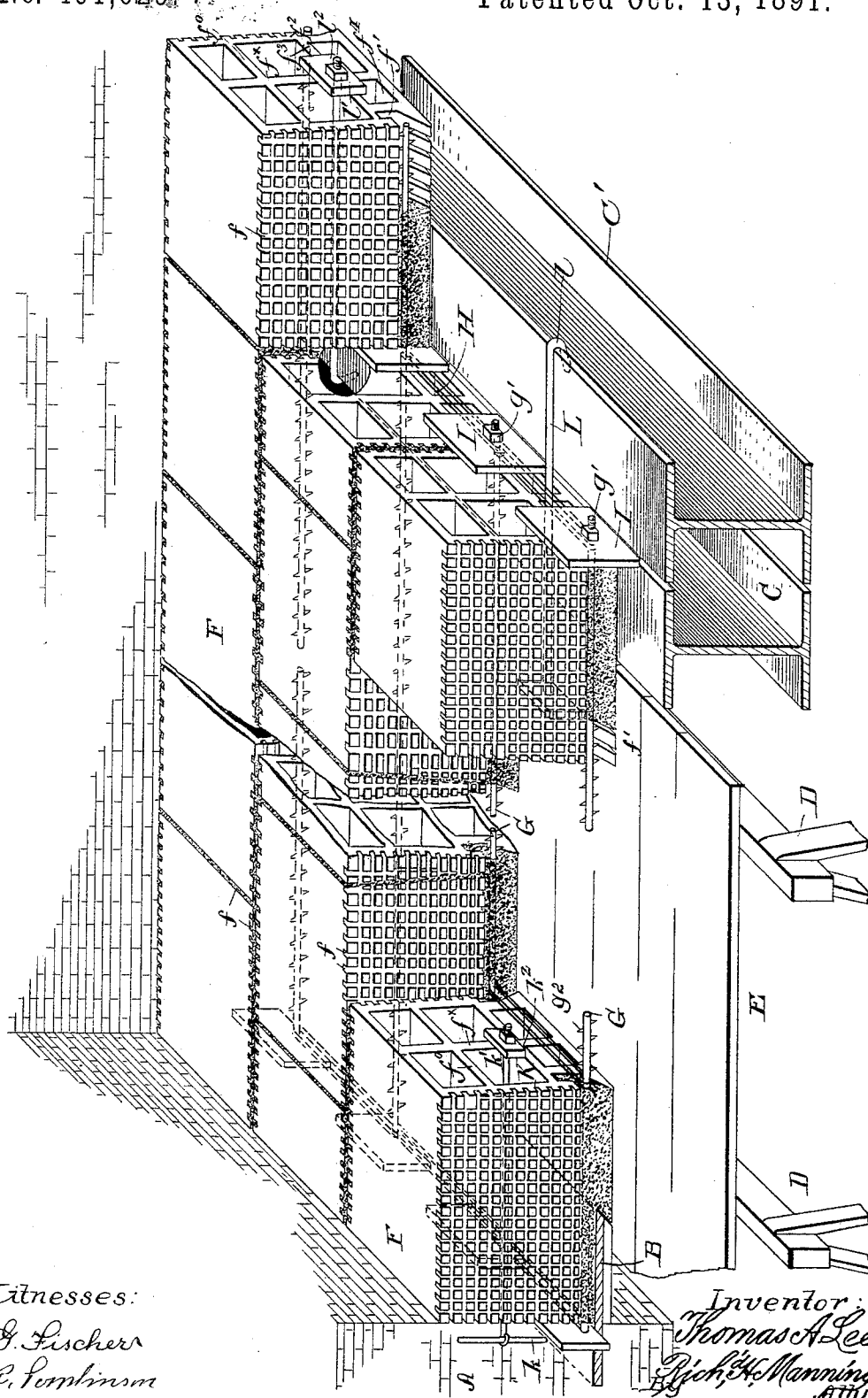


(No Model.)

T. A. LEE.
FIRE PROOF FLOOR OR ROOF.

No. 461,029

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FIRE-PROOF FLOOR OR ROOF.

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To all whom it may concern:

Be it known that I, THOMAS A. LEE, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Fire-Proof Floors or Roofs; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification.

The object of my invention is, first, in fire-proof floor and roof construction to bind together in contiguity from one of the ends of the floor or roof carrying supports to the other ends thereof, the parallel courses of floor-blocks without the intervention of the ordinary I-beams within the floor or roof; second, in fire-proof floor and roof construction in which the courses of floor-blocks are supported at the base by means of the tension strength imparted from tension-rods in the base of the blocks to clamp the end blocks in a course to the floor-carrying support, so as to prevent the floor from parting from the support and to form a tie for binding the building or its walls together; third, to form a vertical dowel-joint between the sides of the contiguous courses of floor-blocks.

My invention further consists in the novel construction and combination of parts, which will first be fully described, and then specifically pointed out in the claims.

In the drawing, the figure is a view in perspective showing the supports for the respective end blocks of the courses forming the floor, the courses of blocks extending in length continuous from one carrying-support to the other carrying-support, the blocks of a course breaking joints with the blocks in adjoining courses, the temporary platform beneath all the blocks in the courses, the tension-rods in the base of the courses of blocks, the vertical dowel-joint between contiguous sides of the courses of blocks and the end blocks of a course clamped to the floor-carrying supports, and the courses of blocks linked together in contiguity continuous from one of the ends of the carrying-supports to the other ends of the carrying-supports.

Referring to the drawing, A represents the side wall of a building in which is built or laid a wall-plate B, which plate projects horizontally a suitable distance to support the blocks at one end of the courses. The other support for the blocks at the other end of the courses is represented by the parallel girders C C', upon the upper top flange of one of which girders C the end blocks are laid, as hereinafter described. In narrow or ordinary buildings the girders C are not used, as the courses or floor-blocks are constructed in length sufficiently long to reach from one side wall to the other side wall of the building.

Between the wall A and girder C is placed the temporary horses or scaffolding D D, upon which is laid a temporary floor E, slightly cambered upon the upper surface and in a position at the ends, a slight distance below the line, horizontal with the top portion of the wall-plate B and the upper flange of the girder C.

The floor-blocks F F, which are used in my construction of the floor, are ordinarily composed of hollow fire-proof material, preferably porous terra-cotta, and the ends of the blocks are cut at an angle or key-shaped to attain the proper support from each other in the floor. Each hollow floor-block is formed with a vertical inner wall or partition f^x , which extends from the inner surface of the upper wall to the inner surface of the lower wall and is equidistant from and parallel with the outer vertical sides of said block, also with two horizontal inner walls or partitions f^0 and f^3 , which extend at right angles to the partition f^x , and from both sides of said partition f^x and to the inside of the outside walls of the block. Thus the block is divided into several compartments or hollows. Between the partition f^3 and the base are the compartments or hollows f^4 . In the outer surface at the base of each block and upon one side is made a longitudinal cavity f^1 and upon the other side a longitudinal recess or cavity f^2 . In the outer surface of the sides of each block are made the vertical grooves $f f$, which extend from top to bottom of the block. The cavity, grooves, and recess are made in the blocks while they are in the process of manufacture.

The blocks are received at the place for executing the work all formed, cut, and ready for use.

To impart the requisite tension strength to the floor, I employ the tension-rod G, the length of which is slightly in excess of the length of a course of the floor-blocks. Each end of the rod G is screw-threaded at *g* and provided with a washer I, and a nut *g'* fitted to the screw-threaded end *g*. This is my preferable way for retaining the washer. In practice, however, I sometimes provide the rod G with an eye at a suitable distance from each end, into which, after the washers I I are placed upon the rod, a small pin is pushed, thus retaining the washers upon the rod. The rod G while in manufacture is made with small projections *g*², which are placed at short distances apart. These projections enable the cement to unite firmly to the rod and prevent the rod pulling loose or slipping through the cement. Around both ends of the rods G, against the inner side of the washers I I, is looped a strand of wire H, and at regular points of three or four feet along the rod between the washers I I similar strands H are placed upon it. The wires are twisted or kinked slightly to cause them to remain at the points where placed while the rod is being put in position. The strands of wire are placed at such distances apart as to exactly correspond to the length of a certain number of floor-blocks, usually either three or four. In preparing to execute a piece of work under my invention these rods are thus fully prepared with projections, nuts, washers, threads, and strands of wire in advance, and hence go into the hands of the workman who executes the floor or roof work complete and ready to be laid in place in the cavity of a course of blocks.

To secure the end blocks of a course, and thereby the whole floor, to the floor or roof carrying supports, as also to tie the building together, I employ the block-clamping rods K and L, which are alike in effect but slightly different in shape, so as to be adaptable to the different kinds of carrying-supports. These rods unite the floor and supports or walls together by being made fast at one end within and at the inner end of the first or end block at each end of a course of blocks. Sometimes, however, it is desirable to make them of sufficient length to enable them to be made fast within and at the inner end of the block second in position from the ends. The other ends of the rods K and L are made fast to the carrying-supports or within the walls. Preferably these block-clamping rods occur in the third course from the end of the floor or roof first and afterward about in each sixth course throughout the length of the floor or roof carrying supports. The rods are placed in position in the following manner: The block-clamping rod K has attached thereto upon one end a cross-bar *k*. This end, with the cross-bar *k*, is built in place within the walls of the building as the same are erected,

and the rod is placed in position at suitable height and intervals along the wall to come in line with a course of floor-blocks. The other end of rod K is screw-threaded, and is provided with washer *k'* and nut *k*².

Upon the girder C', directly opposite and in line for the same course of blocks as that opposite the rod K, is the other block-clamping rod L, upon one end of which is a hook *l*, which end is hooked over the upper flange of the girder C'. The other end of the rod L is screw-threaded and provided with a washer *l'* and nut *l*², the same as block-clamping rod K. These block-clamping rods occur as often as necessary to properly secure the floor or roof to its carrying-supports and to form suitable ties for binding the building or the walls of the building together.

In constructing the floor or roof after having provided the carrying-supports, the temporary scaffolding, and the block-clamping rods, as described, I first take one of the tension-rods already prepared and completed, as described, and place it horizontally in position next to the end wall of the building, (or the wall at angle to the wall A,) and support the rod temporarily in position a slight distance above the respective carrying-supports B C. The free ends of the wire H, against the washer I, are then drawn or laid outwardly in position at right angles to the rod or transversely to the course of blocks to be laid. Likewise all the other strands of wire along the rod are laid out. One of the floor-blocks F is then spread with mortar in the recess *f*², which is to come in contact with the tension-rod just laid, and upon the whole broad side which is to adjoin the end wall of the building, and also upon the end which is to touch the washer and wire H at end of the tension-rod and the side wall of the building. The block is then set upon the temporary scaffolding with the hollows toward wall A, and is then shoved or pressed firmly endwise against washer I, wire H, and wall A, and sidewise against the tension-rod G and the end wall of the building, the flat bottom surface at the outer end resting directly upon carrying-support B. The tension-rod G is received partly within the recess *f*² and embedded in the cement. The cement which has been spread upon the side of the block, a part of which has entered the vertical grooves, is now pressed upon and around the tension-rod G and its projections, so that the tension-rod and the block, by means of the cement and by means of its attaching to the vertical grooves in the block and the projections on the tension-rod, are bonded and united together in such a manner as when the cement has become hardened prevents longitudinal movement one upon the other. The strand of wire H is then drawn straight across the inner end of the block, after which another block is taken, spread with the cement in the same manner and is set and shoved in place in the same manner, one end against the in-

ner end of the first block and said strand of wire H, and one side against the tension-rod G and said end wall of the building, care being taken to fill the vertical joints between the ends of the blocks, so that the shell or wall portions of the second block bear fairly against the like portions of the first block. A third block is then taken and laid in like manner, after which a fourth and fifth block is laid. A strand of wire H is drawn across the inner end of a block whenever the point at which a wire is located is reached. When the blocks set reach a point near the center of the floor, work is begun at the opposite end of the course and upon the carrying-support C, and the same process of setting the blocks is followed until a point near the center is reached, when the course is completed by setting the key-shaped block in the center. The cavity f' is thereby made continuous the whole length of the course, the cavity in each block registering one with another longitudinally. Likewise the recess or cavity f^2 in each block registers longitudinally, and both recess f^2 and cavity f' register with each other in adjacent courses. Care is taken that the vertical joints between the contiguous ends of all the blocks are filled with cement and struck that the blocks may have a fair bearing endwise one against the other. I then take a second tension-rod G, which is complete with projections, washers, nuts, and strands of wire, and place it in the cavity f' in the base of the course of blocks just set and temporarily support it in said cavity, the washers I I bearing against the ends of the shell portion or vertical outer walls of the ends of the end blocks already set, and I at once twist around the rod G the free ends of the strand of wire H, that extends across the course from the previously-set tension-rod at the outer end of the end blocks, and also those between the ends of the interior blocks wherever occurring. Said second tension-rod G is thereby tied to the first course of blocks by a metal tie, and this tie is a part of the metal tie which is to bind the second course of blocks to the first course of blocks. I then draw or lay out at right angles to the course set the strands of wire H from said second tension-rod in position, the same as in the first instance, ready to receive the next or second course of blocks and to project beyond it and its cavity, as in the first instance. I start the second course of blocks, respectively, upon the carrying-supports B and C and complete it in center with key-block, as in the first instance.

The length of the end block is such as to break joints with blocks in the first course. Before setting the end block F, I place and pack cement in the cavity f of the first course over and around the said second tension-rod G for a distance back from its end equal or more to the end block to be set in the second course. I then spread cement upon the end block upon its end which is to go against

washer I, wire H, and wall A, and within its recess and upon its side which is to come in contact with said second tension-rod G and the first course of blocks, said cement upon the side being in quantity sufficient to enter the grooves in its side, together with those in the side of the blocks in the first course against which it is to lie when pressed into position. Cement is then placed in cavity f' of first course over and around said second tension-rod G a distance equal or more to the length of another block, and a second block is spread with cement upon its end in the recess f^2 and upon its whole side and in the grooves which are to adjoin the said second tension-rod and side of the first course of blocks. It is then shoved in position, one of its ends against the inner end of the end block just set. It breaks joints with the blocks in the first course. The vertical dowel is made complete by thus bringing together in contact the grooved side of the two courses of blocks. The cement hardens on and around the projections of the said second tension-rod G, also in the grooves of the blocks, also between the grooves and the sides of the two courses of blocks thus brought into contact.

By means of the cement thus used between blocks so prepared and so set in courses and resting upon and so united to tension-rod so prepared, together with the metal tie, (the completion of which tying the courses together is hereinafter referred to,) the separate courses of blocks are bound together in contiguity and in a novel manner, and prevents the longitudinal movement of a single block or a course of blocks upon another, or (by reason of the cement joints, particularly in the cavity and recess) the deflection of a single block or a course of blocks one beneath the other, or the separation of a single block, or a course of blocks one from another.

In the cavity of the latter or second course I then lay a third tension-rod G, which has been prepared with projections, washers, nuts, and strands of wire, as before stated, and while supported in the cavity I draw the free ends of the strands of wire H, and twist said ends around the end portion of the said rod G, inside the washers I I, and next the outer end of the end blocks, and likewise twist the other wires that appear at the several intervals throughout the length of the said rod G, thereby tying the two courses of blocks together in contiguity. The metal tie uniting the several courses is thereby made complete. This process of tying the courses together and also the courses to each other is repeated throughout the floor.

By means of this metal tie linking the courses together, one with the other continuously, the cement bond between the courses and between the tension-rod and the courses is made secure and greatly strengthened. Hence there cannot be a separation between the courses or a movement either longitudinally or vertically of one course of blocks

upon the other, or of one course of blocks upon the tension-rod. There can be no dislodgment of a block in the floor or deflection of one portion beneath another, as often occurs now with the system of flat arches between I-beams.

By this means of constructing a floor or roof, whereby the hollow blocks are laid and united in contiguity at the ends in courses continuous from one carrying-support to the other and the courses are laid, united, and linked together side by side in contiguity, continuous from one of the ends of the carrying-supports to the other ends, I am enabled to construct a fire-proof floor or roof lighter, stronger, safer, more substantial, and cheaper than by the means, methods, and systems now in use.

The end block F F when laid in the next or third course receives the screw-threaded end of the clamping-rod K, which, as the block is shoved in place enters one of the hollows f^1 at one end of the block F and extends through the said hollow beyond the other end of said block and at the side of the vertical partition f^x in the said block. Upon the screw-threaded end of the rod K is then placed a washer k' , which rests against the outer portion of the vertical partition f^x of the block F, and the nut k^2 is turned upon the rod against the washer k' . Upon the girder C the screw-threaded end of the block-clamping rod L is inserted through the hollow f^4 alongside of the partition f^x of the end block F at the time the same is laid, which block is in line with the end block upon support B, into which block-clamping rod K has been received. Upon the screw-threaded end of the rod L is then fitted a washer, which bears upon the partition f^x in said block, and a nut which bears against the washer, and in this manner the end blocks of a course are clamped to their supports. I then continue setting blocks in this course in the same manner as in the other courses and complete the course, supply it with a tension-rod, bind the course fast to the course previously set in the same manner as the other courses were linked together. Thereby the whole becomes clamped to the carrying-supports.

The cement which is placed between the side walls of the blocks and the courses enters the respective vertical grooves f , which register with one another in the courses, and a vertical dowel is formed which adheres to the sides of the blocks, and thereby increases the resistance to longitudinal strains, and by the breaking of joints of the blocks in a course with the blocks in adjoining courses I strengthen the courses of blocks in compressive resistance at the top and in tension resistance at the base, which, in conjunction with the metal tie linking and binding the courses together, greatly increases the strength and safety of the floor or roof in every part.

By this method of constructing a fire-proof floor and roof and clamping it to its support

or the walls of the building I am enabled to make use of the ordinary hollow-ware fire-proof material placed in contiguity in each direction throughout the floor or roof, and bind each separate piece to the other by cement, dowel-joints, and metal ties, so that not a single piece or block can be dislodged, thereby eliminating the dangers attendant upon the means, methods, and systems of fire-proof floor and roof construction now in use.

In my improved construction of floors and roofs there is no thrust, and therefore my floors and roofs may be built perfectly flat or level on the under surface (or ceiling) or may be crowned, domed, or angle-shaped, and may be built in widths corresponding to the length of joists of every kind now in use—say fourteen, sixteen, or twenty feet wide.

In constructing my floors and roofs I prefer to use the ordinary hollow ware fire-proof material, such as porous terra-cotta, but other materials may be used, such as manufactured blocks of straw, paper, cement, plaster, &c.

The temporary floor is retained in place beneath the blocks until the cement between the blocks has hardened, when the floor is self-sustaining.

Heretofore flat fire-proof floors have been formed with I-beam joists of steel or iron, which rest upon the carrying-supports and which were set at distances apart of about five feet and tied with rods, and between were filled with hollow blocks, usually in form of flat arches, the thrust being sustained by the I-beams. Often the beams spring and allow the deflection of one arch beneath another and cause cracks in ceiling. Still more often arches and portions and single blocks are dislodged. In my improved method I dispense with the beams and the separate arches and so construct the blocks as to use them directly to sustain the weight of the floor upon the carrying-support throughout the length of the supports.

By constructing the blocks in courses which are continuous in length from one carrying-support to the other carrying-support and then placing one tension-rod in one cavity in one side in the base of a course of blocks and then binding the courses together in contiguity by means of dowel-joints, metal ties, cement bonds, and tension-rods, as described, I am enabled to obtain the united compression and tension resistance of the courses of the blocks throughout the length and breadth of the floor or roof to strains from loads upon the floor or roof.

The blocks composing the floor or roof may be either square or arch-shaped.

The tension-rods and binding-links are composed, preferably, of steel of high-tension strength; but wrought-iron or other material may be substituted.

Having fully described my invention, what I now claim as new, and desire to secure by Letters Patent, is—

1. In fire-proof floors and roofs composed of separate courses of hollow floor-blocks in contiguity, having a cavity in the base of each block and extending the length of and registering with each other in each course, the combination of a tension-rod cemented within the said registering cavities of a course of said blocks and a link connecting the said courses of blocks with each other, substantially as described.

2. In fire-proof floors and roofs composed of separate courses of hollow floor-blocks in contiguity, having a cavity in the base of each block and extending the length of each course and registering with each other, the combination of a tension-rod cemented within the said registering cavities of adjacent courses of said blocks and a vertical dowel uniting the courses, substantially as described.

3. In fire-proof floors and roofs composed of separate courses of hollow floor-blocks in contiguity, having registering cavities in the base of the blocks and extending the length of each course, a tension-rod cemented within the said registering cavities of adjacent courses of said blocks, suitable carrying-supports upon which the courses rest at each end, and the means, substantially as described, for uniting the contiguous sides of the adjacent courses, whereby the strength of one course is imparted to another course continuously throughout the length of the carrying-supports, substantially as described.

4. In fire-proof floors and roofs composed of separate courses of hollow floor-blocks having registering cavities in the base of the blocks extending the length of each course,

the combination of two adjacent courses having meeting cavities, and a tension-rod cemented within the said meeting cavities, substantially as and for the purpose described.

5. In fire-proof floors and roofs composed of separate courses of fire-proof blocks, having suitable supports for the end blocks in each course, and a cavity in each block extending the length of and registering with each other in each course, and a tension-rod cemented in the said registering cavities of the courses of said blocks, the combination, with the end blocks in said course of blocks, of clamping-rods connected with said supports at one end and clamped against the inner end of said end blocks at the other end, substantially as described.

6. In fire-proof floors and roofs composed of separate courses of hollow fire-proof blocks, having partitions within said blocks and a cavity in the base of each block extending the length of each course, and suitable end supports for the end blocks in each course, the combination, with said end supports and end blocks, of clamping-rods having one end connected with said supports and the other end screw-threaded and extending within the hollow of said end blocks, and a clamping-washer upon the said end of said rod against the inner end of said partition in said end block, and a nut on said end of said rod, for the purpose described.

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