only in one place where crossing a bad water-course, were extra intermediate setts needed besides those with four foot centres.

For the framing, good drawings were given the carpenter, who then made very accurate templates, by which the different pieces were quickly marked and cut, so that each sett always fitted together perfectly. If a sett ever did show signs of collapse another was at once put in beside it, and where the tunnel had passed through some porphyry that afterwards swelled and forced the timbers all out of shape, the only relief was gained by every little while working away the rock behind the timbers until this swelling ceased.

When bad running ground is met with, the greatest care is imperative lest the men be suddenly overwhelmed or hundreds of feet of the tunnel filled up in a few minutes. The timbering being right up to the heading that threatens to burst in, this is prevented by slipping in the breast-boards or horizontal planks across the face between the last sett and the rock, then over the cap and behind the posts are driven out the chisel-pointed spiles, 3 inches by 6 inches., 7 feet long, as far as they will there go. Next begin at the face by working around the top breast-board until it can be pushed ahead 6 to 12 inches, and held there by props against the sett, and then the other planks down to the bottom. As soon as possible the "false sett" is put in place to prevent the spiling from closing in too soon, and I believe the best, handiest and cheapest form of false sett is that used by Mr. D. W. Brunton in this tunnel. When in the wash very difficult ground had been traversed by spiling, but the old method of keeping the heading open until a new sett could be put in, by holding the spiling out by any possible prop or scheme, used a great amount of timber and allowed an immense deal of sand and mud to enter the tunnel. With this new device the work was wonderfully simplified and much better controlled. Two strong posts notched at the foot to crow-foot into the corners of the windsill and posts, supporting on their top rods a length of 5 inch gas-pipe, bent to a shape to correspond with the timbering used, were fastened to the cap of the last sett by turn buckles and rods passing through near their heads This last sett was tied back to the next sett with turn-buckles and rods passing through holes near the four collar-braces. Now, when the breast boards have been gradually and laboriously worked forward far enough, and held by stays that could not obstruct the new sett, this was now set up, the bridg-