square, 15 feet span, and uniformly loaded, carry 16 tons, while three 15-inch light-rolled iron beams, lying side by side and occuping about the same space, will carry 69 tons.

CLASSIFICATION OF FIRE-PROOF STRUCTURES.

I divide fire-proof buildings into three classes :—

Class I. embraces those structures in the construction of which only incombustible material is used, and all constructive ironwork is properly protected against the action of fire.

Class II. embraces those structures into the construction of which incombustible material enters, but the iron-work *not* protected by fire-proof and non-conducting coatings. Suitable for buildings not containing so much inflammable matter as to injure or weaken the iron in case of fire.

Class III. comprises all buildings in the construction of which combustible material is used, but all vital members protected by fire-proofing.

DETAILS OF CONSTRUCTION.

Class I. or II. In the construction of Class I. all combustible material is rigorously excluded, except for doors, window-sashes, stair-rails, flooring and skirting. The external faces of outside walls may be either of brick, sandstone, or granite ; the backing to be of brick with a hollow space two inches wide, located one brick distant from the inner face of the wall. All openings in the brickwork to be arched. Roof construction, furring, and lathing, of iron. The floors to be constructed of iron beams, supporting arches of brick (Fig. 1), hollow tile (Fig. 2), or corrugated sheet iron (Fig. 3) ; the haunches and crown to be filled with concrete, level with the tops of the beams.

When floor-tiles are used, they should be bedded in about one inch of cement, spread over the concrete ; when of wood, wooden strips two by two inches, to which the flooring is nailed, are bedded on the concrete from sixteen inches to two feet apart ; the spaces between the strips being filled with cement mixed with fragments of porous brick. Practically there is no difference between the above methods as to strength, but considerable in weight, the order being as follows, commencing with the lightest : hollow tile, corrugated sheet-iron, brick. When ceilings are to be plastered, the plaster is applied directly to the brick arches and hollow tile ; the corrugated iron arches are merely painted. When flat ceilings are required, iron lath is riveted to small ⌐ or T irons that run from and rest on the bottom flanges of the beam ; the hollow tile is generally made for flat ceilings.

It is important that the soffits of beam and lath to iron girders receive a coat of some good fire-proof and non-conducting material, not less than one inch thick, and securely fastened on. A mixture of asbestos and pipe-clay is very effective. The soffits of floor-beams may also be protected by the brick skewbacks of arches being made in such a form as to lap the lower flanges of beams. (See Figs. 4 and 5.)

The shafts of cast-iron columns should be continuous from middle to middle of the floor thickness, enveloped with not less than one inch of some fire-proof, non-conducting material, securely held to the shaft by buttons or ribs imbedded in the material. The capital and base should be of cast or sheet iron, fastened to lugs or bosses cast on the shaft, and long enough to pass through the envelope. (See Figs. 6 and 7.)

If light partitions are required, such as do not start from the foundation, and for which common brick would be impracticable by reason of its weight, hollow terra-cotta tile or brick can be used. Another method, more expensive, but admitting a construction which is self-supporting, consists of light I-beams, generally four inches deep, placed vertically two feet from centres, with the ends riveted or bolted to plates or channel-irons secured to the floor and ceiling ; to these beams the iron lath is bolted for receiving the plaster. These partitions can be readily trussed, so that they add no weight to the floor from which they start.

All steep parts of slated roofs are provided with rolled iron purlins T or L shaped, weighing about two pounds per linear foot, riveted to the jack-rafters or trusses. The spans of these purlins should not exceed six feet for slate weighing ten pounds each. The distance between centres of purlins depends upon and is always equal to the weathering of the slate ; one purlin is required for each line of slate ; for example ; a slate 12x24 inches, showing ten inches to the weather, with four inches lap, requires the purlins to be ten inches from centres. The slate is fastened to purlins by No. 16 B. W. G. copper wire passing through two holes in the tail of the slate and around the purlin. (See Fig. 8.) Another method, more expensive, but in proportion to its greater security, consists of two $\frac{3}{16}$ inch diameter bolts with heads countersunk in the slate, and fastened with a nut to a hook hanging to the purlins. (See Fig. 9.) Instead of purlins, corrugated sheet-iron is sometimes used, running from rafter to rafter ; to this the slate is fastened by wrought-iron pins, countersunk and passing through the slate and corrugated sheets, where they are bent so as to form a hook or clinch ; the slate may also be bedded in a layer of cement applied to the corrugated iron. (See Fig. 10.)

Flat parts of roof are covered with either cement, copper, lead, zinc, tin, or galvanized sheet-iron ; either one of the metal coverings are fastened to a layer of cement, about one inch thick, overlying concrete supported by corrugated sheet-iron arches, by the tags imbedded therein. (See Fig. 11.) The supporting material may also consist of burnt clay tile, resting on T-irons. (See Fig. 12.) Another very good method consists of metal boxes filled with fire-proof material ; the boxes are about two feet wide, from two to three inches deep, and of lengths up to eight feet spans ; the bottom, sides, and ends are formed of galvanized sheet-iron, and the top of copper or galvanized sheet-iron ; the boxes are placed alongside of each other and fastened to the beams of the roof. This method possesses an advantage in that it is light, strong, overcomes the difficulties from expansion and contraction, and forms a smooth ceiling. (See Fig. 13.)

Fire-proof doors and shutters are indispensable. They consist either of sheet-iron boxes filled with fire-proof material, or layers of corrugated sheet-iron riveted together ; they are also made of a sheet-iron plate surrounded by an iron frame forming an open box, into which a fire-proof preparation is filled and secured by lath of a peculiar construction ; this is an effective shutter or door, in that the fire-proof material is directly exposed to an encroaching fire, and no part of the metallic construction is in danger of warping and the material falling out. It is essential, to insure a proper working condition of shutters in warehouses or factories, to so construct the shutter that it can be attached to the glazed sash, and that both will slide on the same bar or track, so that the sash cannot be opened without also moving the shutter. In buildings where subdividing fire-walls are made use of, it would be well to so arrange the shutters that they can be operated from an adjoining room or compartments by means of rods or endless chains.

Class III. All girders, joists, struts, and roof timbers to be of wood, and, if possible, of large scantling. All floors to be counter-ceiled so that not less than two inches of non-conducting material will lie between the flooring and counter-ceiling. The spaces between the scantlings of partitions to be filled with mortar or a mixture of clay and cut straw not less than one foot above floor level. (See Figs. 14, 15, 16.)

The roof construction may be of wood. For the slated parts strips of wood 2x2 inches are nailed horizontally to the sheathing boards ; the spaces between strips being filled, level with their tops, by a mixture of clay and cut straw or any other fire-proof non-conducting preparation. The same method is also used for flat parts of roofs, the metal tags for holding roof covering being nailed to strips.

The sketches hereto attached illustrate the various methods described.

ELECTRICITY IN FLOWERS.—Last evening a gentleman of thi city accidentally made a most singular discovery respecting the electrical influence of the ordinary morning glory vines. Seated near the lattice work, over which the vine was twined, his attention was attracted to a single little branch tipped with a growing line extending straight out from the rest, and speculated within himself whether the tiny hairs with which the stem was clothed were not placed there for the purpose of conducting the electric fluid of the atmosphere to the plant. In order to continue this investigation he approached his finger within a half inch of it, and was amazed to observe a slight—almost imperceptible—yet unmistakable motion of the stem. As he pushed his finger a little nearer the stem trembled very visibly and was seemingly attracted and repelled from him. The hairs which he noticed before did not move, but remained erect. There was no wind at the time and the motion was purely an induced one. After this interesting experiment he placed the end of his finger within a short distance of the growing bud and slowly moved in a circular direction. The stem followed the motion until it was bent in the shape of a letter C, and when the finger was withdrawn instantly regained its former straight position. This last experiment was witnessed by several persons, all of whom tried it with varying success.—*Lafayette (Ind.) Courier.*