

DOMINION MECHANICAL & MILLING NEWS

DEVOTED ESPECIALLY TO THE INTERESTS OF OWNERS AND OPERATORS OF

Flour Mills, Saw Mills, Planing Mills and Iron-Working Establishments.

Vol. XII.—No. IV.

TORONTO, CANADA, APRIL, 1889.

Price, 10 Cents \$1.00 PER YEAR.

SLOW BURNING CONSTRUCTION, APPLIED TO MILLS AND FACTORIES.

THE fearful losses of life and property by fire in the United States have lately attracted the attention which is due to the causes of such loss and to the means for preventing them.

The question therefore arises, can buildings be constructed either wholly of timber, or of brick, stone, or iron for the outer walls, combined with wood for the inside construction, in such a way as to eliminate the greater part of the causes of the fearful fire tax which now constitutes a waste equal to an average of at least fifteen per cent. on the net savings or possible additions to the capital of the country in a fairly prosperous year?

To this question an affirmative reply may be given. It is based on many years' experience in the construction of textile factories under the supervision and guidance of the mutual underwriters by whom these factories have been insured on an absolutely mutual principle for a period ranging from thirty to fifty years in respect to the principal companies.

In what does slow-burning construction consist? It may be considered somewhat amazing that so simple an art should not have been common for generations. We will begin at the weakest point in the common art of combustible architecture, to wit, with the roof, and describe its evolution.

In the evolution of the factory all the faults have been discovered and remedied which now infest nearly all the warehouses, hospitals, dwelling houses, school-houses, college buildings, and other examples of combustible architecture of this country.

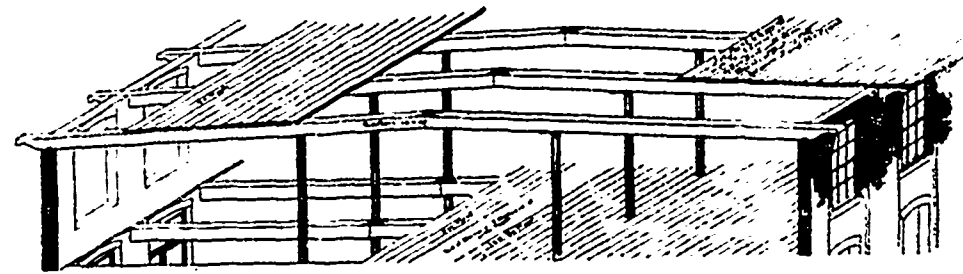
The first form of factory roof resembled the gambrel roof of the dwelling-house. In early days it was constructed of solid timbers set wide apart, as they should be, covered with good thick boards and shingled; in some cases the shingles were laid over mortar. I have an example of shingles which are more than fifty years old yet still in good condition, having been preserved by the interposition of the mortar between the shingles and the roof boards.

This method of outside construction might not be objected to in itself; on the inside, however, the owners were apt to put vertical sheathing at a little distance from the eaves and horizontal sheathing across the upper timbers of the roof, making a cockloft. These hollow spaces, in which fire may spread out of the reach of water, are among the most dangerous elements of bad construction, especially when connected with the basement or the cellar by vertical flues in the walls or partitions of the building.

The next form of roof came into vogue when heavy timbers were displaced by joist or plank rafters set close together. It is commonly known among factory people as a "barn-roof," consisting of an ordinary pitched roof made of rafters set eighteen inches or two feet apart on centers, covered outside with thin boards and slated, sheathed inside vertically at the eaves, and horizontally across the apex.

This barn-roof is the most abominable, unsafe, and

atrocious roof ever devised for the covering of buildings of any kind. The slates serve to attract the heat of the sun, which beats in through the interstices of the open boards and converts the interspaces of the roof into ovens for the concentration of heat and for its distribution throughout the building, especially when the roof spaces are connected with hollow walls. The most effectual method of diffusing heat in a factory has proved to be to suspend the steam-heating pipes overhead, at some distance from the walls—the warm air following



THE FACTORY ROOF, FIRST DEvised BY W. B. WHITING.

the cold air as it passes out by bottom ventilation. By analogy it may be assumed that the heat concentrated by the slates in the interspaces of a hollow roof diffuses itself through the hollow walls of a building of ordinary construction. Thus the thin-slated roof fails in summer as well as in winter. In this kind of roof a fire is completely protected from water; the slates when exposed to outside heat are readily cracked; they then fall and cut open the firemen's heads; the interspaces at the eaves also make excellent nesting-places for the rats, which carry into them only waste and other combustible

or two feet apart on centers, covered on the outside with boards and then with composition or metal and sheathed within upon the under side of the rafters. The humidity generated in any room warmer than the external air and in the processes of many of the manufacturing arts passes into the interstices of this roof, where the moisture is condensed on the under side of the thin boards of the outer covering, from which it drops upon the sheathing and rots it, while the interspaces add not only to the danger of fire, but work the speedy destruction of the whole roof by the rotting of the rafters, especially near or upon the walls. This roof was usually furnished with a hollow wooden cornice, also bad and dangerous.

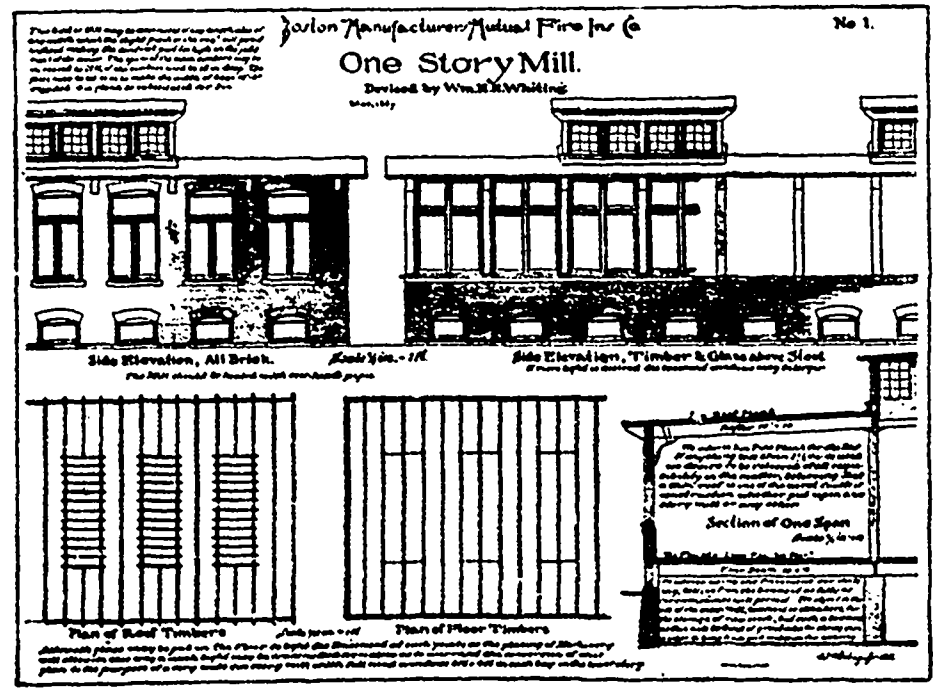
It remained for the officers of the Factory Mutual Insurance Company to suggest that the same solid floor which is required in the construction of the mill might well be adopted in the construction of the roof, only

changed so as to give a pitch of half an inch to the foot. It was also suggested by the underwriters that the wooden coverings and gutters and the sham hollow cornices, by means of which fire was conveyed from building to building in the great Boston conflagration, were a dangerous and superfluous element in the construction of the roof of the factory. In pursuance of these suggestions all the former bad forms described gave way to a simple deck constructed of three-inch plank grooved and splined, placed on timbers set from eight to eleven feet apart on centres, sheathed underneath between the timbers if the owner desires a fine finish, and covered on the outside with any of the customary materials; the ends of the timbers sometimes projecting outside the wall and the deck carried far enough over to form a suitable coving, according to the height and character of the building; or else the finish may consist of a brick cornice, without gutters, the drainage being below.

Again: the old type of textile factory, from which the plans of a great many other factories have been derived, was very narrow and very high. It had not entered the minds of the constructors of the earlier factories that the spaces of wall between the windows might be very narrow and that the windows might be very wide; nor had it apparently occurred to any one that the tops of the windows had better be carried up flush or even with the ceiling of each room in order that the light might be better diffused within. Consequently the wall of the factory consisted mainly of a great blank of brick-work with small holes in it for windows, the mill being seldom more than fifty-two feet wide, often less, and many stories in height.

The width of the mill was gradually extended and the size of the windows enlarged by degrees; for many years about sixty-two feet was considered the proper width and the windows began to occupy a larger part of the wall space, while the wall itself was increased in thickness.

At last it was discovered that if the tops of the windows were carried up flush with the ceiling and as much space, or a little more, was devoted to windows as to



ONE-STORY MILL, DEVISED BY MR. W. H. H. WHITING, C. E.—No. 1.

substances to be ignited by spontaneous combustion in the heat of summer, to the partial or total destruction of many a mill.

The next abomination came with what is called the French roof. This, when put upon the top of a factory, is nearly as bad as the barn-roof; it restricts the space in the attic within, adds greatly to the cost of the building, while in it are commonly repeated nearly all the faults of construction of the barn-roof.

The next roof was a little better. It consisted of a flat roof made of ordinary plank rafters set eighteen inches