years,—sometimes brought up to one hundred millions. The cost of fire departments is about twenty-five millions a year, and the mere cost of conducting the system of underwriting is about thirty million dollars a year; so that the annual fire expenses of the United States are greater than the cost of the largest standing army maintained in Europe; and yet we call ourselves an instructed, well-educated people. We brag too much and do too little; that is the case.

When you approach this subject your first question is, how to build a fire-proof building, but you cannot do it. There is no such thing as a fire-proof building. A smelting furnace may be consumed by fire, and many of the so-called incombustible substances are the most dangerous to use in buildings. Granite, which is apparently incombustible, is one of the most dangerous things. Iron, you know, is one of the most treacherous of all materials when heated: it yields either by bending or breaking; and iron doors, when subjected to the heat of a fire, begin warping almost instantly, and are about the worst things that can be put in a building.

A grain elevator in Philadelphia, capable of holding six hundred thousand bushels of wheat, was composed almost entirely of iron and brick. The wheat took fire, and the six hundred tons of iron were so warped and twisted by the heat that the building was torn to pieces, and the owners had to pay money to get rid of the wreck, even of the iron. In London, the Pantechnicon, one of the most fire-proof buildings ever constructed, was entirely consumed by the heat of its contents, with enormous loss of valuable goods, furniture, plate, pictures etc., stored in it for safety.

The object of the mutual system of insurance upon factory buildings is twofold. I place first the prevention of loss by fire, and second the payment of the indemnity in case the fire occurs. If a fire occurs it is usually somebody's fault, and usually, though not always, the fault of either the owner or the underwriter.

The beginning of the mutual system was in this wise. Mr. Zachariah Allen of Providence, having constructed and fitted his factory in the best manner, according to the general knowledge existing in 1835, applied to one of the stock insurance companies for a lower rate of premium, and they made the same reply that they do now: "We can't make any different rate for a cotton factory; we insure it at two and a half per cent, and you can take the policy or not." Mr. Allen concluded that he could associate himself with other mill-owners and insure each other; and so the first factory mutual company was formed. This company still continues, now insuring a cotton factory for nine tenths of one per cent; and of this premium two thirds have been returned to the members. The actual cost of factory insurance has been brought down from two and a half to one quarter of one per cent.

In the seventeen mutual companies there are three hundred million dollars combined, and the saving to factories is about two million dollars a year. The expense of doing business, instead of being forty per cent, is about four per cent on the premium.

I think I will do well to give you some of the principles which guide the "combustible architect" in the constructions so common in our larger buildings, even of to-day. [Mr. Atkinson exhibited diagrams of each variety of combustible architecture described hereafter.] We will first consider the combustible stone church. The average combustion of churches is one a week,—one for every Sunday. It is a very simple art; it consists in building a stone sham on the outside with a timber structure inside, and a good large space well protected from water over the nave. Then place a furnace in the collar, with an air-box, the first three or four feet of metal, the rest of wood, carried along under the hollow floor above. Now, when it comes a cold Wednesday, Thursday, and Friday, with the temperature in the church down to forty-five degrees, and then a warm Saturday, the sexton lights the fire in the furnace, and all is well prepared for a conflagration. The air-current is reversed, the air inside the church, being the colder, passes out through the air-chamber, carrying the heat with it; the air-box takes fire and spreads straight up through the open spaces between the walls, and the first appearance of the flame is away up on the ridge of the roof, and the whole thing is under way.

The next example is a dwelling-house, in which the fire caught in the basement, got in behind the furring on the party-wall, and spread all over the building; damage, $10,000.

Not long ago I was called upon to inspect a hospital. One or two hospitals or asylums are burned each month, usually with loss of life. This particular one contained a thousand inmates, and was admirably planned for quick combustion. The steam-boilers, engines, pumps, ventilating fans, and the like were on the first floor of a small, detached building, and on the second was a paint and carpenter's shop, being about one of the most dangerous things possible to place there. The fire apparatus, cooking apparatus, and heating apparatus all depended on the safety of this building; and while a large sum of money had been spent on an expensive but poor fire apparatus, its use depended on the safety of this paint and carpenter's shop, in which were no appliances for extinguishing fire.

The average destruction of hotels is one a day throughout the year. The cooking apparatus and boilers are often in the basement; every possible means of helping the spread of a fire is provided in the construction, and we usually allow thirty minutes for burning.

The largest losses come from the destruction of warehouses. Here is a very common form of warehouse,