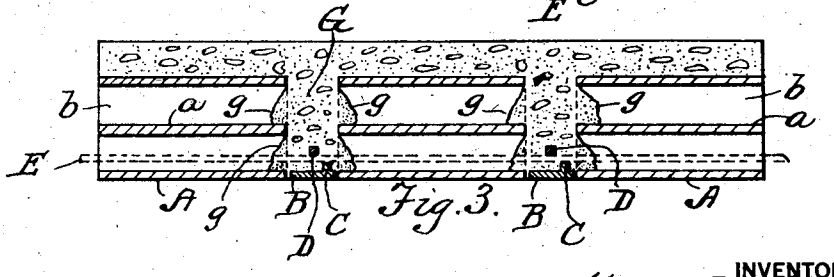


Fig. 3.

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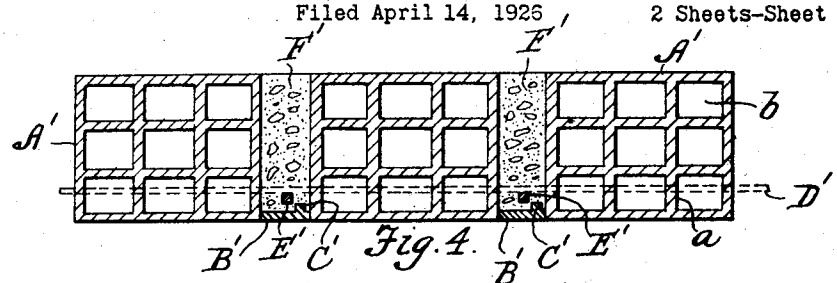


Fig. 4.

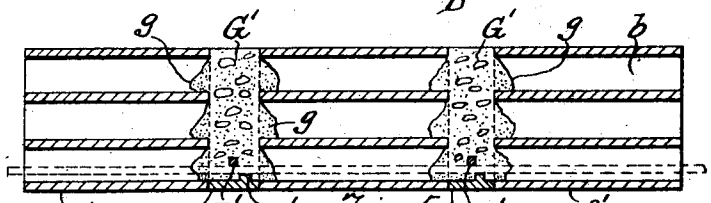


Fig. 5.

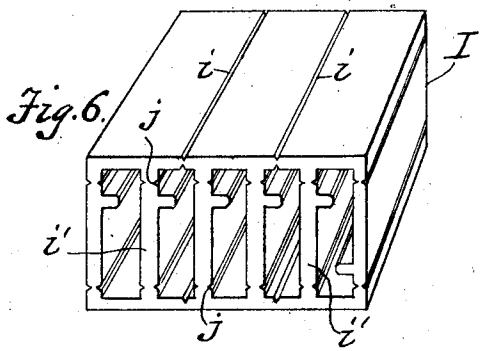


Fig. 6.

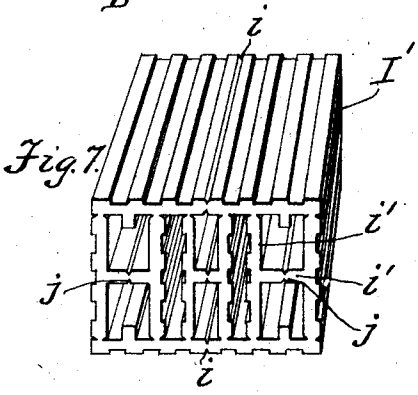


Fig. 7.

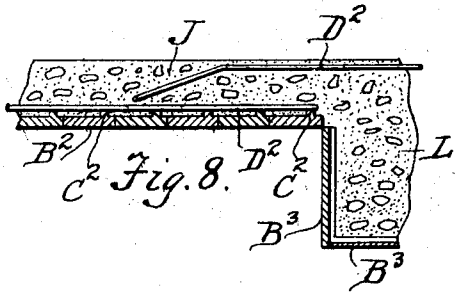


Fig. 8.

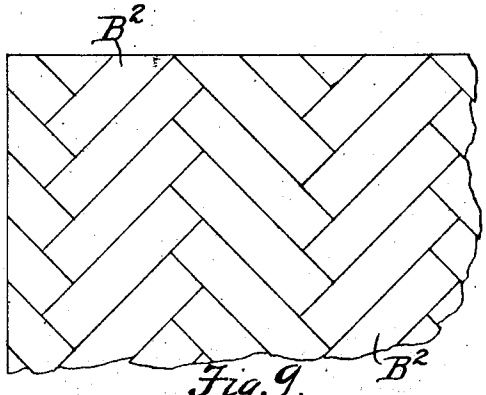


Fig. 9.

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Patented Feb. 19, 1929. 1,702,706

UNITED STATES PATENT OFFICE.

KARL R. SCHUSTER, OF HOPATCONG, NEW JERSEY.

FIREPROOF CONSTRUCTION.

Application filed April 14, 1926. Serial No. 101,875.

This invention is a fire proof construction, pertaining more particularly to a floor plate or slab, composed in part of concrete and in part of tile blocks, or composed wholly of concrete; but the tile used herein is adapted for use generally as a facing for ceilings, concrete beams, walls and other surfaces.

A flat tile of my invention possesses marked utility when used to form a facing or an under surface of a ceiling constituted by a floor plate or slab; and its utility is the more apparent in floor slabs composed in part of tile blocks and in part of concrete ribs, the latter being reinforced by metal rods or bars, said reinforced concrete ribs extending in two directions and said ribs co-operating with the tile blocks to produce a floor slab having the desired load-carrying capacity and being capable of installation rapidly, economically and by unskilled labor.

The invention consists in a tile of novel form, and a floor slab the under surface or ceiling of which is composed in whole or in part of said tile.

In a preferred form, the flat tile is provided with a key rib positioned on one face thereof intermediate the edges and extending, preferably, in the direction of the length of said tile. The tiles are adapted to be positioned at the under surface of a floor slab, or at the surface of a girder or beam so as to form, in whole or in part, a facing for said slab, beam or girder. In this connection, the ribs on the faces of the tiles perform at least three important functions; first, by embedding the ribs in the concrete material, they act as keys for retaining the tiles immovably in position; second, the ribs serve the function of spacers for the reinforcing metal bars or rods so as to leave appreciable intervals between the tiles and said bars or rods, whereby the concrete material is adapted to fill said spaces or intervals in order to envelop the rods or bars and to secure a perfect bond between the metal rods or bars and the facing tiles, and, third, the tiles being composed of clay material, they are rather fragile, but the tendency to break or disintegrate due to transportation and handling is overcome, at least to a substantial extent, by the added strength imparted to the flat tile by the presence of the longitudinal key rib integral with said tile.

For economy of manufacture, it is preferred to produce a number of the ribbed tiles in the form of hollow blocks provided with lines of weakness or cleavage, whereby the blocks may be handled and shipped with the least liability of breakage, and they can easily be broken at the place where the tiles are to be employed in the construction of the building.

An important part of the invention, from one aspect thereof, is the employment of the ribbed tiles in a floor slab composed of tile blocks and of reinforced concrete. This part of the invention comprises tile blocks and the flat ribbed tiles assembled in rows in two directions, said ribbed tiles being positioned at the bottom of the resulting slab and intermediate the tile blocks so as to space the latter in two directions, the entire under face of the resulting slab being composed of the tile blocks and the flat tiles, so as to result in a relatively smooth tile surface at the ceiling, which surface is comparatively free from irregularities which follow from the exposure of the concrete material on the under surface of the floor slab. The ribs on the flat tiles extend upwardly in the spaces between the tile blocks, and on these ribs are laid the bars or rods to form the steel reinforcement for the concrete ribs. The tile blocks, the flat tiles and the steel rods or bars are assembled in a dry condition and by unskilled labor, and subsequently the concrete material, in a plastic condition, is deposited in the spaces between the tile blocks, thus enabling the floor slab to be installed quickly and by the services of unskilled laborers, whereby economy of construction is secured.

My flat ribbed tiles are available, also, in the construction of flat slabs composed of reinforced concrete, said tiles forming a smooth surface at the under side of the slab or the ceiling, but in both forms of slab, i. e., tile block and concrete construction, and reinforced concrete, the flat tiles perform important functions, to wit: the ribs act as spacers for the steel bars or rods so as to permit the concrete material to pass between the steel and the tiles for the purpose of encasing the steel by the concrete; said tiles form in whole or part the under surface of the floor slab so as to secure a relatively smooth surface against which the plaster or other finish may be applied to good advantage, and the ribs of the tiles perform the function of keys, for the reason that they are embedded in the concrete and thus fasten the tiles immovably

in position, said ribs performing the function of imparting strength to the tiles in order to minimize breakage thereof.

Other features of the invention and the advantages thereof will appear from the following detailed description.

In the drawings,—

Figure 1 is a plan view showing the tile blocks and flat tiles as they appear when assembled upon a suitable support, form, or centering, and illustrating the metal reinforcing rods or bars extending in two directions and positioned within the channels between said tile blocks.

Figure 2 is a vertical cross section through a flat floor slab in a direction transversely with respect to the cells or longitudinal passages within said tile blocks, the concrete material covering the tile blocks to a suitable depth over the top thereof.

Figure 3 is a vertical section taken at right angles to Figure 2 and in a direction longitudinally with respect to the cells or spaces in the tile blocks.

Figure 4 is a section similar to Figure 2, wherein deeper tile blocks are employed in the construction of the floor slab, the top layer of the concrete material being omitted.

Figure 5 is a section at right angles to Figure 4, and in a direction similar to Figure 3.

Figure 6 is a perspective view of a tile block provided with lines of cleavage, whereby the block may be broken to produce individual flat tiles in accordance with this invention.

Figure 7 is a perspective view of a preferred form of the breakable tile block.

Figure 8 is a vertical section through a reinforced concrete floor slab and a part of the girder or beam thereof, illustrating the mode of using my flat tiles as a facing for the concrete slab.

Figure 9 is an inverted or bottom plan view of the concrete slab illustrating the arrangement of the flat tiles forming the ceiling surface.

The floor slab illustrated in Figures 1, 2 and 3 is composed of tile blocks and reinforced concrete. The tile blocks A are cellular and open at their ends, each block being composed of clay which is run through the die of a clay machine so as to be formed with internal webs *a*, after which the clay material is cut at suitable intervals and the formed material is subsequently baked or burned in a kiln. The blocks may be of any suitable size and dimensions, and, preferably, said blocks are free from flanges at their sides or ends, the cells or longitudinal passages *b* within each block being open at the respective ends of said block.

An essential feature of this invention consists of a flat tile or a tile slab, B, the same being provided with a rib or web C. The tile B is of a determined length, width, and thickness, one face of the tile being adapted to have applied thereto the concrete material which enters into the construction of the floor slab. The rib C extends or protrudes from that surface of the tile or tile slab against which the concrete is applied. As shown, the rib C extends the full length of the tile or slab, and it is positioned intermediate the side edges of said tile or slab. The rib performs several important functions, as will presently appear; but one function of the rib is that it adds strength to the tile or slab, so as to minimize breakage thereof when handling said tile or in shipping it.

When it is desired to install the tile block and concrete floor slab, the usual centering, form, or support is placed in position, and the blocks A and slabs B are assembled, as in Figure 1. The blocks are placed in rows extending in two directions, and the tiles or slabs B are positioned between the sides and the ends of the blocks, and in contact therewith at the bottom portion of the same, for the purpose of spacing the blocks in a manner for the rows to be spaced or separated by the tiles B which thus act as spacers for the individual blocks. It is preferred to employ slabs equal in length to the blocks. Thus, in laying a row of blocks the workman places one block in position, then places a flat tile or slab in contact with an end portion of the block, the second block is placed in position and another slab is placed in contact with the end of the block, and so on, until the desired number of blocks in the first row shall have been installed. The next step consists in placing the tiles or slabs along the sides of the blocks composing the first row, the row of slabs or tiles being in contact with the slabs and blocks of the first row, and said row of tiles are in contact with each other at their ends. The blocks and tiles required to form the second rows are now installed in the manner described, after which a second row of tiles or slabs in endwise abutting order is placed next to the second rod of tiles, and so on throughout the operation until the desired area is covered by the blocks and by the tiles. It will be observed that by interposing the tiles between the blocks in the manner described, said tiles operate to space the blocks in two directions, and as a result of this mode of assembling the blocks and tiles two series of channels will be produced, the channels of one series extending in one direction between the open ends of the blocks, and the channels of the other series extending between the blocks at the closed sides thereof, the channels of one series intersecting with the channels of the other series. These channels receive the metal bars or rods D, E, the rods D extending in one direction between the ends of the tiles in the rows, and the rods E extending in another direction between the closed sides of the tiles forming the rows. The rods E are shown as contacting

with the top edges of the ribs C on the flat tiles, whereas rods D rest upon the rods E which they cross, the two series of rods thus intersecting and the rods of one series contacting with those of the other series.

Having installed the blocks, slabs and metal rods, the concrete material is deposited thereon. The material enters the channels formed by the co-operating slabs and blocks so as to result in the formation of concrete ribs, which ribs extend in two directions, so that the ribs will intersect with each other at the several corners of the tiles in the rows. The concrete material fills the spaces between the blocks at the sides and at the ends thereof, thus resulting in concrete ribs F, G, see Figures 2 and 3. As shown, the concrete is deposited to a suitable depth over the tops of the tile blocks, thus forming a concrete slab F', the latter adding materially to the strength of the resulting floor slab where comparatively shallow tile blocks are used.

By reference to Figures 2 and 3, it will be noted that the ribs C of the flat tiles or slabs extend upwardly into the channels between the blocks, and thus said ribs C are embedded into the ribs F, G, formed by the concrete material, whereby said ribs C anchor the flat tiles or slabs firmly in position. Furthermore, the rods E where they cross the slabs or tiles are in contact with the upper edges of ribs C, and the rods or bars D cross the rods or bars E. By thus assembling the rods for contact with the ribs, said rods D, as well as the rods E, are spaced with respect to the upper surfaces of the tiles, thus providing openings of appreciable depth between the rods and the upper faces of the tiles, which spaces are filled with concrete material. The concrete material thus acts as a bond for uniting the reinforcing bars or rods and the flat slabs or tiles, said concrete material thoroughly encasing the metallic bars or rods.

When the concrete material is deposited into the space between the open ends of the tiles to form the ribs G, said material is in a plastic condition, and it is free to enter the longitudinal cells or passages *b* of said tiles, the degree of entry of the plastic material into the open ended tile blocks being determined by the angle of repose of said material and by the resistance which said material encounters due to frictional contact with the walls of the cells, whereby the concrete material of the ribs G form keys *g* for the purpose of securing an interlocking connection between the open ended tile blocks and the concrete ribs.

It will be observed that the entire under surface of the floor slab is composed of the tile blocks A and the flat tiles or slabs B, the latter being provided with upstanding ribs which are embedded in the concrete ribs for the purpose of anchoring the flat tiles to said concrete. The ceiling of the floor slab is thus composed entirely of tile material, affording a comparatively smooth surface whereon one or more coats of plaster may be applied to good advantage; in this particular, the floor slab of my invention is distinguished from prior structures composed of tile blocks and concrete, wherein the concrete ribs are exposed at the under or ceiling surface of the slab, which concrete ribs present a more or less irregular or rough outline, so that it is difficult to apply the plaster coat in a way to secure a desirable smooth finish. Such objection is, however, overcome by my construction, for the reason that the tile material of the blocks and the slabs are comparatively smooth, so that the plaster coat can be applied evenly and uniformly to secure a desired finish. Furthermore, the employment of the slabs or flat tiles serves at least two important functions; first, they operate to space the tiles in rows extending in two directions, and, second, their presence at the bottom of the tile blocks and in contact therewith affords surfaces upon which the plastic concrete material is deposited, thus precluding said plastic concrete materal from flowing to the bottom or ceiling surface of the floor slab.

The embodiment of the invention, disclosed in Figures 4 and 5, is identical with the construction in Figures 1, 2 and 3, except that the tile blocks are somewhat higher, or of increased vertical dimensions, and, further, the top slab of concrete over the tile block is omitted; but otherwise the floor slab of Figures 4 and 5 is installed and constructed as hereinbefore described in connection with Figures 1, 2 and 3. As shown, the tile blocks A' of Figures 4 and 5 are provided with rows of three cells one above the other; said tile blocks A' of Figures 4 and 5 are assembled concurrently with, and are spaced by, the flat tiles or slabs B', each having the rib C'; the reinforcing metal bars D', E', are positioned in the channels between the rows of tile blocks, so that said bars will cross or intersect and will be spaced relatively to the flat tiles by the ribs of the latter, and the concrete material fills the channels between the tile blocks and encases the bars D', E', and it also keys or locks the open ended tile blocks with the resulting concrete ribs, all as hereinbefore set forth.

It is understood that the flat slabs or tiles provided with the ribs may be made in any usual way and shape, transported or handled by any suitable method; but as such flat slabs are composed of baked clay material, it is apparent that considerable breakage is liable to occur during shipment and handling thereof. Accordingly, in Figures 6 and 7, I have shown a multiple construction of the tiles or slabs, the same being embodied in the form of a hollow block, I, in Figure 6, and

block I', in Figure 7, each block being provided with longitudinal lines of cleavage *i*. As shown in Figures 6 and 7, the hollow block is composed of clay material which is run through a suitable die and is cut into suitable lengths, after which the clay material is burned or baked in a kiln in the ordinary way. The block is composed of a top wall, a bottom wall and two side walls, and the interior of the block is formed with webs *i'*. Each web is formed with a line of cleavage *j*, and the lines of cleavage *i*, *j*, are so positioned on the walls and the webs that when the block I or I' is broken along the lines of cleavage, there results a number of flat tiles or slabs, each slab being provided with one or more of the longitudinal ribs extending upwardly or outwardly from that face thereof against which the cement material is to be applied when setting the tiles or slabs along with the other blocks in the operation of installing the floor slab.

The floor slabs heretofore described are composed in part of tile blocks, tile slabs, and in part of reinforced concrete material; but in Figure 8 there is illustrated an all concrete reinforced construction, the under or ceiling surface of which is formed by the use of flat slabs or tiles B^2, constructed in accordance with this invention. The concrete slab J is provided with the metal rods or reinforcements D^2, arranged or assembled in a suitable way, said rods being embedded or encased within the concrete material. The tiles B^2 are assembled in any desired order, one method of assemblage being illustrated in Figure 9, wherein each tile is lapped at its edge portions by other tiles on both the side edges and end edges thereof. The tiles may be laid in the "herring bone" order illustrated, or they may be assembled in any other appropriate or desired manner. The tiles form the bottom or under surface of the floor slab, as in Figure 8, the ribs C^2 extending upwardly from said tiles, and being embedded in the concrete material, whereby said ribs anchor the tiles to the concrete material, and they serve to space the reinforcing bars D^2 with respect to the upper surface of the tiles, so that the concrete material will flow into the spaces intervening the metal bars and the upper surfaces of the slabs or tiles. As shown in Figure 8, the floor slab is reinforced by a beam or girder L, the latter being formed of concrete, and said beam being integral with the slab. The girder is faced by flat slabs or tiles B^3 having the ribs embedded in the concrete material as hereinbefore described.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

A masonry floor comprising concrete, metal rods embedded in the concrete, and tile slabs on the under surface on the floor, said tile slabs being provided with longitudinal ribs and said ribs extending upwardly into the concrete, said metal rods resting upon the ribs and spaced thereby from the slabs; said spaces between the slabs and the rods being filled with concrete which encases the rods.

In testimony whereof I have hereto signed my name this 12th day of April, 1926.

KARL R. SCHUSTER.