A. G. BAGNALL & J. A. TAYLOR.

FLOOR CONSTRUCTION.

APPLICATION FILED OCT. 22, 1914.

1,235,636.

Patented Aug. 7, 1917.

2 SHEETS—SHEET 1.

Fig. 1.

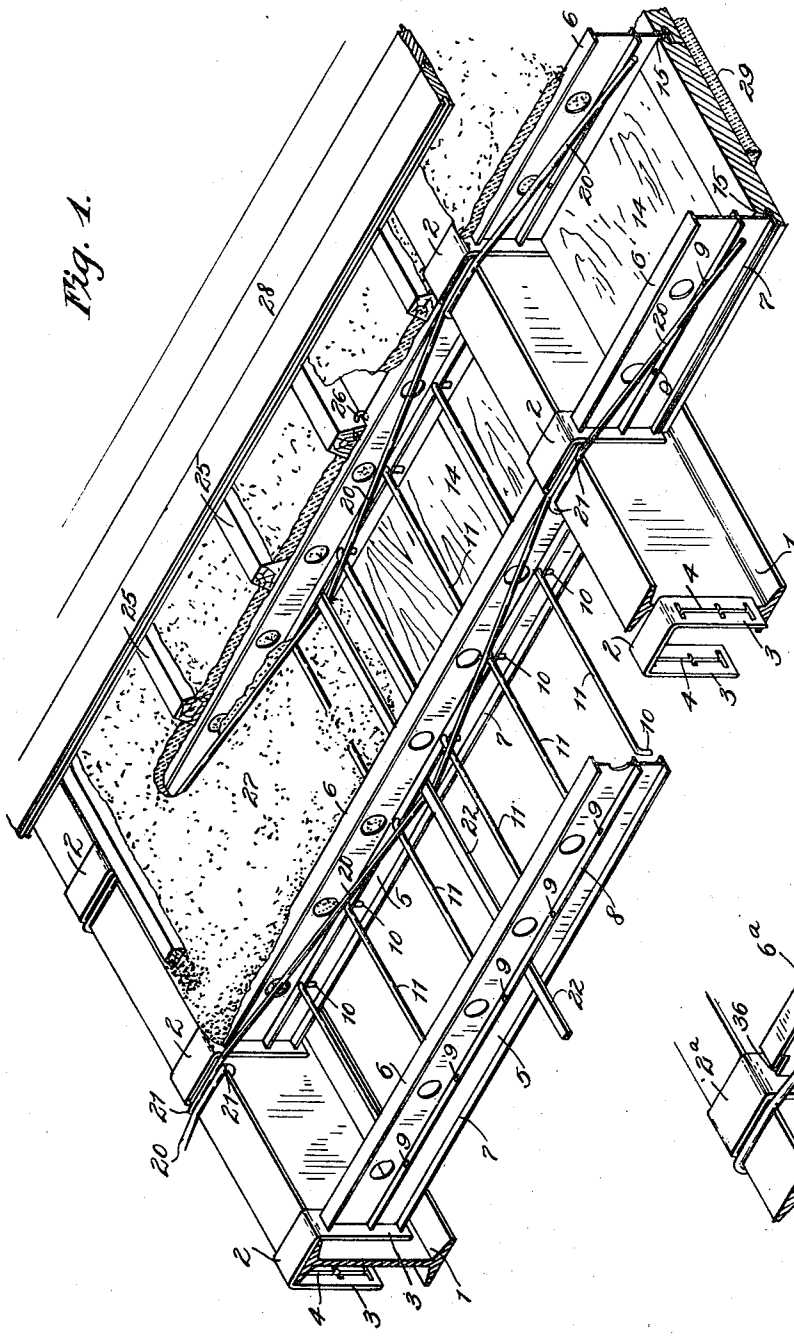
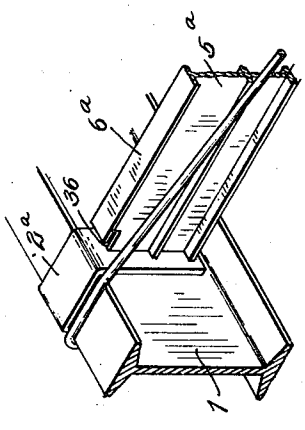


Fig. 5.



Witnesses:
R. L. Bruck.
H. B. McGill

Inventors,
Arthur G. Bagnall
James A. Taylor
By Hull & Smith
Attys

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2 SHEETS—SHEET 2.

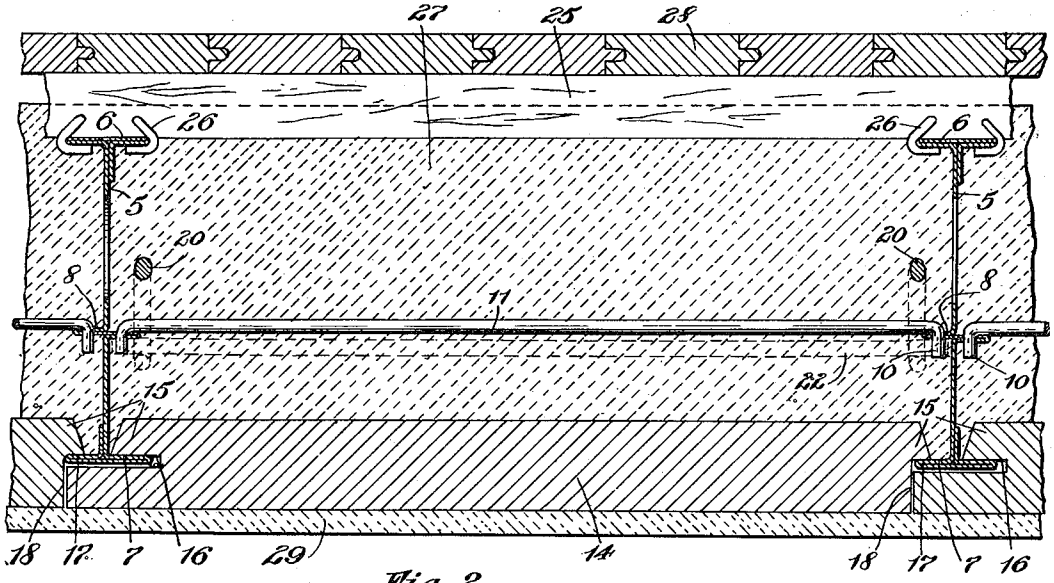


Fig. 2.

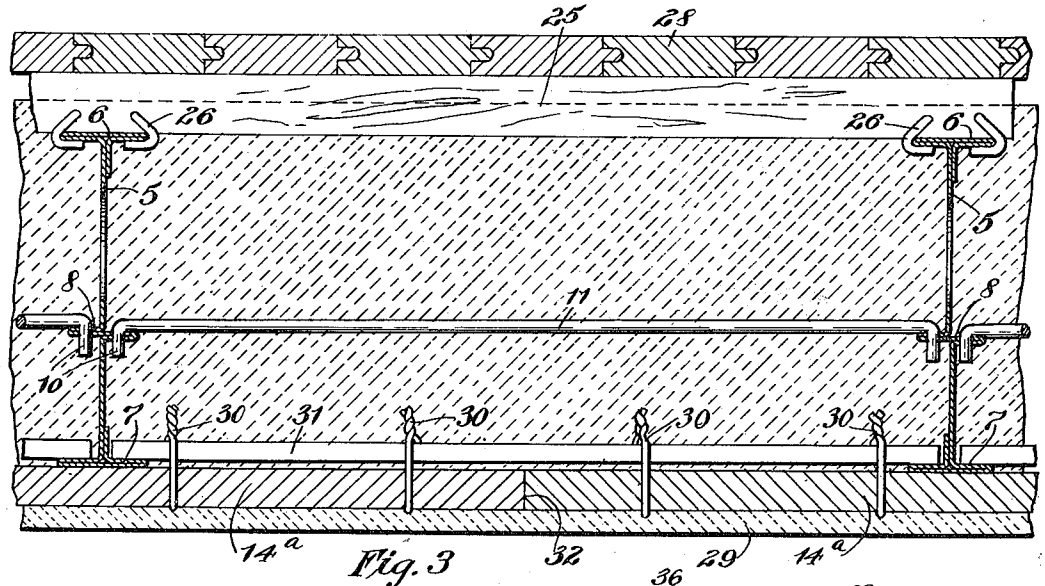


Fig. 3

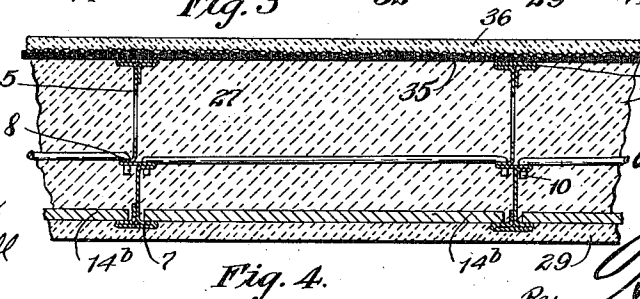


Fig. 4.

Witnesses:
R. L. Buck.
H. B. McKill

Inventors,
Arthur G. Bagnall.
James A. Taylor.
By Shell & Smith
Attys.

UNITED STATES PATENT OFFICE.

ARTHUR G. BAGNALL AND JAMES A. TAYLOR, OF CLEVELAND, OHIO.

FLOOR CONSTRUCTION.

1,235,636. Specification of Letters Patent. Patented Aug. 7, 1917.

Application filed October 22, 1914. Serial No. 868,008.

To all whom it may concern:

Be it known that we, (1) ARTHUR G. BAGNALL, (2) JAMES A. TAYLOR, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Floor Construction, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to building construction, and particularly to a mode of construction whereby floors may be rapidly and economically laid in a fire-proof manner, with great rigidity, and with the use of cheaper materials and more expeditious methods than any heretofore in use. The floor constructions now principally in use are the following: first, the plain wood floor consisting of spaced parallel wooden joists having the flooring boards secured to their upper edges and lath for the ceiling below secured to their lower edges; second, the tile floor made of hollow interlocking burned-clay tile suitably reinforced by metal members and carrying above a floor of wood boards or concrete, and having secured to their lower faces the plaster forming the ceiling of the room beneath; third, the reinforced concrete slab run into wood molds which are afterward taken away, a wood or concrete floor being laid upon the upper surface and the plaster for the room beneath secured to the lower surface, adhesion being secured by means of tile plates, paint surface, or other expedients. The first of these is notoriously inflammable and is prohibited by ordinance in a great many cities and towns, especially for buildings of a public or semi-public nature or those above a certain size; also the increasing price of lumber is rendering such construction less desirable than formerly. The last two constructions are notoriously expensive, the expense of the second method being caused largely by the high cost of the tiling and the labor to set the same, and of the third method by reason of the great expense of lumber necessary to make the molds and forms, the cost of erecting those forms, and the long period required for setting of the concrete, during which time other work on the building is practically suspended.

According to our invention, thin and light joists, preferably bent up out of sheet metal, are substituted for the wooden joists of the first method, and to the lower edges of these joists are secured boards, plates, or slabs of some suitable imperforate incombustible material, forming with the joists large molds in which is poured a suitable cementitious or plastic composition, preferably plaster of Paris mixed with sawdust or other cheap like diluent. This cementitious material serves to stiffen and prevent buckling of the joists, prevents the passage of noise through the floors, and forms a very effective fire shield, although having very little tensile strength. Upon the upper surface of this structure there is laid a wearing surface of boards, concrete, mosaic, or the like and to the lower surface is applied the plaster forming the ceiling of the room beneath. Suitable tie rods are employed between adjacent joists, while tension members may also be employed to stiffen the same and guard against sagging of the floor.

Generally speaking our invention may be defined as consisting of the combinations and constructions recited in the claims hereto annexed and illustrated in the drawings accompanying and forming a part of this application, wherein: Figure 1 is a perspective view of a portion of a floor constructed in accordance with our invention, different parts of the floor being shown in different phases of construction; Fig. 2 is a vertical sectional view taken transversely of the floor joists and illustrating the completed floor shown in Fig. 1; Fig. 3 is a view similar to Fig. 2 but showing a modified mode of treating the lower surface of the same; Fig. 4 illustrates a cheaper modification of our improved floor; and Fig. 5 is a detail perspective view showing a modified form of connection between the joists and girders.

Describing the parts by reference characters 1 represents the main girders here shown as I-beams. Upon these girders we hang at spaced intervals, preferably sixteen inches, the U-shaped iron saddles 2—2, whose depending legs 3—3 are slotted as shown at 4—4 for the reception of the joists 5—5. Each of these joists is formed with laterally extending flanges 6 and 7 at its top and bottom, respectively, and also with intermediate lateral flanges 8, the latter being formed with spaced apertures 9—9. These joists are preferably made from strips of sheet metal such as galvanized iron of suitable gage by bending the marginal portions as illustrated in Figs. 2 and 3 to form

the flanges 6 and 7, and folding an intermediate portion upon itself in two directions to form the intermediate flange 8, although we do not confine this invention to joists constructed in this manner. The slots 4—4 are preferably of a shape to receive the ends of these joists snugly as illustrated in Fig. 1.

The apertures 9—9 are for the reception of the downturned ends 10—10 of the tie rods 11, while the flanges 7—7 support the plates or slabs by which the plastic material is supported. In Figs. 1 and 2 these plates or slabs are illustrated generally at 14, and consist of rectangular sheets of some composition such as gypsum, paper board, pulpboard or like substance, preferably incombustible, and having at each end an overhanging tongue 15 adapted to rest upon the adjacent flange 7. Preferably one edge of each of these members is formed at a point beneath and spaced from the tongue by the recess 16 with a forwardly extending lip 17 whose width is not less than the total width of the flange 7, the opposite edge of the member being cut away as at 18 for the reception of the corresponding lip of the adjacent slab (see Fig. 2). This provides a fire proof coating for the lower edge of the joists as is required by many city-ordinances, and shifts the joint to one side of the joist as also required by many ordinances while the thickness of the lip 17 may be made sufficient to satisfy the local requirements or any need which might be expected to arise. Also this construction permits the members 14 to be applied after the joists are in place, the tie rods 11—11 being necessarily left out until after these members have been placed. The width of the flanges 8 is preferably slightly less than that of the flanges 7 for this purpose.

In case the distance between the girders 1—1 is excessive, or in case the load expected surpasses a given figure, tension reinforcements may also be employed, these consisting preferably of steel rods 20—20 having hooked ends 21—21 gripping the top flanges of the girders and having their middle portions passing beneath suitable stays 22 affixed to the joists. In practice these rods are preferably formed with one hooked end in advance which is applied to the girder at one side, the rod passed under or over a suitable gage, and the opposite end bent around the other girder. After this has been done the stays 22 can be pried into place so as simultaneously to place the required tension upon the rods 20 and to secure them to the joists 5—5. Our experience has indicated that these rods are not necessary excepting for heavy weights or long joists since a floor made with eight inch joists of sixteen gage galvanized iron, the joists being eight feet long and sixteen inches apart and embraced with a mass of plaster of Paris and sawdust applied as described herein, has stood for ten days a weight of sand bags amounting to three hundred and fifty pounds per square foot with a measured deflection of only one-fourth inch.

In case a wood floor is to be laid, suitable sleepers 25—25 are applied to the upper edges of the joists 5—5, said sleepers being preferably wider at the bottom than at the top as shown in Fig. 1 and held in place by suitable slips 26 driven into their sides and hooked over the flanges 6 of the joists. When the plastic material 27 is run into place it surrounds and prevents warping, twisting or shifting of any of the submerged members, and also by being keyed around the sleepers 25 serves to retain them firmly in place. The floor boards 28 may then be applied in the usual manner to the upper surface of the sleepers, while a suitable plaster 29 is applied to the lower faces of the members 14—14.

In Fig. 3 we have shown a modified form of construction in which the members 14—14, instead of being molded to interlock with the joists, are formed merely of wide flat sheets 14^a—14^a of plaster boards, "sackett board," or other suitable composition held in place by the wire staples 30—30 whose legs are twisted about suitable rods 31—31 whose ends rest upon the flanges 7—7. Preferably the joints of these boards are brought in a space midway of the different joists as shown at 32, although this is a feature depending upon the fire ordinances of the place where the work is done, and the plaster 29 is applied to the lower faces of these boards in the usual manner.

In Fig. 4 we have illustrated a still cheaper and simpler construction, usable only in places where the fire risk is slight or the fire ordinances are lax. In this embodiment the bottom members are formed of sheets 14^b of plaster board, sackett board, or the like laid upon the upper edges of the flanges 7—7 so that the lower edges of the joists are visible therebeneath. After the introduction of the filling material 27, the plaster 29 is applied as before covering both the boards and the joists. Also in Fig. 4 we have shown a different kind of wear surfacing for the upper part of this floor, the sleepers 25 being omitted and in their place a suitable bonding layer 35 being employed upon the upper surface of which is applied a floor 36, of concrete, mosaic, or the like. The bonding layer 35 is employed for the purpose of obtaining proper adhesion between the cement and plaster and for preventing the occurrence of chemical action therebetween, and any one of several well known compositions or expedients may be employed for this purpose.

In the construction illustrated in Figs. 1

and 2 it will be noted that the upper surfaces of the joists 5—5 are spaced somewhat beneath the surfaces of the girders, since the top flanges of the joists necessarily must avoid the corresponding girder flanges. This difference in height is comparatively unimportant in case a board floor is used, since the floor boards are raised sufficiently by the sleepers so as to bridge these girders. In some cases however, as in the arrangement shown in Fig. 4, it is desirable to have the upper edges of the joists and girders substantially on a level, which may be done in the mode shown in Fig. 5 by forming the slots in the saddles 2^a more nearly at the top thereof, and cutting away the top flange 6^a of the joists 5^a as illustrated at 36 thus permitting the web of the joist to be inserted through the slots in the saddles without interfering with the top flange of the girder.

This floor, by the employment of suitable joists and tension rods, may be made as strong as the cement or tile floors, and in case such strength be not needed its expense may be made much less than that of the prior constructions. Also there is no false work required, and no waste of lumber in molds, braces, and the like, the weight of the floor and of the building is very much less than in the case of concrete or tile, it can be laid by comparatively inexperienced workmen, and will harden in a single night so that work on the building need not be delayed as in the case of Portland cement and other slowly setting materials.

While we have described our invention in detail it will be understood that we do not limit ourselves to such details except as the same may be positively included in the claims hereto annexed or may be rendered necessary by the prior state of the art.

Having thus described our invention, what we claim is:—

1. A floor construction comprising a pair of spaced I-beams, a plurality of spaced parallel sheet metal joists bridging said I-beams, a plurality of saddles adapted to rest on the I-beams and receive the ends of the sheet metal joists, said sheet metal joists having projecting from the sides thereof, intermediate their edges, horizontally disposed integral flanges, said flanges having spaced apertures therein and a plurality of bracing rods having deflected ends engaging the perforations in the horizontal flanges whereby the parts may be quickly assembled into a rigid floor construction.

2. A floor construction comprising a pair of spaced I-beams, a plurality of spaced parallel sheet metal joists bridging said I-beams, a plurality of saddles having slots therein and adapted to rest on the I-beams and receive the ends of the sheet metal joists in said slots, said sheet metal joists having projecting from the sides thereof intermediate their edges horizontally disposed integral flanges, said flanges having equally spaced apertures therein throughout the length of the joists, and a plurality of parallel arranged bracing rods having deflected ends engaging the perforations in the horizontal flanges on said joists whereby the parts may be quickly assembled into a rigid floor construction.

In testimony whereof, we hereunto affix our signatures in the presence of two witnesses.

ARTHUR G. BAGNALL.
JAMES A. TAYLOR.

Witnesses:
J. W. GREENBERG,
M. G. BAGNALL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."