

cracks and distortions were continuously developing in that part of the asylum now under review; and, although possibly the reports were exaggerated, yet the present detailed examination and survey, by fixing and limiting the area of unsoundness, may tend to reassure the Government as to the present condition of the entire building.

5. In dealing with that very important portion of the inquiry—viz., what is the cause of the present state of the works of that part of the building affected—the Commissioners have taken a large mass of evidence, and they have spent four days on the building itself, making a close examination of the same, and also of the ground in the immediate vicinity. Two main theories have been propounded to account for the injuries now manifest in the building—viz., first, that a gradual movement of the surface of the ground has taken place, carrying with it the whole of the north wing of the damaged building; and secondly, that the effects seen in the block now affected are from the operation of vertical settlement and consequent action thereon.

With regard to the alleged movement eastward, the Commissioners have given every possible attention to this supposition; but they find that, from the absence of any data, lines of setting out, or fixed bench-marks, there are no reliable means of checking the position on the ground of the building as finished. They have excavated the water-main supply-pipe to the building at that part where, if there had been a movement of ground to the extent asserted, some indications might have been fairly expected, and they found nothing to lead them to suppose that any movement had taken place. While, therefore, not asserting that such a movement is impossible, the Commissioners may fairly say that it has not been proved.

In respect to the second theory—viz., vertical settlement—a drawing from the Public Works Office produced before the Commissioners professes to represent the western front of that portion of Block No. 2 (north) as it appeared 17th February, 1885, the said drawing bearing a statement on it that the cracks there shown had increased very little, if anything, since the winter of 1884. If this drawing is to be taken as correct, it shows distinctly the effects of vertical settlement in the north and south ends of the block, the centre part at that time not sinking at the same rate as the ends; but, as since the drawing was made the western wall has been replastered, these indications are no longer visible, and the present aspect of this same wall seems to indicate a further movement wherein the centre sunk more than the sides, and the later cracks and fissures tend to cross those of a former date, leading to the inference that this wall must, from the double lines of fissures, be in a state of disintegration. The effect of the continuous action producing the vertical settlement was found by levelling to amount to 4in., as ascertained from the adjacent stable portion of the building.

The intermediate and cross-walls of the block seem to have sunk more or less in connection with the back or west wall, being also influenced by their greater or less weight as loaded with chimneys or otherwise, while the outer wall on the east front, which is carried on low-pitched arches, and is not tied into the other walls for a distance of 70ft., has settled in a different degree—not so much as the other two longitudinal walls, but sufficient to have caused extensive fractures across the piers and arches, and to have assisted, in combination with the other walls last named, in creating a thrust north and south. That to the south, being butted by the main building, has not developed any injury to that part, whereas the north building, being weaker, and having no abutment, has been thrust out towards the north.

It appears from all the evidence that the ground on which this Block No. 2 (north) stands was always known to be doubtful. On the 13th December, 1881, the Inspector suggested that the concrete at this part should be improved, and he also reported that the concrete of the main back retaining-wall cracked before any brickwork was built upon it. It is also shown by evidence and letters that the water constantly lay about on the surface and saturated the ground at this part: in fact, without drainage the whole body of this ground must have been in the condition of plastic puddle, so that one part, being unduly pressed by a heavy wall, sank until the clay below was sufficiently compressed to bear it, and by so doing drove the water into the surrounding parts, which, not being so heavily laden, yielded in various degrees, and might even have been raised in some parts, which indeed seems to have been the effect in the present case. Referring more especially to the east wall, built on piers, the points of support were rather scant in area (considering the material), but they have been much assisted by being on a continuous foundation; otherwise there can be little doubt but that the whole of the east wall would have become a ruin. The real weakness of this wall consists in the method of construction above the arcade, where, instead of the wall receding in set-offs for the floor-plates, it is carried up in one thickness from bottom to top, and the wall-plates of both floors built into the thickness of the wall, thus practically reducing the wall from 18in. to 14in.; in addition to which, at each 18in. for a length of 70ft. the wall is additionally cut into by building in the floor-joists, 6in. by 9in.; thus at these two points in the height reducing the thickness of wall to 12in. Unfortunately these very points on both upper floors have been selected for the white stone band-courses, which do not bond in well with the brick dimensions, necessitating much cutting and broken brickwork at the weakest points of the wall. This construction, with a very slight settlement, is sufficient to account for the contortions in the upper part of this wall; and another detail that tends to weaken this and all the walls throughout is the great number of air-flues with which they are perforated from bottom to top.

The Commissioners, therefore, are of opinion that the cause of the movement in the part of the building now under examination may be attributed to unequal settlement, caused by the absence of good drainage, by the want of sufficiently broad and deep footings, by the total absence of cross-tie, and by a weak method of construction of the walls generally. The Commissioners are also of opinion that sufficient provision was not made in the specifications for the best brick bond; and from the account given of this important detail it appears that the bricks cannot be considered as first-class, and must depend to a greater extent than is desirable on the tenacity of the mortar, so that when a strain came on the walls they would slide upon the joints sooner than break through the bricks, which can be seen in many places at the fractures.