

lagoon, this piece of news is of far more enduring importance than that of the resignation of Lord Salisbury and the reconstruction of the British Cabinet. The failure of the campanile must be in the foundations which are the ancient part. The shaft and belfry stage are comparatively modern. Some restoration of the foundation was undertaken less than twenty years ago and a piece of one of the piles that was cut was given to a Toronto architect by one of the engineers in charge of the construction. The pile was of oak and the piece taken from it, though showing the structure of wood and the appearance of oak, is almost as hard as stone. The failure of the foundation cannot be due to the failure of the piles themselves, but to some cause of which we await an explanation with the greater anxiety from consideration of the proximity of St. Mark's and the recollection that its original foundation was earlier than that of the campanile.

The Construction of Grand Stands

THE investigation into the cause of the collapse of the Grand Stand during a football match at Glasgow has brought to the surface valuable information with regard to what are the essentials in planning and construction of such structures necessary to insure the safety of the persons who may use them. The problem has become a difficult one in view of the enormous crowds for whom accommodation must be provided. The Grand Stand in Glasgow was an enormous structure, capable of containing 80,000 persons. Unlike the great amphitheatres of ancient times, it was constructed not of solid masonry but principally of wood, steel and concrete. Following are the quantities of material used in its construction: 1,500 lineal yards of fencing, 1,000 tons of concrete for the bedding of the iron girders, twenty-eight miles of pitch pine treads, twelve miles of girders, nine miles of columns, two miles seating, 700 hundred tons of steel, 15,000 square yards tufting, and two miles drain pipes. Between the tiers of seats was a net work of supporting timbers on which the victims of the accident fell and were "broken" in their descent to the ground 40 feet below. The stand appears to have been a substantial affair as such structures go, and the plans were submitted to and approved of by the district surveyor and board. The result has shown, however, that sufficient provision was not made for the tremendous strains imposed by the swaying to and fro within a concentrated area of such an immense assemblage of people. On this point Mr. Edwin O. Sacks, the well-known theatre architect of London, says: "In respect to the terrible accident to the staging at Glasgow, the only thing I should like to observe is that the effect of the moving or live load, such as a crowd of people swaying their bodies but slightly, is enormous, while the effect becomes terribly dangerous when the swaying of the body is accompanied by a shifting of feet. In watching a game in an arena the eyes of every individual in the crowd naturally follow an interesting feature of the game, which may at one time be to the left and at another time to the right of his seat or perch. With the movement of the eyes there is generally a slight movement of the head and upper part of the figure, and at exciting moments the whole body is frequently strained in one or the other direction, and often accompanied by a change of posi-

tion in the feet. This is done rhythmically by thousands at a time, and the movement thus caused is accompanied by the gravest of risks." It may reasonably be expected that the Glasgow tragedy will lead to the exercise of more exact knowledge and greater care in the planning and building of structures of a similar character, not only in Great Britain but throughout the world.

NOTES OF A VISIT TO THE NEW BUILDING OF THE NEW YORK STOCK EXCHANGE.

Anyone looking at the plan of the New York Stock Exchange will see that it is a rectangle with lugs at diagonally opposite corners—N.W. and S.E. The rectangle runs from street to street in its long direction and the lugs are taken out of the lots to the North and South, which are otherwise completely built over.

The lugs are very useful for entrances, elevators, etc., so as to leave the main rectangle clear for the Stock Exchange; and it is this clear area that in considering either design or construction constitutes the building. Both in the foundation and in the upper floors these annexes have no share in the great problems of the building, and while we are considering these problems we may dismiss these annexes and look upon the building as for all practical purposes the great hall of the Stock Exchange which occupies the whole rectangle, 112 by 138 feet, inside measurement, and eighty feet high. The 138 feet run from street to street and the light comes from these ends, through the great portico on Broad Street, that we know from drawings, and a plain colonnade of equal dimensions on the New Street side. In addition to these windows there is a skylight in the ceiling. This is at the bottom of a light well for three or four storeys of administration rooms which, appearing as a blank attic above the Broad Street portico form internally and on the New Street side, well lighted offices. This then is the general scheme of the Stock Exchange; a chamber on the ground floor occupying the whole area; several tiers of offices above, which do not appear in the design; and sufficient basement.

It is the sufficiency of the basement that has required most from the engineer and was the principal object of interest in a visit to the works.

As we entered the building the water level was plainly visible, in a trench along the outside, standing at between 10 and 14 feet below the street level. When therefore we stepped on a wheelbarrow elevator and dropped through three storeys of steel beams, for a distance which we found was 42 feet below the ground line, it was evident that, while the building was classic architecture above the street, it must be something of the nature of naval architecture below. And this we found to be the case.

It has been customary of late in New York to carry the foundation down to the bed rock, either as a continuous wall or in the form of piers, excavating for this purpose, by means of pneumatic caissons, the quicksand that lies above the rock. But the excavation for the cellar has stopped short of the water level, which down town is not very far below the surface. At the site of the Stock Exchange the water level, as has been said, was about 15 feet down. A cellar this depth was not nearly sufficient for the elaborate mechanical ar-