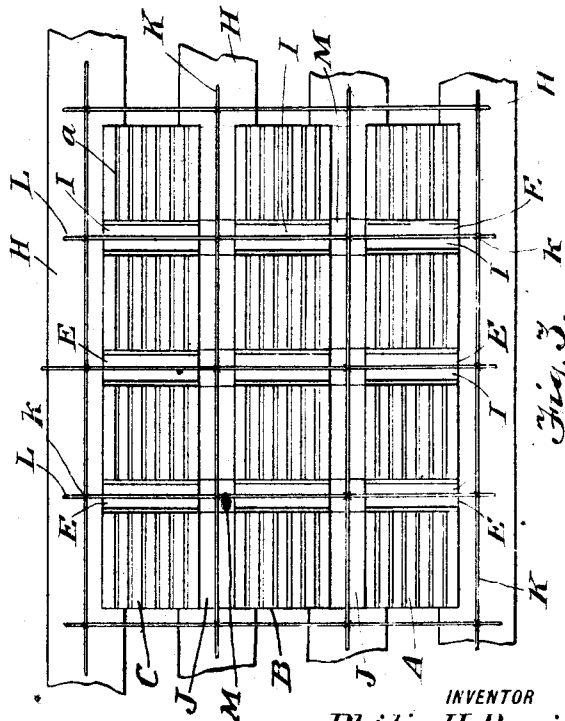
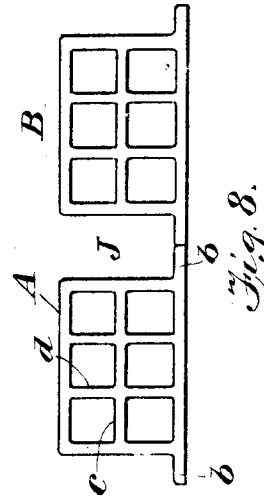
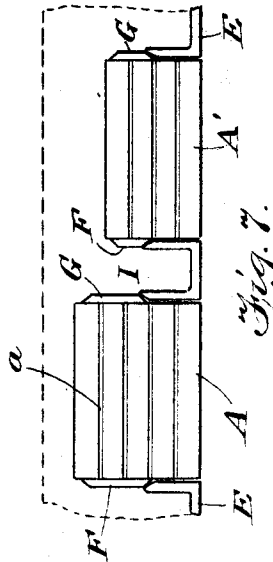
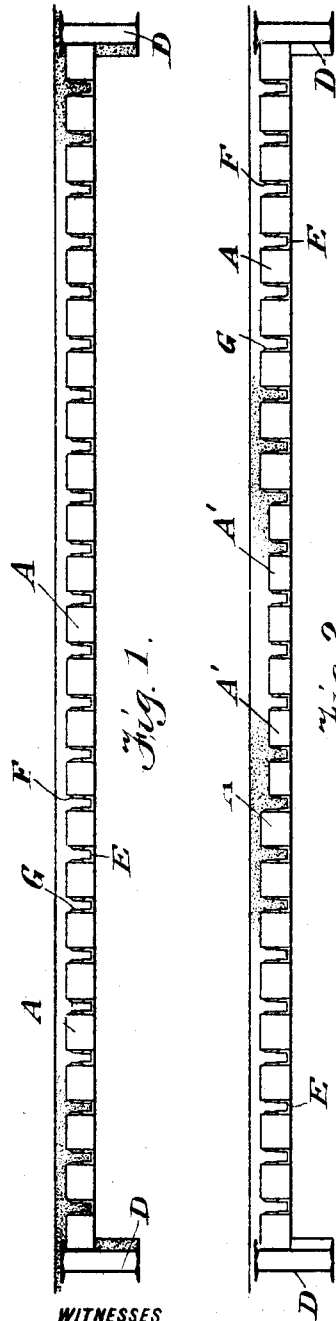


1,063,005.

Patented May 27, 1913.
2 SHEETS—SHEET 1.



WITNESSES
Robert Head
Francis Mothurshead

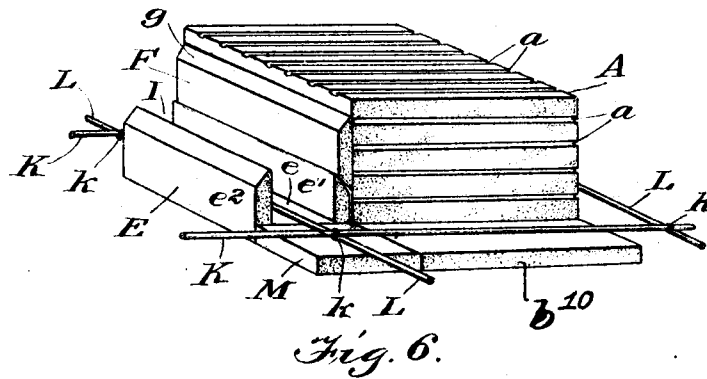
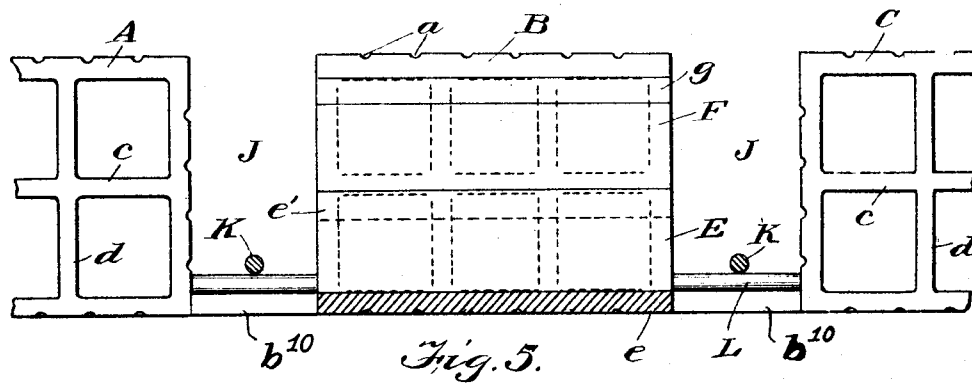
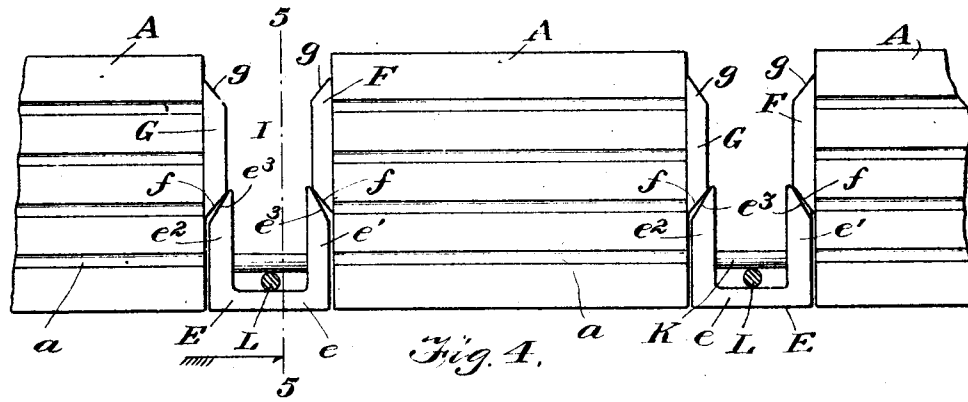
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P. H. BEVIER.
FIREPROOF ARCH.
APPLICATION FILED JULY 16, 1910.

1,063,005.

Patented May 27, 1913.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

PHILIP H. BEVIER, OF NEW YORK, N. Y.

FIREPROOF ARCH.

1,063,005.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed July 16, 1910. Serial No. 572,322.

To all whom it may concern:

Be it known that I, PHILIP H. BEVIER, a citizen of the United States, residing in the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented a certain new and useful Fireproof Arch, of which the following is a specification.

This invention is a fire proof arch of the long span type, and embodies a structure wherein the individual tiles of each row are spaced apart, *i. e.*, transversely of the arch, by a concrete or similar filling, and the different rows are also spaced apart, *i. e.*, lengthwise of the arch, by a concrete or similar filling intersecting said transverse concrete filling, said fillings constituting what are technically termed ribs in the art.

In a preferred form of the invention, certain substantially U shaped tiles, which are herein termed foot tiles, are positioned between the individual tiles of each row, said tiles serving the purposes, among others, of spacing the tiles apart and to receive the concrete filling. These foot tiles perform the further functions of preventing the concrete filling from entering the hollow tiles, and, in conjunction with said hollow tiles produce a practically continuous tile surface in each row of tiles adapted to receive the plaster. Coöperating with the foot tiles are certain flat tiles resting upon, and extending above the foot tiles, which perform, among others, the function of precluding the concrete filling from entering the openings near the tops of the hollow tiles.

Other features and advantages of the invention will be apparent from the following detailed description.

In the accompanying drawings I have illustrated different practical embodiments of the invention, but the constructions shown therein are to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a vertical section taken in the direction of the width of an arch embodying this invention illustrating a preferred construction wherein all the hollow tiles or blocks are uniform in height. Fig. 2 is a view similar to Fig. 1 illustrating another embodiment of the invention wherein certain tiles are somewhat shorter than other tiles in the same row, whereby an increased quantity of concrete filling material may be employed at the middle portion of an arch

when it is desired to construct an arch of increased strength. Fig. 3 is a plan view on an enlarged scale illustrating the method of assembling or positioning the tiles previous to introducing the filling of concrete between said tiles. Fig. 4 is an elevation on an enlarged scale illustrating the foot tiles and closure tiles between adjacent hollow tiles or blocks. Fig. 5 is a cross section on the line 5—5 of Fig. 4. Fig. 6 is a perspective view illustrating one of the hollow tiles or blocks, a foot tile, one of the closure tiles engaging with the foot tile, a center flat tile adapted to be positioned between four adjacent tiles or blocks, and tension rods or members employed in the construction of the arch. Fig. 7 is a view in side elevation illustrating two tiles or blocks of different heights spaced by the foot tiles, the dotted lines illustrating the level of the concrete filling material adapted to cover said tiles. Fig. 8 is a view in end elevation of two tiles or blocks illustrating spacing flanges thereon whereby the tiles of two adjacent rows are spaced apart.

A, B, and C designate hollow tiles or blocks employed in three rows of tiles or blocks. It will be understood that any desired number of rows may be employed in the construction of the arch, although for the sake of clearness in illustration I have shown only three rows of blocks in Figs. 3 and 5 of the drawings. There may be any number of tiles in each row according to the length of the span illustrated in Figs. 1 and 2 of the drawings. The end blocks of each row engage with I-beams, D, in a manner well understood by those skilled in the art.

Instead of permitting the blocks of each row to have abutting engagement at their end faces, as is usual in hollow tile arches, I employ means for spacing the individual blocks of each row so as to produce substantially wide spaces adapted to receive the filling material. Furthermore, the spacing devices employed between the individual tiles of each row are constructed with flanges so as to partly close the spaces within the hollow blocks or tiles, and in connection with the flanged spacing devices I employ certain other flat tiles, hereinafter referred to as closure tiles, which are adapted to rest upon the flanged tiles and to be retained thereby into engagement with the end faces of the hollow tiles or blocks, whereby the

flanges of the spacing tiles and the flat closure tiles will operate to close the spaces of the hollow blocks so as to preclude the admission of filling material into said hollow blocks, thus reducing the quantity of filling material required, and securing economy in the installation and construction of the arch. The spacing tiles which I prefer to employ are substantially U-shaped in cross section, said spacing tiles being indicated by the reference character, E. As shown more clearly in Figs. 3, 4, and 6 of the drawings, each foot tile, E, hereinbefore referred to as a spacing tile, consists of a flat bottom member, e , and upstanding flanges or members, e' , e'' , each flange, e' , e'' , having a bevel, e^3 . As shown, the length of the foot tile, E, is equal to the width of the block or hollow tile in the row, and the foot tile is placed between two adjoining blocks, such as A, A, in each row, whereby the foot tile operates to space the adjacent blocks, A, A, for the required distance apart. The foot tile is so positioned that the underface of its bottom member, e , is substantially flush with the underfaces of hollow tiles or blocks, A.

The flanges or upstanding members, e' , e'' , of said foot tile extend above the bottom member, e , for a predetermined distance. Cooperating with the foot tiles, E, are flat closure tiles, F, G, each having beveled edges, f , g . The length of each flat closure tile is equal substantially to the length of foot tile, E, and the width of hollow block or tile, A, but the width or height of the closure tile is about one-half the height of block, A. After the hollow tiles and the foot tiles shall have been placed into position, the operator proceeds to drop the closure tiles, F, G, into the space between two adjacent hollow tiles or blocks. The beveled edges, f or g , of the closure tiles enter the spaces between the beveled edges, e^3 , of the foot tiles and the vertical end faces of the hollow tiles or blocks, whereby the flat closure tiles are adapted to rest upon the flanges of the foot tile, and said beveled edges, e^3 , of the foot tile operate to retain the closure tiles into engagement with the vertical end faces of the hollow tiles or blocks.

It will be noted by reference to Figs. 4 and 6 that the foot tiles close the lower ends of the vertical spaces between two adjacent blocks; that flanges, e' , e'' , of the foot tiles and the flat closure tiles, F, G, close the openings or spaces within the hollow tiles or blocks, and that a filling of concrete when placed within the channel of the foot tiles and between the closure tiles will be retained in the spaces between the hollow tiles or blocks, *i. e.*, the semi-liquid or plastic concrete cannot fall through the bottom side of the arch because the bottom member, e , of the foot tile precludes the downward movement of the filling material, nor can

said filling material enter the openings or spaces of the hollow tiles for the reason that the flanges of the foot tiles and the flat closure tiles preclude the flow of a substantial amount of material into the hollow blocks. 70

Prior to installing or laying the blocks composing the new arch, a staging or scaffolding is erected between the I-beams, D, said staging including planks, H, which are shown in Fig. 3, and are spaced apart so that the blocks and the tiles will rest thereon. The planks, H, of the staging are so related to the I-beams that the blocks and the tiles will occupy the desired horizontal position with respect to the I-beams when the arch is completed. After the staging shall have been properly erected, the operator proceeds to place blocks, A, of one row into position upon two of the planks, the foot tiles, E, being positioned between each two adjacent tiles or blocks, A. The next row of blocks or tiles, B, are placed in position upon the staging and the foot tiles, E, are placed into position between each two adjacent tiles, and so on throughout the series of blocks composing the row, C, and each successive row of tiles or blocks. The blocks composing row, A, are spaced apart from the blocks composing row, B, and likewise the blocks of row, B, are spaced from the blocks of row, C, and so on throughout the rows of blocks. It will be observed that tiles, E, between the blocks of row, A, produce certain spaces, I, and the spaces, I, in row, A, are coincident with similar spaces, I, in the rows, B, C, and other rows of the arch, said spaces, I, extending the full length of the arch, or from end to end thereof. By spacing the tiles of row, A, with respect to row, B, there is produced a space, J, extending the width of the arch, and similar spaces, J, are produced between rows of tiles, B, C, and all other rows of the arch. It is to be particularly noted that the spaces, I, between adjoining blocks of the rows extend substantially at right angles to the spaces, J, between the rows of tiles, and further that the spaces I, J, intersect or cross with each other. 100

After installing the rows of tiles, A, B, C, and the spacing blocks, E, the operator should place tension members, K, in the transverse spaces, J, between the rows, and other tension members, L, in the longitudinal spaces, I, between adjacent blocks, said tension members, K, L, crossing or intersecting each other, and being cooperatively related at their respective ends to the I-beams and to other suitable fixed points of attachment. For the purpose of precluding displacement of the tension members at their points of intersection, it is preferred to tie or bind them together, as for example, by wires, Z, indicated in Figs. 3 and 6. The tension members, L, are adapted to lie with- 105 110 115 120 125 130

in the channeled foot tiles, E, as shown in Figs. 3, 4, 5, and 6 of the drawings. After having properly installed the blocks, the foot tiles and the wires or tension members, the operator drops the flat closure tiles, F, G, into engagement with the beveled edges of the foot tiles so that they will be retained in position against the vertical end faces of the hollow blocks, and finally the filling of concrete material is applied to the blocks and tiles composing the foundation of the arch. This concrete material fills the longitudinal spaces, I, and the transverse spaces, J, and also covers the tiles to a suitable depth, a certain amount of the concrete material flowing into the small spaces or crevices between tiles or blocks, the foot tiles and the closure tiles, whereby the several parts of the arch are united or bound into a homogeneous structure. As a result of the concrete material filling the spaces, I, J, between the tiles and blocks there is produced a series of concrete ribs extending transversely of the arch in the direction of the spaces, J, and another series of concrete ribs extending lengthwise of the arch and in the direction of the spaces, I. The concrete ribs operate to embed the tension members, K, L, between the tiles and the rows of tiles, and said concrete material effectually binds together all the tiles and blocks. The employment of concrete ribs extending lengthwise of the arch, as well as transversely thereof, enables a wide span arch of increased strength to be produced, but at the same time the weight of the arch is not materially increased in proportion to its strength owing to the fact that the concrete material is not permitted to enter the hollow spaces or openings of the hollow tiles or blocks, A, B, C. The arch having been properly laid and covered with concrete material to any desired depth, the staging, H, is removed at the proper time, the arch being self-supporting, and the longitudinal and transverse ribs produced by the filling of concrete material affording the requisite strength and durability to the structure whereby it is rendered not only self-supporting, but capable of sustaining a very considerable weight without falling or breaking under the stress of the load imposed thereon.

There are several optional features of construction illustrated in the drawings and which may be incorporated in arches embodying the present invention. For example, the hollow blocks or tiles, A, B or C, may be, and preferably are, provided with longitudinal grooves or channels, a, on the outer faces of the side walls and the top. Again, certain blocks in each row may be of a different height from other blocks in the same row, as shown in Figs. 2 and 7. certain blocks, A', may be somewhat

shorter than other blocks, A, in one row, the shorter blocks being shown in Fig. 2 as positioned at the middle part of the arch. This provides a space at the middle of the arch which is of greater depth than spaces at the respective sides of the arch, whereby a filling material of concrete of greater depth may be provided at the middle of the arch than at the respective ends thereof. This secures increased strength in the arch at the breaking point thereof owing to the fact that the concrete at the middle is of greater depth than the concrete at the respective ends. Furthermore, I may employ tiles provided with spacing flanges, b, as shown in Fig. 8. It will be understood that each tile is of hollow cellular construction, the interior of the tile being divided by horizontal and vertical webs, c, d, into longitudinal spaces or cells, as shown in Figs. 5 and 8. Each tile is, or may be, provided at its bottom with a flange, b, extending from each side thereof, and when two adjacent tiles, as A, B in Fig. 8, are placed in position upon the scaffolding, the flanges, b, are adapted to meet and to contact, thus producing the space, J, between the rows of tiles. As alternative to the side flanges b on the adjacent tiles in a row, which flanges b operate to space the tiles sidewise as in Fig. 8, I may use the sidewise spacing flat tiles b¹⁰ shown in Figs. 5 and 6. Said flat tiles b¹⁰ are positioned between the sides of adjacent tiles, in contact therewith, as shown, and they are in the same plane as tiles M and the bottoms of the V-shaped or channel tiles, said tiles b¹⁰ operating, mainly, to space the hollow tiles sidewise and to close the bottoms of the spaces between the sides of the tiles.

When an arch is composed of hollow tiles or blocks having spacing flanges, b, at their lower sides, and channeled foot tiles, E, are placed in position between the individual blocks of each row, the flanges, b, close the spaces, J, at the lower end thereof, and the channeled tiles, E, close the spaces, I, between the individual tiles, but there are spaces provided at the points where tension members, K, L, intersect between the corners of four tiles. In order to close these spaces I may employ the flat corner tiles, M, adapted to be positioned in the substantially square space between the meeting spacing flanges, b, and the end portions of the channeled tiles, as shown in Figs. 3 and 6. These corner tiles, M, have abutting engagement with the respective ends of two adjacent channeled foot tiles, E, and they have similar abutting engagement with the spacing flanges, b, at the lower side edges of four adjoining tiles. The spacing flanges are positioned below the tension members at the points where they intersect and where they are bound or tied together by wires, z.

Said corner tiles are substantially flush with the underfaces of the channeled foot tiles and with the faces of the spacing flanges, *b*. The corner tiles are adapted to be retained or bound in position by the filling of concrete material, some of which will find its way into the crevices or spaces between the edges of the corner tiles and the end edges of the channeled foot tiles, and the end edges of the spacing flanges, *b*.

It will be observed that practically the entire surface of the arch is composed of tiles, for the reason that the hollow blocks or tiles, the flanged foot tiles, the spacing flanges, *b*, on the hollow blocks or tiles, and the corner tiles, *M*, all lie in substantially the same horizontal plane. By providing an arch of this construction, the filling material of concrete is not exposed on the under-surface of the arch, and thus a good tile surface is provided for the reception of plaster or other finishing material adapted to form the ceiling of a room or other apartment.

No claim is herein made to the invention embodying a fire proof floor construction embodying the combination with supporting girders, of hollow panel tile having open ends and spaced apart longitudinally and transversely and arranged in longitudinal and transverse rows, transversely extending channel tile arranged transversely between and closing the ends of said hollow panel tile, spacers of slab tile at the intersection of the longitudinal and transverse spaces between the rows of tile, said spacers lying between the ends of said channel tile, longitudinally and transversely extending solid integral concrete beams or ribs filling the channels of said channel tile and the longitudinal spaces between said hollow panel tile, and crossing steel reinforcements extending longitudinally and transversely and embedded in said concrete beams or ribs.

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

1. In a fire proof arch, a row of hollow tiles open at their ends, substantially U-shaped foot tiles each positioned intermediate two adjacent hollow tiles of the row and operating to space them relatively to each other, and additional tiles positioned in coöperative relation to the foot tiles, said additional tiles closing the open ends of said hollow tiles.

2. In a fire proof arch, a row of hollow tiles open at their respective ends, substantially U-shaped foot tiles each positioned intermediate two adjacent hollow tiles of said row and operating to space them relatively to each other, additional tiles positioned in contact with the foot tiles, said additional tiles coöperating with the foot

tiles in closing the open spaces of said hollow tiles, and in coöperative relation to end faces of said adjacent tiles, and a filling of concrete in the spaces between said tiles.

3. In a fire proof arch, a plurality of spaced rows of hollow tiles, each tile being open at the respective ends thereof, each row of tiles including foot tiles each positioned between two adjacent hollow tiles of said row and operating to space said adjacent hollow tiles relatively to each other, additional tiles coöperating with the foot tiles in closing the open ends of the hollow tiles, and fillings of concrete, certain of said fillings occupying spaces between the rows of tiles, and other fillings occupying the spaces produced by the interposition of said foot tiles and the additional tiles between the aforesaid hollow individual tiles of the rows.

4. In a fire proof arch, a row of hollow tiles, each tile being open at the ends thereof, substantially U-shaped foot tiles positioned intermediate the individual tiles of the row, said U-shaped tiles partially closing the hollow tiles, and other tiles coöperating with the U-shaped tiles and closing those portions of the hollow tiles left uncovered by said foot tiles, whereby a concrete filling is precluded from entering the hollow tiles.

5. In a fire proof arch, a row of hollow open ended tiles, flanged foot tiles positioned between the ends of the hollow tiles, closure tiles resting upon the flanges of the foot tiles, the flanges of said foot tiles and the closure tiles coöperating with the ends of the hollow tiles in closing the spaces in said hollow tiles, and a filling of concrete in the spaces of the foot tiles and between the closure tiles.

6. In a fire proof arch, a row of hollow open ended tiles, foot tiles positioned between the ends of the individual tiles of the row, said foot tiles having beveled edges, closure tiles resting upon the beveled edges of the foot tiles, whereby the closure tiles are held in contact with the ends of the hollow tiles, and a filling of concrete between the closure tiles.

7. In a fire proof arch, a row of hollow open ended tiles, foot tiles positioned between the ends of the individual tiles of the row, said foot tiles having upstanding flanges, the edges of which are beveled, closure tiles provided with beveled edges which rest upon the beveled edges of the foot tiles, said closure tiles and the flanges of the foot tiles coöperating in closing the ends of the individual tiles, and a filling of concrete between the closure tiles and in the space between the flanges of the foot tiles.

8. In a fire proof arch, a row of hollow open ended tiles, flanged foot tiles positioned between the ends of the individual

hollow tiles and spacing them apart, said foot tiles being substantially flush with the undersurface of the hollow tiles, and flat closure tiles resting upon the flanges of the foot tiles, the flanges of each foot tile and two flat tiles being in contact with the respective end faces of two adjacent hollow tiles.

9. In a fire proof arch, rows of hollow tiles, said tiles of each row having spacing flanges whereby the rows of tiles are spaced apart, each hollow tile being open at the ends substantially U-shaped tiles positioned between the individual tiles of each row, thereby producing spaces at right angles to the spaces between the rows of tiles, additional tiles coöperating with the U-shaped tiles in closing the open ends of the hollow tiles, and fillings of concrete between the rows of tiles and also between the spaced tiles and said additional tiles of the rows.

10. In a fire proof arch, rows of open ended hollow tiles, said rows being spaced apart, flanged foot tiles positioned between the open ends of the individual hollow tiles of the rows, whereby each tile is spaced on all sides relative to adjacent tiles in the same row and to tiles in adjacent rows, said spaces between the individual tiles of the rows extending transversely of the arch and the spaces between the rows extending lengthwise of said arch, separate flat tiles positioned between the corners of four adjacent tiles, and fillings of concrete in said spaces, said flanges of the foot tiles operating to close the open ends of the hollow tiles for excluding the concrete filling material from said hollow tiles.

11. In a fire proof floor construction, the

combination with hollow panel tile having open ends and spaced apart longitudinally and transversely and arranged in longitudinal and transverse rows, channel tile extending transversely between said panel tile, additional tiles positioned upon the channel tiles and against the open ends of said hollow tile, whereby the channel tile and the additional tile coöperate in closing the ends of the hollow tile, a network of longitudinal and transverse concrete ribs filling said channel tile and the spaces between the sides of said panel tile, and tensile acting reinforcements for said concrete ribs substantially as specified.

12. In a fire proof floor construction, the combination with hollow panel tile having open ends and spaced apart longitudinally and transversely and arranged in longitudinal and transverse rows, channel tile extending transversely between said panel tile, additional tiles positioned upon the channel tile and against the open ends of said hollow tile, whereby the channel tile and the additional tile coöperate in closing the ends of the hollow tile, a network of longitudinal and transverse concrete ribs filling said channel tile and the spaces between the sides of said panel tile, and tensile acting reinforcements for said concrete ribs, said reinforcements extending both longitudinally and transversely, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PHILIP H. BEVIER.

Witnesses:

CHAS. C. KRIESCHER,
HENRY STRUBE.