

The Author. checked with templates and straight-edges in the manner described by Mr. Mitchell, and no subsequent local grinding down had been found necessary. For cutting the dovetails in the old wall hydraulic jacks had been experimented with, but not successfully. He was obliged to Mr. Varley for the interesting information given as to the working of the caisson since its construction.

Correspondence.

Mr. Halcrow. Mr. W. T. HALCROW considered that blockwork coffer-dams had obvious advantages where the blocks could be utilized later in the permanent work. The chief difficulty to be overcome in their construction was the making of a watertight face. The method described by the Author, which appeared to have proved very satisfactory, was ingenious. In the case of a similar coffer-dam for a dock at Swansea, designed by the late Mr. C. S. Meik, M. Inst. C.E., some years ago, watertightness had been obtained by driving a row of steel sheet piling in front of the blockwork, and filling the space between the sheet piling and the blocks with puddle clay; that dam had proved entirely successful. It would be of interest if the Author could give figures as to the cost of making the dam watertight by the method adopted at Tranmere.

Mr. Wilson. Mr. MAURICE F.-G. WILSON congratulated the Author on an interesting Paper, clearly expressed, so that the various operations described could be easily followed. A Paper of this nature, which dealt with the alterations and reconstruction of existing work, executed in such a manner as to allow the general traffic to be carried on without interruption, was always of special interest. In the present case, everything seemed to have been very carefully thought out, and the whole of the work carried on without any hitch or special difficulty, although it had been considerably handicapped—as all works carried out at that period had been—in regard to the difficulty of obtaining special plant during the war. In one respect, however, the works at Tranmere dock were in a fortunate position, inasmuch as they had a good rock foundation throughout. Good foundations disposed of nine-tenths of the difficulties in carrying out works, especially docks and similar undertakings, which were so often placed in positions, such as estuaries and marsh land, where the underlying strata were soft and unsuitable, in which case the foundations gave

very considerable trouble. The concrete-block coffer-dam was a Mr. Wilson. very interesting structure, especially in regard to the method adopted for making it watertight; that was always a difficult matter, and the difficulty seemed to have been overcome satisfactorily and in an ingenious manner. Whether the specially shaped blocks, so formed as to key into one another in cross section, had been absolutely necessary, was perhaps doubtful. There would not have been much risk of plain rectangular blocks sliding, and they would have been easier to make and to set. At the same time, the additional security afforded by the keyed blocks perhaps compensated for the extra time and trouble. Another matter of some doubt was whether there was any advantage in polishing the caisson-stops. That must always be a considerable expense, and it was doubtful if such a face made a better watertight joint with the timber work of the caisson than did an ordinary fine-axed face. Very rarely could the stones be set so truly as to obviate any trimming of the face after they had been placed in position, in which case the polish was, of course, wasted. It would be interesting to know if in the present case the stones had had to be re-dressed to any extent after having been set. The drilling and blasting away of the old dock-wall seemed to have been carried out very successfully, in spite of the great depth to which the holes had been drilled—nearly 50 feet. It would have been interesting if the Author had given the total volume of concrete removed per pound of explosive. The subsequent use of the blocks forming the coffer-dam for building the new river-wall was certainly a good and economical arrangement. He noticed that these blocks, when built into the quay-wall, had been set in mortar. The advantage of this arrangement was doubtful. It was certainly costly, and it was extremely likely that portions of the mortar beds had been washed out. It would have been much more usual to set them in the dry, without any attempt at mortar beds. If it had been necessary to make the wall specially watertight, this could have been done in the same manner as when the blocks were used for the coffer-dam. The object of the small wood strips which were attached to the blocks was not quite clear. The whole weight of the blocks would come upon the wood strips, instead of being distributed over the general surface of the blocks as it would have been if the strips had not been used.

The AUTHOR, in reply, observed that the approximate cost in The Author. labour and materials of making the dam watertight with the cement sausages had been 4s. 6d. per square yard, or 22s. 6d. per linear foot of dam. At the time when this work was done the labour rate for a diver ranged from 2s. 6d. to 3s. per hour. In his opinion the

The Author. use of the interlocking type of concrete block adopted had been justified in practice, if only by the readiness with which divers could lay it accurately in the discoloured water. None of the stones which had been polished at the quarry and set to a wire had required any subsequent re-dressing. The volume of concrete in the old dock-wall removed by blasting was 1 cubic yard to $\frac{1}{2}$ lb. of 50-per-cent. gelignite. With regard to setting the blocks in cement mortar, when built into the quay-wall the larger part of that wall had been constructed tidally. As its purpose was to retain the water in the dock at low water, the wall was subjected to a considerable head. There were practical difficulties in placing the cement sausage joints on the inner or dock face of the wall; and, as the sausage joint was used on the outer face only, it meant that, had the joints not been filled, the water would have entered them and subjected the wall to internal pressure. It would therefore appear that the adoption of the system of filling the joints solidly with cement was justified. The timber slips had been adopted with the object of forming a compressible cushion between the blocks, but the Author agreed with Mr. Wilson that their advantage was doubtful, except in so far as they had been of assistance to divers in setting the blocks, as indicated in the Paper.
