

“Note on the Movement of the Walls of the
Kidderpur Docks.”

By JAMES HENRY APJOHN, M.A., M. Inst. C.E.

*Reply of Mr. Apjohn to Correspondence.*¹

Mr. J. H. APJOHN, in reply to the Correspondence, observed that the dock-walls had been founded by excavating in open cutting to a depth of 27 feet below the surface, and sinking timbered trenches $17\frac{1}{2}$ feet in width, or half the thickness of the walls, for the remaining 19 feet of the depth. It had been found necessary to insert the brickwork as soon as a small portion of one trench had been bottomed, as otherwise the ground rose in the trench. He thought the driving of piles in such a trench would have been accompanied by such vibration as to cause a universal upheaval of the site of the walls. About twenty-two years ago an attempt had been made to pile the foundations of a lock on the Hijili Canal in soil similar to that encountered at the Kidderpur Docks. The area of the lock foundations had been excavated with easy slopes to foundation level, only 25 feet below that of the ground, and pile-driving had been commenced, with the result that the banks had sunk all round the excavation and the whole bottom had risen about 10 feet, spewing up the piles which had been driven. Even if the level of the dock-wall foundations had been raised 5 feet, the depth of excavation, if the piles had been driven in open cutting, would have exceeded 40 feet; and experience of the soil proved that the slopes would have had to be made as flat as $7\frac{1}{2}$ to 1. Such an open cutting had never been excavated in the alluvial soil of the Delta of the Ganges, and it was quite uncertain what the result of making it would be. The alluvial strata had never been penetrated, though borings had been carried at Calcutta to a depth of about 350 feet. There was no reason to suppose that the soil improved at greater depths; but, on the contrary, there was evidence that at about 60 feet below the surface there existed a layer of water-bearing sand, the water being under

¹ Minutes of Proceedings Inst. C.E., vol. cxxi. p. 143.

pressure, and when tapped rising to ground-level. He thought it possible that if two-thirds of the soil above this sand were removed, the pressure of the water in it would upheave the remaining 20 feet of soil. The strata plotted from borings made on the site of the docks previous to their construction showed this sandbed in some cases dry; but all through the construction of the works a strong spring was experienced wherever a bore-hole had been made, the water from such springs being all that had to be pumped out except the rainfall. The drainage of the works during construction had been most complete. Borings recently made in connection with a project for a railway tunnel under the Hooghly, 15 miles below Calcutta, had disclosed the existence of a similar stratum of water-bearing sand at about the same depth as that at Kidderpur, and when tapped the water had risen above ground-level. The only mistake at Kidderpur had been the exposing of the wall to pressure from the backing, instead of counteracting that pressure by an efficient bank of earth against the face of the wall as high as the coping level, to be dredged out after the admission of the water. The walls were, however, now as good as if they had never moved, and the loss of time and money caused by their movement had been trifling compared to that which would have been involved by founding them on piles, even if such a course had been practicable.
