

(Paper No. 3997.)

“The Canton-Kowloon Railway: Chinese Section.”

By FRANK GROVE, M. Inst. C.E., and BASIL TANSFIELD BERIDGE  
BOOTHBY, Assoc. M. Inst. C.E.

*Authors' Replies to the Correspondence.*<sup>1</sup>

Mr. Grove. Mr. GROVE, in reply, stated that the contraction of the waterways in the East River valley was only noticeable at the East River bridge and the Tung Kun River bridge, especially the former. The speed of the stream, namely, 5 miles per hour, during high flood, was only experienced at the former structure, and was a little less than through the town higher up, where the contraction was even greater. This flow was due to the contraction and the natural slope; lower the stream widened to  $\frac{1}{2}$  mile or more, and was, of course, shallow. The land behind foreshore and bunds was flooded by various spill-channels, as well as by main channels in the case of exceptional flood, and the water stood without much movement until the flood receded, when nasty scours might occur, exactly where was never certain, because the sudden breakage of a bund introduced a new factor. Spurs were being added where they appeared to be necessary. A rather serious hole of 30 feet was scoured out at the Kan Sui River (three spans of 100 feet) in July, 1912. The foundations were another 30 feet deep, so there was no movement. The hole was filled with earth in old salt-bags and covered with rubble. At other bridges good rubble had been dumped near piers, and the flood referred to, as tested by soundings, caused little disturbance to the normal section. The average working-rate for stone ballast ranged from \$4 per 100 cubic feet for rubble to \$5.50 for broken stone. The rate of \$7 mentioned in the Paper included an average lead of 20 miles by truck, spreading, and some packing, as well as contingent charges. The working-rate should have been \$1 or so lower, but there were various forms of “blackmail” and “royalties” paid in Kwantung. He doubted if

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burnt-clay ballast would have been cheaper. Its use was considered Mr. Grove. in connection with the possible manufacture of bricks. There was no cheap good local fuel; all coal was Japanese or from North China. Local bricks of poor quality were burnt with grass, straw, or pine-tree tops (not timber) as fuel. Factory-made pressed bricks were of exorbitant cost. In the cube the cost of these local bricks much exceeded the cost of broken stone, and the same remark would probably apply to well-burnt brick ballast. Local lime was not very reliable. While it must be admitted that the wholesale use of cement (average price in barrel, say, £2 14s. per ton on the works) was rather luxurious, the practice adopted was decided upon after much inquiry, and need not be regretted. So far as he was aware, the Indian system of "surkhi" and fresh-burnt and slaked lime had yet to be tried in China, fuel being probably the greatest difficulty. Lime, sand, and "red earth" mortar was not successful on the British section for large works; but, if anywhere practicable, the Indian system might with economical advantage be tried. The minimum number of culverts and small bridges required were put in. Demands made for irrigation-channels were frequently cut down. Fencing was not used in China, especially in Kwantung, because of the thieving habits of the natives; in a few weeks the whole thing would disappear bodily. The formation-width of 17 feet 6 inches was safe, but he considered it the absolute minimum for the 4-foot 8½-inch gauge. The clay was frequently of a slippery nature, and traffic commenced before banks were completely consolidated. Both in cuttings and on banks the inclination was to reduce the formation-width, so as to provide as little inducement as possible for its use as a high road. As it was, people streamed along, and nothing could keep them off. The death-roll was now about two per month. Steel decks were put in the 224-foot spans to provide a safe footway for employees, but others used them, there being just enough clearance for a man and basket. This footway, however, was strongly discouraged. The bridge-opening per mile should be considered in sections for purposes of comparison. The only large water-flow crossed at right angles was in the East River valley; otherwise waterways were little more than streams unless flooded, and no great watersheds were crossed. Taking the length of line passing through country feeding into the East River waterways at 20 miles, the girder opening per mile was 170 feet for this length, the large bridges being actually confined to 10 miles only. He wished to express his sense of obligation to those who had so cordially treated the subject of the joint Paper, both in discussion and by correspondence.

Mr. Boothby. Mr. BOOTHBY, in reply, stated that soundings were taken subsequent to the autumn floods following the completion of the piers, and plans showing the depth and extent of the scour accompanied the original Paper. At the East River bridge, floods occurred during sinking, and rubble was put down to counteract the scour which took place. At this bridge, after completion, and after the subsidence of the autumn floods, it was found that very little further scour had taken place at the piers, but that the river-bed had deepened between them. At piers Nos. 2 and 3 of the Tung Kun River bridge, where no rubble was deposited during sinking, a maximum scour of 13 feet was found at the up-stream end of the pier. The scour was local, and the holes were all filled with rubble, as indicated in the plans referred to.

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