(No Model.)

W. M. BARR.

CONSTRUCTION OF FIREPROOF FLOORS.

No. 540,224. Patented June 4, 1895.

FIG. 5

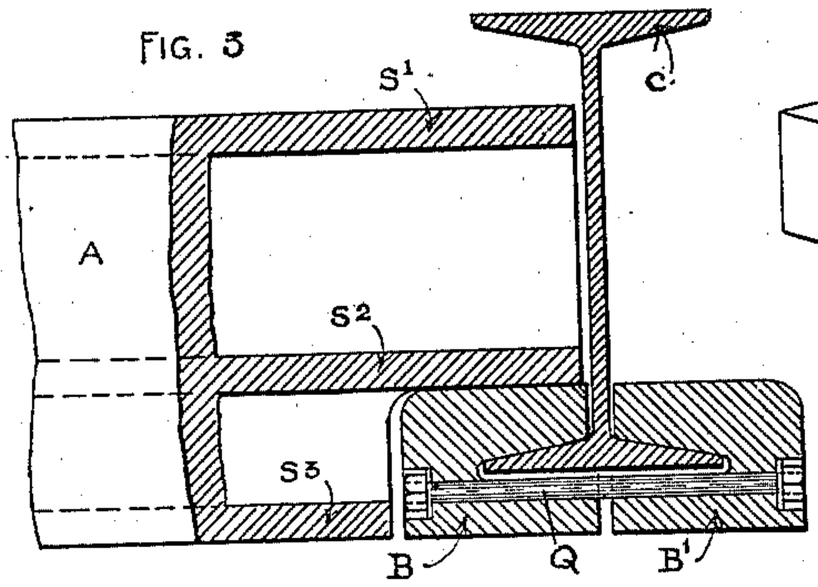


FIG. 1

FIG. 4

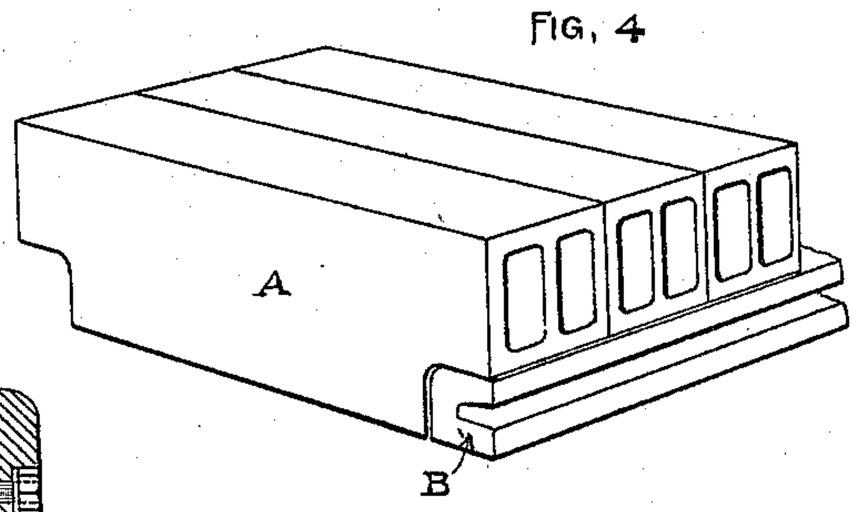


FIG. 2

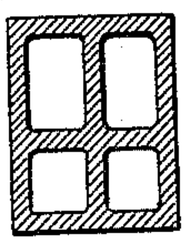
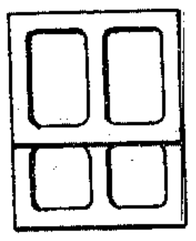


FIG. 3



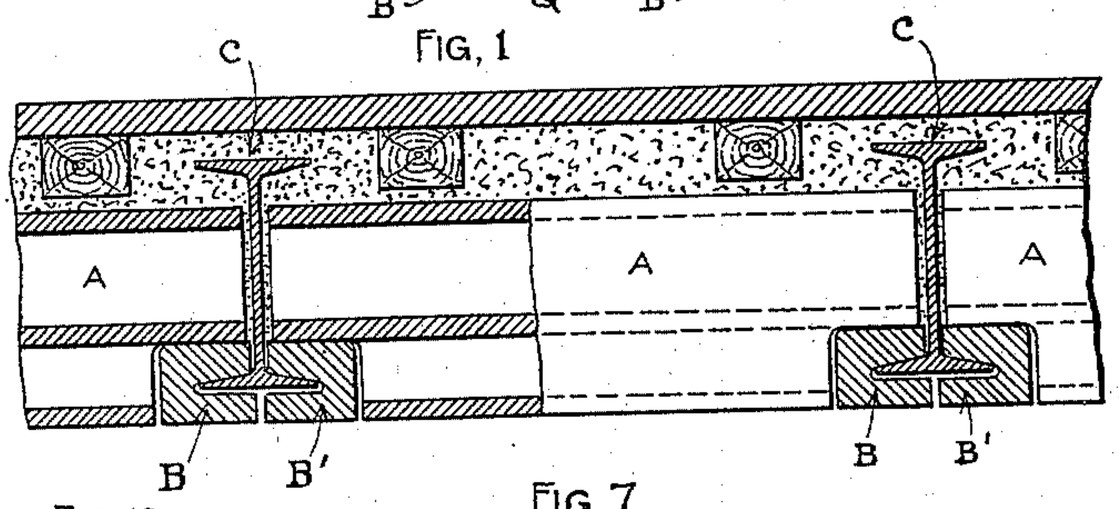
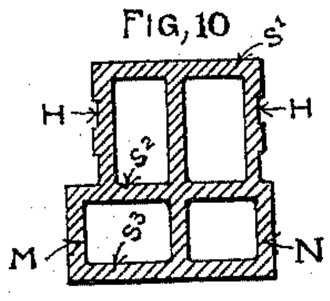


FIG. 7

FIG. 10



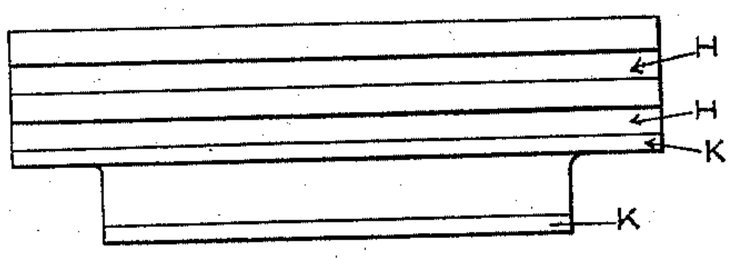


FIG. 6

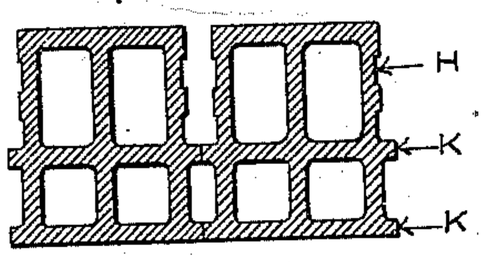


FIG. 8

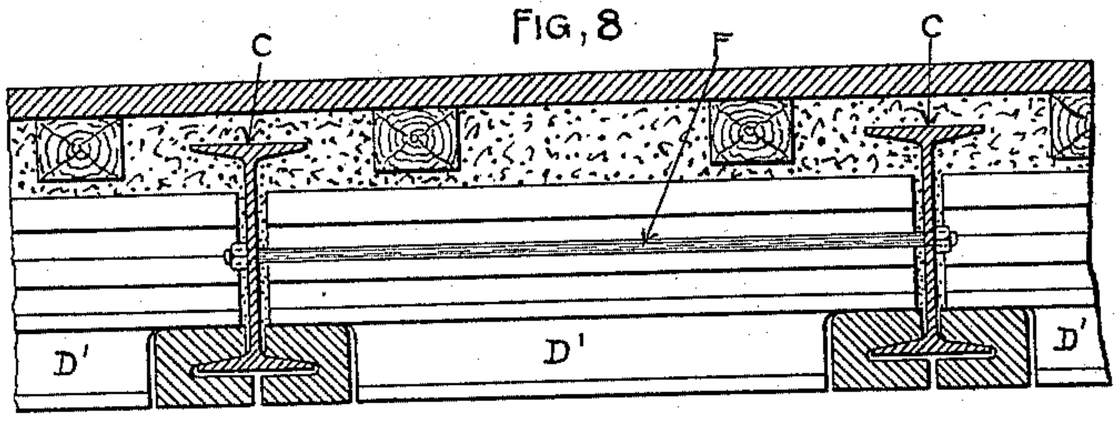


FIG. 9

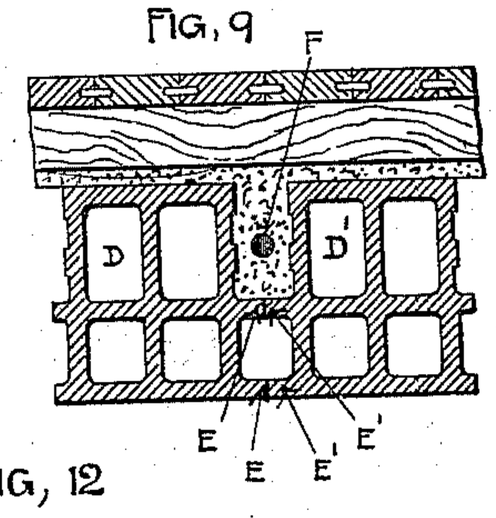


FIG. 11

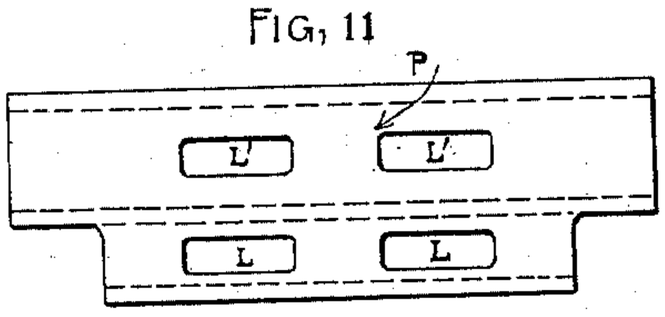
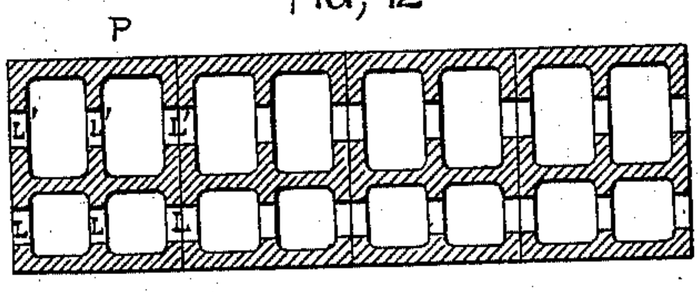


FIG. 12



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CONSTRUCTION OF FIREPROOF FLOORS.

SPECIFICATION forming part of Letters Patent No. 540,224, dated June 4, 1895.

Application filed June 4, 1894. Serial No. 513,415. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. BARR, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented certain Improvements in the Construction of Fireproof Floors, of which the following is a clear, full, and exact description.

My invention has for its object the protection of metal floor beams, joists or girders in buildings from the destructive action of fires; to make a fireproof floor which will resist an intense heat, and shall be able, while subjected to the action of fire, of carrying its regular load without any serious impairment of the factor of safety originally given the floor; to reduce the dead weight of floors to a minimum and to enable them to be constructed with greater facility and more economically than heretofore.

In order that my invention may be fully understood, I have shown the same in the accompanying drawings, in which—

Figure 1 is a vertical section through the floor. A is called the "floor-lintel." B and B′ are called "flange-protectors." C and C are metal beams forming part of the structure to be protected. Fig. 2 is a central cross-section of lintel A. Fig. 3 is an end elevation of lintel A. Fig. 4 is a perspective view of three lintels A arranged in place upon one of the flange-protectors. Fig. 5 is an enlarged sctional elevation showing how flange-protectors B and B′ envelop the lower flange of the beam C when in place, together with a section of lintel A, resting upon one of the the flange-protectors, in which S′ represents the top section, S^2 the intermediate section, and S^3 the bottom section. Fig. 6 is a cross-section of lintel A when made with grooves in and projections on its parallel sides for receiving cement or mortar. Fig. 7 is a longitudinal elevation of lintel A when made with grooves and projections shown in Fig. 6. Fig. 8 shows a method of preventing the lateral spreading of metal floor-beams with flange-protectors in place. Fig. 9 is a cross-section through one pair of lintels, showing how provision is made for the floor tie-rods needed in building construction. Fig. 10 is a section of lintel with projecting sides for retaining cement or mortar. Fig. 11 is a side elevation of a lintel, showing ventilating-openings. Fig. 12 represents a number of lintels (four) in cross-section, placed side by side, showing how a current of air can pass through from one lintel to another in series.

The flange protectors B and B′ are entirely independent of lintel A. The groove in each flange protector for metal beam C may be of any shape that will best adapt it to the dimensions, form and angle of the flanges to be protected. These flange protectors may be made in random lengths to include two or more lintels, as will best economize their manufacture and facilitate handling when covering flanges of metal floor beams in a building. In the process of putting in a floor the flange protectors B and B′ may be laid loosely on the flanges of metal beam C, and in all ordinary cases this may be sufficient, but this grooved space permits the use of fire clay or lime mortar, cement, plaster of paris or other adhesive in the space between the metal flange and the flange protectors, making thereby a rigid joint which is also both air and water tight, affording absolute protection to the lower flange of metal beam C from the action of flame, hot gases or radiant heat.

A mechanical fastening is provided for use whenever conditions make it necessary. This is attached to flange protectors B and B′ to fix them securely to the bottom flange of metal beams. Fig. 5 shows a bolt and nut Q simply as one and perhaps the best method of fastening, but the same end may be attained by a rivet instead of a bolt, by wiring or by the insertion of flat or other shaped ties, passing through a slot and bending the ends to prevent the separation of the flange protectors, all of which, by reason of greater convenience and lower cost refer to fastenings below the metal flange, but it is obvious that if the beam C be suitably perforated, the same methods apply equally to fastenings above the flanges.

The floor lintel A which is a unitary tubular or solid member extending from beam to beam does not rest directly upon the flange of the metal beam C, but on top of flange protectors B and B′. These lintels may be laid loosely side by side and preferably at right angles to the beams until the whole floor space is filled, after which the lintels are covered

with concrete to any desired depth. Sufficient concrete will pass around the ends of the lintels to fix them firmly and prevent end movement, but, if desired, the lintels can be laid on top of flange protectors in a course of mortar or cement in the same manner as brick laying or the setting of terra cotta details in building construction, methods familiar to every builder. The lintel may be of any convenient length, depth or width, depending upon the size of the metal beam C, and the load to be carried on the floor. No form of lintel other than tubular is shown in the accompanying drawings. The section of lintel A, Fig. 2, and the end elevation, Fig. 3, show it to be constructed of three vertical and three horizontal sections. It is obvious that the lintel can be increased in width by one or more additional sections, if thought desirable; or, on the other hand, it may be reduced to a single or to two vertical sections without impairing the efficiency of the lintel. Indeed, the irregular spaces to be covered in buildings make such changes in width more or less imperative, but to get the best results the lintels ought to be tubular of two sections and not single pieces. It is recommended, however, that in the case of the horizontal sections they be not reduced below three, or the number shown in all the illustrations. An important feature in this design is that of so placing the height of the intermediate section S^2, Fig. 5, in the lintel that its lower side shall provide a large bearing surface on the top of the flange protectors B and B′ instead of resting the lintel upon the thin edges of its vertical sections, which would be the case if the bearing surfaces of a lintel were only sections above or below the intermediate horizontal section S^2. The whole load upon any lintel will be distributed proportionally upon its two ends. It is apparent, therefore, that the large bearing surface thus secured adds to the strength and durability of a floor. The bottom section of the lintel, S^3, Fig. 5, carries no other load than the weight of the suspended plastering underneath. Its lower line ought to be on the same level as that of the flange protectors B and B′, as shown in all the illustrations whenever a flat ceiling is wanted.

The lintel shown in Fig. 3 has smooth vertical sides. Each lintel, therefore, must sustain singly whatever weight is brought immediately upon it, but if the sides of two or more lintels are grooved, as shown at H and furnished with projections K, Fig. 6, and also placed side by side as shown, will allow a cement mortar to flow therein and fill the intervening space between the lintels, the effect after the hardening of the cement, will be equivalent to fastening or interlocking the lintels together, adding greatly to the strength and stiffness of the floor. When all of the lintels are in place, a layer of concrete or other filling may then be spread over the top of the lintels to any required depth, as in Fig. 1, and afterward finished in tiles, wood or other material suited to the requirements of the building.

Metal floor beams have but little strength to resist lateral pressure, and when of considerable length require to be bolted at intervals of every few feet to keep them straight, and prevent their yielding sidewise under a heavy load. This detail in building construction is shown in Fig. 8 in which C and C are the metal beams and F, a connecting tie rod or bolt. Provision must be made in any system of fireproofing for non-interference with such tie rods or bolts, and to this end I have designed a form of right and left hand lintel, shown at D and D′ in Fig. 9, which consists of flanges E E on lintel D, and flanges E′ E′ on lintel D′. The amount of projection at E and E′ depends on the diameter of the tie rod F, and such additional allowance as must be made for cement filling between the lintels. The projections E and E′ Fig. 9, and the projections K, Fig. 6, will be heavy enough in all ordinary lintel construction to safely bear transportation and subsequent handling at the building, but for unusual transportation and the better to withstand rough usage, lintels, as shown in section, Fig. 10, are recommended in which projections are arranged as shown at M and N. Both of these latter projections are below the intermediate horizontal section S^2, upon which the floor load is distributed. Consequently no loss of strength occurs by widening the bottom of any lintel beyond that of its top, because the bottom section S^3 carries no load other than its own weight and that of the attached plastering. A ventilated floor can be secured in this method of construction by making ventilation openings L L of any convenient size or shape, in the lintels, as shown in Figs. 11 and 12 in which the lintel is marked P. When the openings L L are used the ventilation will be confined to the lower half of the lintel. This will be ample for any necessary change of atmosphere, and it is a part of this invention that, in the event of fire within a building, the hot gases thus generated shall not have complete access to the interior of the lintel, but be confined to the cells immediately above the ceiling and always below the intermediate section S^2. By this method of construction no hot gases can ever impinge against, or come in contact with the metal beams C, because the lower openings of the lintels terminate when in place against the flange protectors B and B′.

Having thus expressed my views regarding this important detail of construction, I do not hereby waive any advantages which may be secured by a separate system of ventilation through the upper openings L′ L′. On the contrary, I regard this upper series of openings as possessing valuable features, which, by reason of their having no connection with the lower series of openings, permit an independent flow of air, without any interference between the upper and lower currents. In

case ventilation openings L only are required, the cross section of a lintel may be that of Figs. 2, 6, 9 or 10; but if an upper and lower system of ventilation is required, the sides of the lintel should be parallel, as in Figs. 2 and 12.

Having thus described my invention, I claim the following features as new and desire to secure the same by Letters Patent:

1. In fire-proof floors the combination of a unitary tubular floor lintel extending from beam to beam, said lintel being provided with an inner section S^2 extending from end to end and horizontally across the lintel, resting directly on top of said flange protectors, substantially as described and for the purpose set forth.

2. In fire proof floors the combination of a unitary floor lintel A extending from beam to beam and tubular in a direction angular to the beams, and flange protectors B and B′ substantially as described, and for the purpose set forth.

3. In fireproof floors a mechanical fastening passing through both flange protectors for securing them in place on the bottom flange of the metal beam C, in combination with the two flange protectors, substantially as described and for the purpose set forth.

4. In fire proof floors the combination of the flange protectors B and B′ the unitary floor lintel A resting directly upon the flange protectors B and B′, and one or more grooves H in the sides of the lintel A, substantially as described and for the purpose set forth.

5. In fire proof floors the combination of the flange protectors B and B′, the floor lintels D and D′, with projections extending beyond the face of the floor lintel, said projections being confined to the lower half of the faces of the said floor lintel.

6. In fire proof floors the combination of the flange protectors B and B′, the floor lintels D and D′, the projections E and E′, constructed substantially as described, and for the purpose set forth.

7. In fire proof floors the combination of flange protectors B and B′, and a series of unitary hollow lintels, P, having substantially registering openings L and L′, as described, and for the purpose set forth.

8. In fireproof floors the combination of the flange protectors B and B′, the floor lintels P, having ventilating openings L′ substantially as described and for the purpose set forth.

9. In fire-proof floors the hollow lintel P, provided with openings L and L′ adapted to register with similar openings in companion lintels when arranged in series in the building as set forth.

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Witnesses:
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A. MCKNIGHT.