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J. T. SIMPSON & M. N. SHOEMAKER.

CONSTRUCTION OF BUILDINGS.

APPLICATION FILED DEC. 13, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

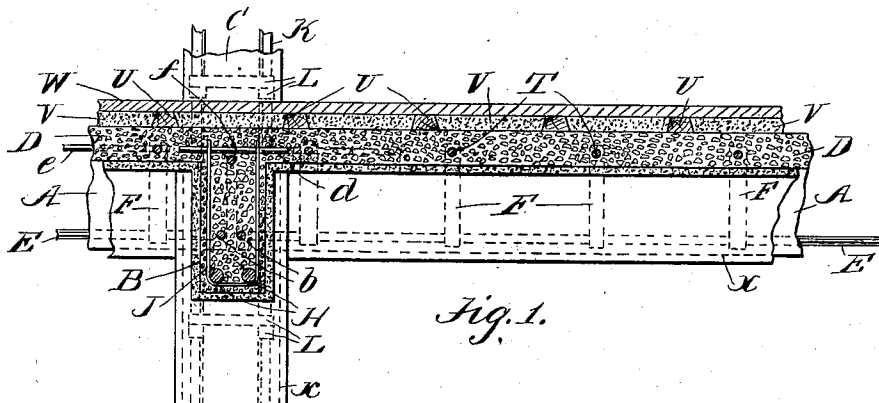


Fig. 1.

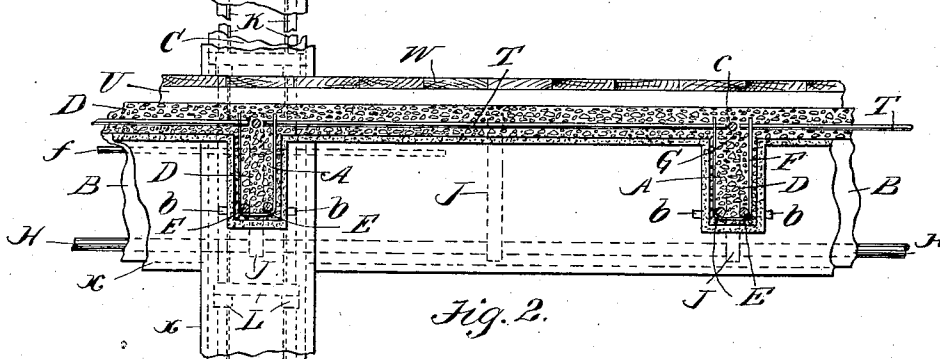


Fig. 2.

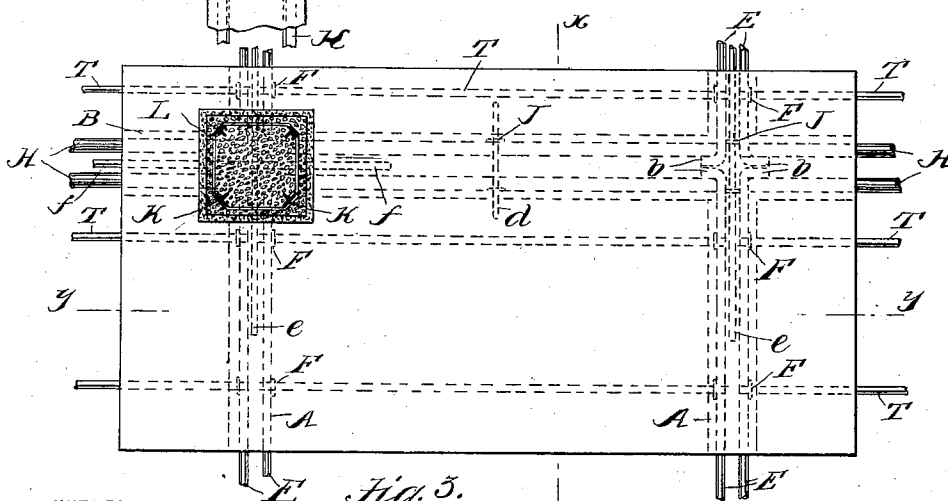


Fig. 3.

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2 SHEETS—SHEET 2.

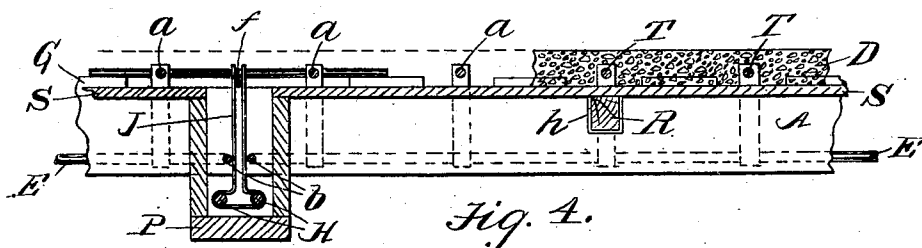


Fig. 4.

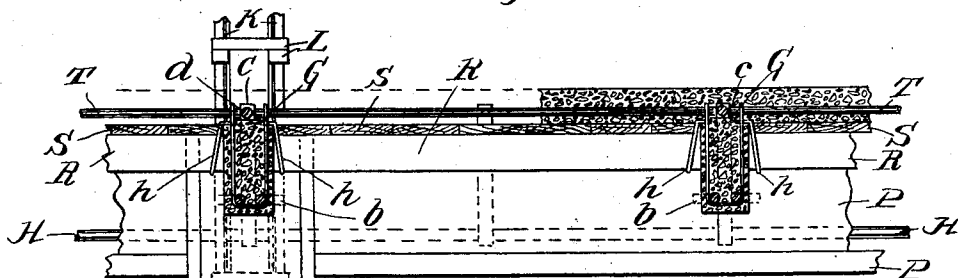


Fig. 5.

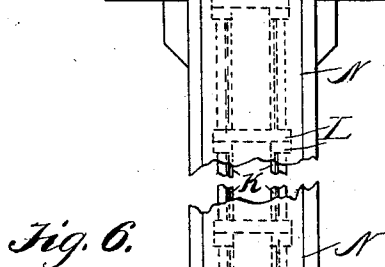


Fig. 6.



Fig. 7.

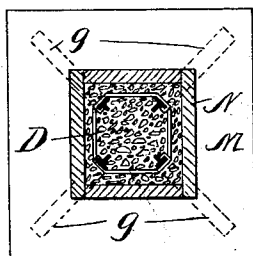


Fig. 8.

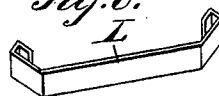


Fig. 9.

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UNITED STATES PATENT OFFICE.

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CONSTRUCTION OF BUILDINGS.

SPECIFICATION forming part of Letters Patent No. 739,030, dated September 15, 1903.

Application filed December 13, 1902. Serial No. 135,141. (No model.)

To all whom it may concern:

Be it known that we, JOHN T. SIMPSON and MARSHALL NEY SHOEMAKER, citizens of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in the Construction of Buildings, of which the following is a specification, such as will enable those skilled in the art to which it appertains to make and use the same.

Our invention consists of an improved process of constructing fireproof buildings of concrete or similar plastic materials reinforced with metal in which all of the supporting-columns, girders, and beams, together with the floor-arches, are constructed of the above materials.

The essential features of this invention are to provide a floor construction in which the usual steel columns, girders, and beams are omitted and columns, girders, and beams of concrete, reinforced with metal, are used in their place and upon which the floor-arches are supported and all parts of which are so designed as to employ the smaller and more expensive materials (metal) in tension and the bulkier and cheaper materials (concrete) in compression, thereby obtaining a cheap practical fireproof construction that can be readily adapted to all manner of buildings.

A further object of our invention is to provide a construction that is absolutely fireproof and having all metal parts thoroughly embedded in the concrete in such a manner that the action of fire, rust, and corrosion will not damage same, thereby affording a construction that is more durable than the present processes of building construction.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which a column, girder, beam, and floor-arch construction of the preferred form and having all the features of the invention is shown and in which the separate parts are designated by suitable reference characters in each of the views, and in which—

Figure 1 is a section of the floor construction taken at right angles to the floor-girder, between and parallel with the floor-beams and on the line *x x* of Fig. 3; Fig. 2, a sec-

tion of the floor construction taken at right angles to the floor-beams and parallel with floor-girder and on the line *y y* of Fig. 3; Fig. 3, a plan view of the construction shown in Figs. 1 and 2 and showing the embedded and supporting metal members in their relative positions in the supporting-columns, girders, beams, and floor-arches; Fig. 4, a section of the floor construction taken similar to Fig. 1 and showing the members in the course of construction, together with the center used in forming the same, all of the concrete of the girder and a portion of that of the floor-arches being omitted to show the process of construction; Fig. 5, a section of the floor construction taken similar to Fig. 2, but showing the members in the course of construction and the centering employed in forming the same, a portion of the concrete being omitted to show the construction more clearly; Fig. 6, an elevation of the construction showing the formation of the column and footing upon which it rests, together with the wood center used in forming the same; Fig. 7, a sectional plan of the column construction showing the anchorage of the footing and location of the supporting members, together with the wood centers; Fig. 8, a perspective view of the binders used in supporting and binding the reinforcing members of the columns; Fig. 9, a perspective view of the beam construction showing the manner of attaching the wood centers for arch construction, together with the reinforcing metal members and indented top to form keys for floor-arch.

Referring to the drawings, A represents the floor-beams, B is the girder which supports the beams, and C is the column supporting the girder.

The floor-beams A are made of concrete or other similar plastic materials D, in the lower flange of which are embedded steel or metal rods E and stirrups F and having dovetails or keys G on the top surface. These beams are formed in the preferred form in molds at a shop or on the ground and left until sufficiently dry or set to permit of handling without breaking same, after which they are raised and placed in the structure. They may, however, be formed in centers in place similar to the girders, as hereinafter described. The

metal rods E in the preferred form are shown round; but they may be square, flat, L-shaped, T-shaped, or of any preferred form in cross-section. The rods E are placed in the bottom portion of the beams to give tensile strength to the same and have their ends bent at right angles to the bars to form anchors, as shown at *b*, for attaching to a girder or wall and are held in position during the formation of the beams by means of stirrups F. These stirrups F are formed of flat bars of metal provided with openings *a* (see Figs. 4 and 5) to receive the bars of the arch construction and are bent into the form shown. These stirrups are spaced at certain intervals along the beams as the bars of the floor-arches may require and serve the triple purpose of binders in the beam, a support for the rods of floor-arches during the construction, and a binding element between the beam and the concrete of the floor-arches which is afterward placed on top of the same. They also provide means for attaching the slings with which the beams are raised into place in the building. The dovetails or keys G on the top are formed as shown and afford an additional bond between the concrete forming the body of the arches and the beams, thereby utilizing that part of the floor-arch directly over the floor-beam as a part of the compression member of the beam. The floor-beams A are placed at certain intervals and supported by the wall or resting upon the wood centering forming the mold for the girder or column. (See Figs. 4 and 5.)

The girder B is composed of concrete reinforced with metal similar to beams A, but with the difference that the girder is formed upon the wood center in place, the concrete forming the bulk of which unites with the ends of the floor-beams A and securely anchors the same in place. The rods H are placed in the bottom portion of the girder and are shown round in the preferred form, but may be square, flat, L-shaped, T-shaped, or of some other suitable shape, the ends of which rest upon the wall being bent similar to *b* on rods E of beams A and form a firm anchorage to the wall. Where the girder connects with the columns, the rods pass through the same or have anchors similar to the wall end. The rods H are supported in metal stirrups J, spaced at certain intervals along the girder B, which are blocked up in place during the ramming of the concrete D, forming the body of the girder, which blocking is removed as the work progresses. The stirrups J are provided with holes *c* in their upper ends, through which pass the auxiliary binding-rods *d* and *e*, which are placed in the upper part of the girder and project into the floor-arches and floor-beams and form a binding that prevents cracking of the concrete at the point of connection with the girder when floor arches and beams are subjected to severe loading or sudden jars, and auxiliary rods *f* are similarly placed in the

girder B, where the same passes through or is attached to column for same reason given above.

The column C is formed of concrete, reinforced with metal in such manner that the concrete takes the direct compressive stress and the metal takes the lateral stress and supports the column against failure sidewise.

The bars K are shown in the preferred form of T shape, but may be round, square, flat, or some other suitable shape, and are placed at the four corners of the column near the outer surface and are held in position by means of the metal binding bands or ties L, spaced at certain distances in the height of the column. The bars K have their lower ends, when resting on a footing M, bent into the form shown at *g* and embedded in said footing M, thus forming a rigid anchorage with footing. The footing M is formed of concrete rammed in place in some suitable mold, and the bars K are set in during the formation of the same. The binders L serve the double purpose of holding the bars K in position during the construction of the column C and of causing all the bars K composing the reinforcement of the column to act in unison during stress. The wood or similar centers N are placed upon the footing M, completely surrounding the bars K and arranged as shown, and into the space formed by the centers N is placed from above the concrete D, forming the brick of the constructive materials. This is filled in up to the wood center P, forming the molds for the girder B. The beams A are then set in place, and the concrete filling D is then placed in the girder-mold P and filled to the top of same. The wood centers R are then hung from the beams A by means of small bridles *h*, placed at certain distance along the beams A, and upon these supports are placed the wood centers S, which are nailed in place.

The bars T of the floor-arches are then placed in the stirrups F by passing through the holes *a*, which are arranged to come a sufficient distance above the top of the wood centers S to permit of the embedding of the bars T in the concrete D, forming the bulk of the construction of the floor-arches. The concrete D is now placed over the entire surface of the girders, beams, and arches to the desired thickness, thus binding the structure into one solid mass and ready to receive the ordinary finished floor. The sleepers U of the ordinary wood construction are then placed upon the arch at certain distance and the space between the same filled with cinders V in the usual manner, after which the ordinary wood floor W is nailed to the sleepers U and completes the finished floor. After removing the entire wood centering the columns, girders, beams, and under side of arches are covered with plastering X in the usual manner. When desirable, a level ceiling may be attached to under side of beams in some suitable manner.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination in a building construction, of supporting-beams and floor-arches composed of tension-bars spaced at certain distances apart and embedded in the lower side of concrete slabs and forming flat arches between the supporting-beams, said beams being formed of metal tension-bars and concrete and having metal stirrups passing under the bars and spaced at certain distances apart in the length of the beam and bent in the form of the letter **U** having the upper ends of the vertical legs thereof punched to receive the reinforcing-bars of the floor-arches, and all of which is embedded in concrete, and whereby the metal bars take the tension stresses and the concrete the compression stresses, substantially as shown and described.

2. The combination in a building construction, of supporting-beams, girders and floor-arches composed of metal tension-bars spaced at certain distances apart and embedded in the lower side of concrete slabs and forming flat arches between the supporting-beams, said beams being formed by metal tension-bars and concrete, and having metal stirrups passing under the bars and spaced at certain distances apart along the length of the bottom and bent in the form of the letter **U**, and the upper ends of the legs of which are punched to receive and support the reinforcing-bars of the floor-arches, and all of which are embedded in concrete, the girders being formed of metal tension-bars and concrete and designed to support the beam and arch construction and having metal stirrups passing under the bars and spaced at certain distances along the girders and bent into **U**-shaped form and the legs of which are punched to receive auxiliary bars which pass there-through over the girders and into the floor-arches and which prevent rupture between the same, all of said parts being embedded in concrete so that the metal bars take the tension and the concrete the compression stresses, substantially as shown and described.

3. The combination in a building construction of columns, girders, beams and floor-arches, said arches composed of concrete reinforced with metal bars spaced at certain distances apart and extending between and supported by beams composed of concrete reinforced with metal bars and having metal stirrups passing under said bars and bent into the form of a letter **U**, and the upper ends of the vertical legs of which are punched to receive and support the reinforcing-bars of the arch construction, and which stirrups are spaced at certain distances apart in the length of the beams to suit the spacing of the bars of the arch construction; said girders supporting said beams and composed of concrete reinforced with metal bars and having metal stirrups spaced at certain distances in the length of the girders and passing under the reinforcing metal bars and having the upper ends punched to receive and support the auxiliary reinforcing metal bars which pass over the girders into the floor-arches and prevent rupture between same; said columns being composed of concrete reinforced with metal bars and upon which the girders and beams rest which, and said columns consisting of upright reinforcing metal bars, placed near the outer surface of the columns and held in place by means of metal binders and having auxiliary reinforcing metal bars where floor beams and girders attach thereto, these auxiliary bars being placed near the upper surface of the beams and girders and crossing the columns to prevent a rupture occurring between columns, beams and girders; and whereby the reinforcing metal bars take the tension and the concrete body the compression stresses, substantially as shown and described.

In testimony that we claim the foregoing as our invention we have signed our names, in presence of the subscribing witnesses, this 3d day of December, 1902.

JNO. T. SIMPSON.

MARSHALL NEY SHOEMAKER.

Witnesses:

HENRY BROCK BROWN,

JOS. M. A. NASH.