levelling was found necessary, even on fairly level ground, as a 400 ft. base line shews $\frac{1}{10}$ foot error when tape was levelled by the eye only, over fairly level ground.

The angles were repeated 12 times with a young transit graduated to minutes only, and checked to within ‡ minute on averages.

This error of closure was found to be always on the small side. One writer ascribes this fact to the instrument being out of level by repeated turnings, but the author believes it to be due to a slight dragging of the axis in the direction turned.

The soundings were taken by a very simple method: The positions on the base line *exactly* at right angles to each sounding needed were fixed on the ground, as also on a similar base line on the other side of the river also parallel to the axes of the piers. This gave one range, operated entirely by rodmen or axemen. The other range was by transit angles from the distant end of a base line.

In fixing the dredge flags, afterwards, the same method was adopted and found to work very well. This, in case one transitman only is available, and for rivers not over 500 or 600 ft. wide, will be found a ready method albeit probably familiar to most of my readers.

The soundings for pier foundations disclosed a thin layer of closely cemented gravel, overlying soft clay shale at Piers II, III and IV.

13 feet of mud and gravel overlying rock at Pier V.

And apparently solid rock within 7 feet of water surface at Pier I.

This last information was afterwards proven entirely incorrect, and came near causing great trouble.

The seeming solid rock, obtained in about 15 different readings, which all made the rod ring, was merely a solid mass of huge boulders forming the toe of an *ancient* slip, from the mountain side adjacent, and which extended from about 200 feet above the water to the bottom of the river, and varied from 3 to 20 feet in thickness.

When the cofferdam, made by an artificially made filling, above water level, into which sheet piles were hand driven, encountered these boulders, driving had to be discontinued, and another row of sheeting and ring of timbers put in. This was, with much difficulty, carried down completely past the slipped material to a firm clay foundation, nearly level with the river piers foundations.

The masonry base was well spread out, and the pier has not settled by the slighest noticeable amount, when tested by levels.

The foundation for the north abutment was commenced before that of Pier I, the material being wheeled to form the artificial dam mentioned; and as it was supposed that solid rock was within 7 feet of water level, or 16 feet of ground surface, or even less, no great difficulties were looked for. It was accordingly thought ample to lay out foundation pit 4 feet all around larger than the proposed pilaster, which was to be 12′ 6″ at its greatest width.

Here would seem a good opportunity to warn beginners in foundation work of any great possible depth: "Be sure to lay them out "amply large for supposed needs, and then add 1 or 2 feet all around "for exigencies."

After this foundation was carried down 12 feet, the old slip, before mentioned, consisting of clay and boulders, was encountered, and it became evident that the pit must be carried down past this layer to a firm clay at least.

A second row of sheeting was necessary, and the question at once arose:—

Whether the abutment, as originally designed, was heavy enough to withstand the pressure of a mountain side behind, liable to move at any moment, and with only a narrow support (See Plate X for cross-section) between the abutment and the river!

It was resolved to carry down as large a foundation pit as possible and fill it with masonry. Soft rock was obtained 23 feet below ground and neat lines, or about 49 feet below grade, and a width of 14 feet there given to the masonry and concrete. This width was carried up to