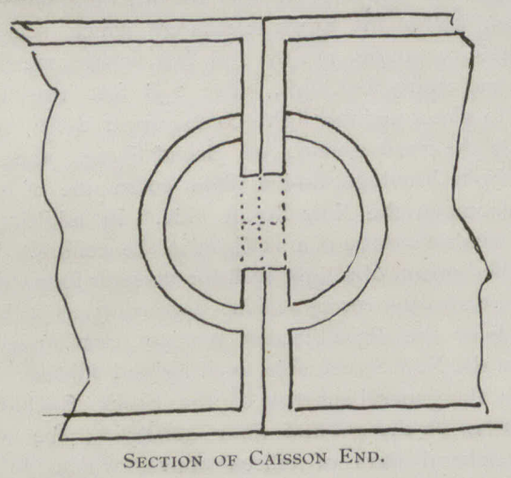
rangements for heating, ventilation, the supply of power and other purposes which will occupy the basements of the Stock Exchange. It was therefore determined to excavate the whole mass of quicksand and gravel down to the bed rock, which Mr. Amory Coffin, Mr. Post's engineer, decided from borings would be found nearly level at about 50 feet down.

The case was therefore not the ordinary problem of sinking a wall to stand in the water. The wall might in this case be very easily sunk in parts, so as to be in effect continuous piers. Where there was water inside and water outside at the same level, an open joint between the portions of wall would be of no moment. But, when the space inside the walls was to be excavated for some 25 feet below the level of water standing outside, it became necessary to devise some means of locking the sections of wall together so as to make them water tight.

The ordinary pneumatic caisson was used 8½ feet wide (the thickness of the wall) and in 15 foot lengths. The working chamber had a domed steel roof, about 8 feet above the cutting edge, and the air shaft rose from the middle of this. The peculiarity of the caissons was that the ends which were square, the better to facilitate square and true sinking, were false ends. The true end was concave for the middle 4 feet, so that when two caissons were put together a cylindrical



SECTION OF CAISSON END.

space was left to be subsequently filled in with concrete. The square ends were planed and greased and sunk with great care so that the clearance was as little as possible—from ¼ to 2 inches. Then the middle planks (shown by dotted lines), which had been tapered for the purpose, were removed from the square ends, and the joint between the remaining portion of ends which projected into the cylindrical well, caulked and drawn tightly together by means of bolts. This caulked and bolted joint on the outer side of the wall will be always immersed in water and may be relied upon to be permanent and to keep out water as effectually as the caulked joint between the planks of a ship.

Having made the joint between the sections of the wall watertight the next thing was to attend to the close connections of the footing and the rock, so that this junction might be watertight also. To accomplish this the rock bottom inside the caisson was cleaned and washed and a footing of 6 inch concrete upon this was set under air pressure. Then the working chamber was filled with concrete and a thin grout of Portland cement run in and forced everywhere by air pressure until the pressure held for ten minutes at 20 pounds. In this way also the shrinkage in the wall above the working chamber was made good. Finally the cylinder of concrete connecting the caisson ends of the wall sections was thrown in and the air shaft filled up.

The result has been satisfactory. There is a certain amount of seepage, which is collected in a pit sunk below the cellar bottom and pumped up to the drain.

The deep cellar thus obtained has three storeys below the street level, and Mr. Coffin has made use of these floors as struts to brace his concrete wall against the heavy pressure from without. In order to do this effectually caissons for the 37 steel columns upon which the floor of the Stock Exchange and the three floors below are carried, were sunk down to the rock, and the columns were built in them, while the walls, which have been described above, were being sunk. Thus the walls and columns were both in place before the excavation was begun, and, as soon as the excavation got down to the level of a floor, the floor framing was inserted, and stayed the external walls in place of the stuff which had been removed. The central bays of the floor frame are well cross braced to form an immoveable abutment for the external bays to thrust against, and the ends of the external girders are fitted to a brace girdle of heavy I beams, set with the web horizontal.

The space thus procured under the ground floor is all wanted. The four floors are called respectively the basement, cellar and first and second sub-basements. In the sub-basements are the boilers and engines, the heating, cooling and ventilating plants. The cellar seemed to be chiefly valuable as a free place to run the innumerable wires and pneumatic tubes which are necessary for the elaborate contrivance for saving and expediting work in the Stock Exchange. There is also on this floor a large safe deposit vault, which was a problem by itself. The original vault was of stone. It was determined to leave this as it was, and the caisson sinking and excavation went on around and under it, leaving the vault and an enclosed passageway of approach undisturbed so that its business went on as usual all through the building operations. When it was finally decided to substitute for it a steel vault, the new vault was built alongside ; and the move from one vault to another made between Saturday afternoon and Monday morning, so that the vault was not out of working order for an hour.

The cellar and sub-basements set free the basement, or storey on a level with the street, for the telegraph offices, locker and toilet rooms and other supplementary needs of the Stock Exchange, so that the main floor and entrance may be kept free for members. The two or three hundred employees will have a basement entrance of their own and basement passages to their elevators, so that the employees and members need never meet in coming and going and, as far as planning can bring it about, the Stock Exchange will go about its business in a dignified manner.

The great room of the Stock Exchange is chiefly remarkable, in point of constructional detail showing in its unfinished state, for the trusses of 112 feet span to carry the four storeys of offices on each side of the light wall. The trusses are therefore on each side of the skylight in pairs, each 15 feet deep and 4 feet wide on the flange. Being 80 feet high they do not look excessive.

The entire walls were being covered with marble when we were there. The entire space behind the columns of the portico is to be filled with plate glass. For this purpose steel mullions are inserted behind the columns. The mullions are supported from above and, as there is a large surface of wind pressure to resist, they are made of 18 inch I beams.

When the marble and the glass and the ceiling finish are in place one will have to go far to find one single room so large and fine as this.