The communication is accompanied by three sections of the sea defences, as they are executed, and by some corroborative testimony as to their efficiency, by Mr. Lewin, of Boston, who has examined and reported upon them.

Full instructions are also given for constructing the different kinds of defences mentioned.

“An account of the repairs done to the Beechwood Tunnel, upon the London and Birmingham Railway, September 1840.” By Thomas M. Smith, Grad. Inst. C. E.

Repairs of
the Beech-
wood Tun-
nel.

Bricks
partially
destroyed.

Cement
first pro-
posed.

Tunnel
lined.

Mode of
conduct-
ing the
repairs.

The tunnel is built of brick, is 302 yards long, and passes through strata consisting of alternate layers of rock and marle, abounding in springs of water: it was completed at the latter end of the year 1837; that winter being of unusual severity, many of the bricks were partially destroyed, owing to their containing lime, upon which the weather acted. Mr. Robert Stephenson first contemplated applying a coat of cement throughout the inside of the arch, but it was apprehended that it would not adhere, in consequence of the constant dripping of the water.

No positive steps were, however, taken until the effects of the winter of 1839-40 had so injured the brickwork as to render further delay dangerous; it was then resolved to line the whole length of the tunnel with an interior brick arch, 9 inches thick, so as to support and insure the stability of the old work.

For the purpose of executing the work with facility, all the trains of carriages were diverted upon the down-line through the tunnel, and for a quarter of a mile at each end; no up-train was allowed to pass upon the single line while a down-train was in sight: a hoarding was then erected between the lines of railway throughout the length of the tunnel, to protect the workmen, and to prevent the building materials from interfering with the trains.

The internal casing of brickwork, 9 inches thick, of English bond, was then carried up one side to the height of 4 feet 9 inches above the springing: a course of York paving, $4\frac{1}{2}$ inches thick, was at this point bonded into the old work, and the new work was securely attached beneath the stone bond course by iron wedges, and regular half brick toothings were inserted, at intervals of 2 feet 3 inches apart, in chases cut into the old work; by these precautions the new work was secured from being detached, and from falling upon the passing trains.

One side being finished throughout its entire length, the trains were turned upon the up-line, and the same mode of proceeding followed with the other side. A series of bearers, 6 feet apart, were then placed over head, and a close flooring laid so as to serve for scaffolding for the workmen, and to prevent the building materials from falling upon the rails. A pair of ribs were then raised upon each bearer, and keyed with a strut, 7 inches below the crown of the arch; the supporting stays were fixed, the laggans laid upon the ribs, and the brickwork of the arch was constructed in English bond throughout the whole length, and on both sides of the tunnel, simultaneously, to within 2 feet of the crown; a moveable centre, 2 feet 3 inches long, was then introduced, and the arch was closed in with two half brick rings.

The whole of the work was done with blue hard burnt Staffordshire bricks, laid in cement and sand, in equal proportions, for the side walls; for the arch, up to within 15 inches of each side of the crown, two-thirds of cement, and one-third of sand; the two rings for keying up the centre or crown were laid entirely in cement, without any mixture of sand. Materials employed.

Previous to commencing the new work, a series of chases were made in the old wall, which, when closed in front by the lining arch, formed drains, $4\frac{1}{2}$ inches square, terminating in the culvert beneath the centre of the railway, and conveying thither all the water, which would otherwise have separated the new from the old brickwork. Drainage.

This work was finished, and the scaffolding removed, within the short space of forty days, by Messrs. Grissell and Peto, under the direction of Mr. Robert Stephenson, and the immediate superintendence of Mr. Dockray. Duration of the repairs.

This communication was accompanied by a drawing, showing the details of the scaffolding, and the mode of construction.

“On the formation of Embankments and the filling-in behind retaining Walls.” By John B. Hartley, M. Inst. C. E.

The numerous failures of the embankments in the construction of railways, and the constant occurrence of defects in retaining walls, induced the author to offer some remarks upon the subject. The formation of embankments.

He first examines the ordinary mode of commencing the embankment at the contemplated finished level, and proceeding with the work at that height throughout, leaving the material to find its own Mode of filling.