gas. Smoke is inflammable, and when it accumulates in a building, often spreads the fire from story to story, or blows out the walls by the explosion of its gases. But while thm skylights are contended for by many expert firemen, it should be borne in mind that nothing so facilitates the spread of fire as a draught, and it would be better to have the skylights adjusted with appliances for opening them, so that when the firemen arrive on the ground, and not before, they may be adjusted to permit the escape of smoke and allow the firemen to enter the building to see where to work to the best advantage. Under any circumstances a network of wire should be above the glass to guard it against flying embers, and another should be suspended beneath the skylights, so that when the glass cracks and breaks with the heat it will not injure the firemen below.

Roofs should be of brick or tile on all high buildings, the roof beams being of iron and, where tanks are supported, of sufficient strength to carry many times the actual probable weight of the water and the containing tank itself. Slate roofs, on very high buildings especially, on street fronts are objectionable, as, in case of fire, the slates would crack and, falling to the street, injure the firemen. A flat roof of brick tile is better than any other. All water on roofs from rain or melting snow should be drained from the front or sides to leaders, so as to avoid drip points, from which icicles could be formed.

The electric light installation of a "fire-proof" building is an important and complicated matter. The switchboard should be of combustible material, and no steam, water, or sprinkler pipes should pass over or near it where, in case of a bursting pipe, water could reach the switchboard and cause disaster. This is an important matter almost universally overlooked. An admirable floor for a dynamo room is one of deck glass, ¾ inches thick, on a wooden (not iron) frame. It will insure that the attendant upon the dynamos will be, at all times, effectually insulated. Such a floor will not become soaked with oil, as would a wooden floor, and can easily be kept clean. A strip of rubber floor carpet stretched over it will prevent slipping.

It is sometimes necessary to have communications between adjoining buildings by doors in the fire walls, and it is not always convenient, for changing merchandise from one room to another, to have "fire-proof" doors closed during working hours. It is possible to have the "fire-proof" doors run upon trolleys on an inclined track, so as to close by the force of gravity and held open by fusible metal latches or links which would release them when melted by the rising temperature of a fire. It has occurred to me that this difficulty may also be met by erecting between two adjoining buildings a separating "fire proof" hallway of brick, which can be utilized for containing staircases and elevators, and for supporting the water tanks of automatic sprinklers. The doors which open into this hallway should not be opposite each other, but at opposite ends of it, so that fire in one of the buildings passing through the door would come against a blank wall opposite. Even if the "fire-proof" doors to these openings should happen to be open at the time of a fire in one of the two buildings, it is improbable that it would find access to the other. The floors should be both fire and water proof, slightly lower than those of the two separated buildings, and with water vents or "scuppers" for carrying off surplus water thrown by a fire department. Indeed, it is well to have "scuppers" on all floors of every building. The walls of this separating hallway should rise 4 feet higher than the roofs of the two buildings, and, if there are window or door openings near it, its walls should project beyond the line of enclosing walls at least 1 foot.

The water tank, as already stated, should be supported on protected iron I-beams, resting on the brick walls, with cast-iron templates, so that the tank cannot fall, break down the staircases and wreck the building in case of fire. It is important always to locate tanks so that they will not be over stairways or elevators, and endanger them in case the supports give way. With a "fire-proof" hallway of the kind recommended, containing no combustible material whatever, the tanks being supported by iron I-beams resting on the brick walls, this would not be an important matter, but in all other cases water tanks should be planned so as not to endanger staircases, and the supporting iron beams should be "fire-proofed," that is, covered with "fire-proof" material. It ought to be unnecessary to state that there should be no combustible material whatever in this separating hallway, and that the staircase, elevators, etc., should be of metal and "fire-proof." Indeed, such a hallway as this could be relied upon to separate wooden buildings. It should, however, for that purpose, be at least 10 feet higher than the peak of their roofs, and should extend 4 feet beyond their front and rear lines.

Where it is not necessary to transfer merchandise from one building to another, and only requisite to have a passageway for employees, this may be arranged by an iron balcony, like a fire escape, cutting down the window on each side of the separating wall for a door, so that communication can be had by the balcony. The openings should have "fire-proof" doors. This would be practically safe. It might, with iron ladders, be utilized as a fire escape, and so prove of great advantage to firemen in fighting a fire, who could hold a hose nozzle at the different windows with perfect safety to the last moment. It is practicable, indeed, to have iron stairways with roofed balconies entirely outside of storage stores so that the floors do not communicate. There are a number of these in Philadelphia.

These should not be of iron, but of wood covered with tin. Solid iron shutters or doors are not reliable. Iron doors yield readily to flame, resulting sometimes in their warping open when exposed to fire in an adjoining building, exposing the one they are intended to protect to the full effect of the flames. Where window openings are protected by iron shutters on rear courts they are almost certain to be opened by a fire in an exposing building, and cannot be relied upon. The tin covered wood shutters are alone reliable. There is no recorded instance in which a solid iron door, exposed to the full effect of fire in an adjoining building, has protected the opening, whereas there is, on the other hand, no recorded instance in which the "Underwriters'" door has failed to serve its purpose—two important facts which are significant and ought to settle the question. The "Underwriters'" door is constructed of ordinary white pine lumber, free from knots, of double or treble thickness, according to width of opening, the boards being nailed diagonally and covered with the best quality of tin, with lap-welded joints. It ought to be unnecessary to state that on the exposed side of a building, not only the shutter, but the window-frame, sash, etc., should be of metal or covered with metal—riveted, not soldered. Where it is not possible to use a "fire-proof" shutter for want of room, wire glass in a metal frame will be found a desirable substitute. It will probably hold a fire until the fire department can cope with it. It is not generally understood nor known that fire will travel from one story to others above by way of the windows in the outer or enclosing walls. Especially where a building has an enclosed court, it will sometimes reach upper stories in this way, even when the floors themselves are thoroughly cut off, the court acting as a chimney.

It may be well to suggest for the benefit of those who are not familiar with city fires that, as heat naturally ascends, the exposure of a low building is often much greater to a neighbor higher than itself than to a building of its own height, so that a tall, "fire-proof" structure, surrounded by smaller buildings, should be provided with fire shutters to all openings. These are not necessary where the exposing buildings are occupied for offices, and are themselves "fire-proof," as the amount of heat which escapes from the windows of a burning building, so long as its enclosing walls remain intact, is seldom sufficient to ignite a "fire-proof" building or its contents. The moment of greatest danger is when a burning building collapses, and the intense heat caused by its enormous bed of coals, exerts its full effect upon surrounding structures. In a recent fire in New York three "fire-proof" office buildings were more or less damaged with their contents, although many feet away from the burning building. It is to be hoped that some inventive genius will devise a plan for simultaneously opening or closing the shutters on any or all stories of high buildings by manipulation from the ground floor. They are usually left open at night, always in the day time, and might thus be closed in case of a dangerous fire in the vicinity. In some cases they are fastened open.

Tests of "fire-proof" material, iron beams, pillars, floor arches, etc., to be of any value must be conducted under circumstances which insure uniform conditions. Otherwise comparisons are unreliable. It is quite customary to refer to results of fires in different buildings, having differing forms of construction, as supporting theories of relative merit; but ordinary conflagrations cannot be relied upon, for the reason that in two buildings, side by side, the conditions may be widely different.