At Cannelton, where the largest slow-moving landslide occurred, the main track had been pushed out of line. Reverse curves were made, in order to get back to the alignment on either side, but, on account of the continual lining out of the track, the curves became too sharp for operation, and the side track between the hillside and the main track became completely covered. As this slide was of such extent and depth, Fig 1, it was out of the question to remove it in order to get back far enough for a rock sub-grade, as at Leon. The change of line not being feasible, it was proposed to remove part of the landslide, permitting the relocation of the tracks on their original alignment, and, after completing this, to protect them from further slides.

braces were carried diagonally, at an angle of 45°, to the lower row of piles, and these were sawed off at the ground level. Steel bands, with 1-inch rods to hold the two sets of piling together, were put on about 8 inches below the top of the brace pile. The depth of penetration of the piling varied from 15 to 30 feet. The piling was selected large white oak, and oak timber was used for the stringers and braces. Moving the shovel ahead about 30 feet, then cutting it back, and driving the piling as shown, constituted a day's operation. The work was completed successfully without further serious landslides. In four weeks about 12,000 cubic yards of earth were removed, the track was thrown back to its original

PLATE 611.
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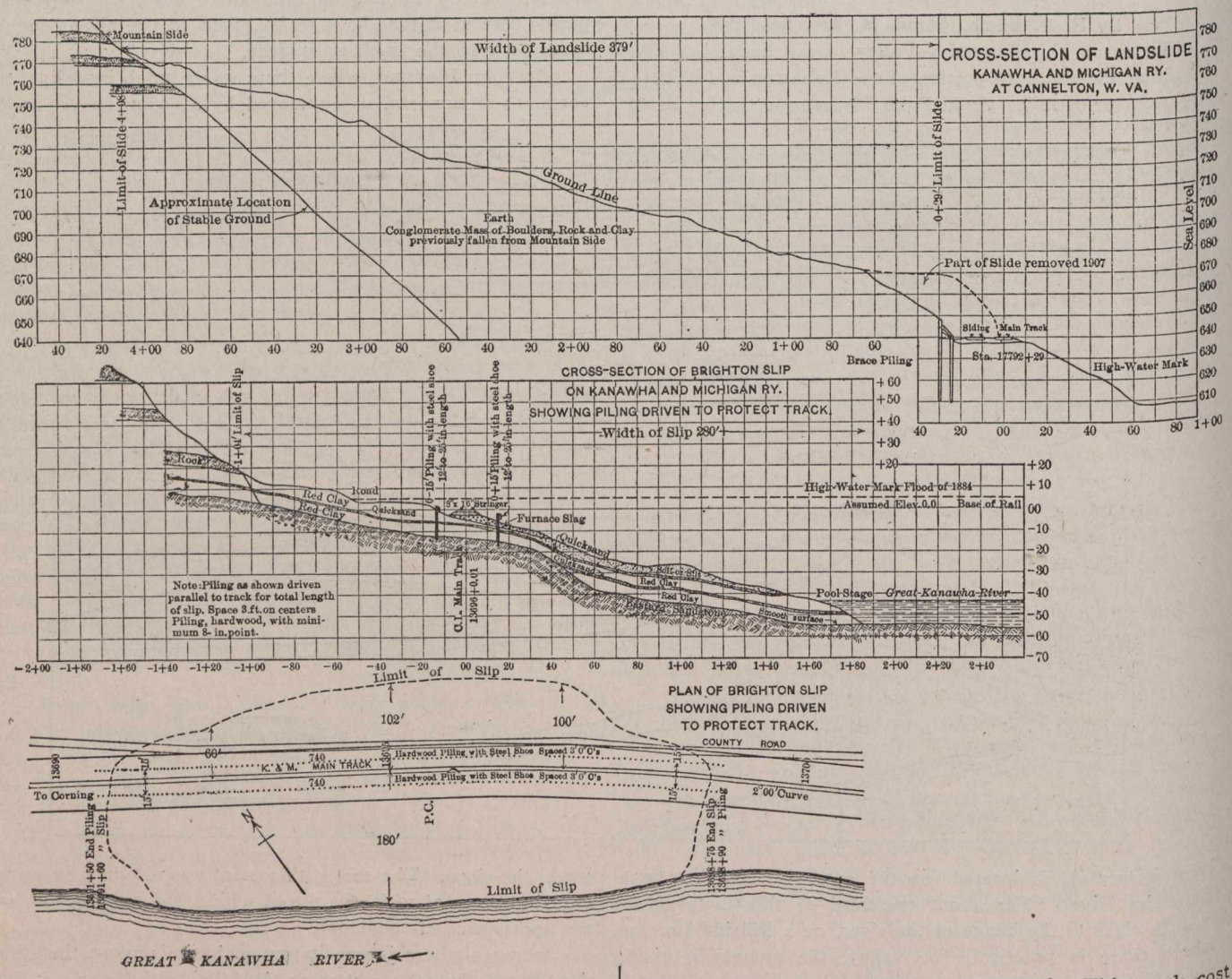
BLACK ON
REMEDIES FOR LANDSLIDES AND SLIPS.



A steam shovel was cut in at one end, and removed enough of the landslide to allow the two tracks to be changed to their original location. After the shovel had worked about three days a slide occurred one night, half burying the shovel. Steps were then taken to hold back the hillside before further slides could develop. This was done successfully by driving two parallel rows of piling, 5 feet apart, about 3 feet from centre to centre, as shown on Fig. 2. The upper rows, against the hill, were backed with 3-inch plank, the front rows being driven against this brace in order to aid in supporting the upper row. A 10 by 10-inch stringer was placed against the upper row, and from this 8 by 8-inch

alignment, and the landslide was stopped. This work cost $16,000.

The upper limit of the slide is about 135 feet above the track. The slide consists of about 200,000 cubic yards of moving earth. This work was done in the spring of 1907, and has been successful. At several places, due to excessive pressure, the braces have been embedded in the stringers. The earth from the top of the piling was given a slope of 1½ to 1; at several other points smaller slides have been stopped with one row of piling. The piles were driven 3 feet apart, centre to centre, and cut off 3 feet above the top of the rail, the ground above being given a slope of 1½ to 1. At one