

## STRATA MOVEMENT ENCOUNTERED DURING SHAFT-SINKING AT 17a SHAFT, CROWN MINES, LIMITED.

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During the sinking of 17a Sub-Vertical Circular Shaft a number of "earth tremors" were felt, concerning which a few notes may be of interest to members.

The first "tremor" occurred when the excavation for 41 Station (at a depth of 6,383 ft. below the surface) was nearly completed, and "tremors" were of frequent occurrence until the shaft was 310 ft. below 41 Station (see Fig. 29) over a period of nearly three months.

It will be seen from the plan of 41 Station and the section (Fig. 29) that the shaft was being sunk between two faults. The method employed to excavate and support stations was as follows:—Curb A (Fig. 29) was put in at a measured distance to suit the hanging of the station, after walling up to the curb above, the shaft was sunk to a few feet below Curb B and walling brought up to the footwall of 41 Station. The station excavation north and south was then proceeded with to a height of 10 ft., and 18 in. brick side walls carried to a height of 8 ft., and hanging to the required height was then blasted down, the side walls built up, steel girders placed in position and concrete filled in.

The method of fixing concrete curbs was described by Mr. A. J. Walton in a paper "Sinking 16a Shaft, Crown Mines," presented to the Third Empire Mining and Metallurgical Congress S.A. 1930.

When the first lift of 41 Station had been completed, with side walls built to a height of 8 ft. and the further excavation to the full height almost completed, the first "earth tremor" occurred and was felt on the bank and engine room on the 24th Level. There had been quite a movement at Fault A, Curb A was broken on the south and the steel former buckled, the brickwork was damaged on the south for about 6 ft. of the circle to a height of 50 ft. above Curb A, the 9 in. bricks were cracked at about 4 in. from the face but still intact. As Curb A was badly broken on the south, the danger was that it might give way and let the brickwork down. This curb was supported by placing one of the Station I beams (18 in. by 6 in. by 27 ft. long) on the side walls already built and by three 3½ in. single jack bars on top of the I beam to the underside of the curb, with two similar single jack bars under the I beam to the footwall. The side walls were then built to the required height, the roof girders placed in position and the concrete filled in. On the south the concrete was reinforced with 40 lb. arch rails. The damaged brickwork above Curb A was taken out and rebuilt.

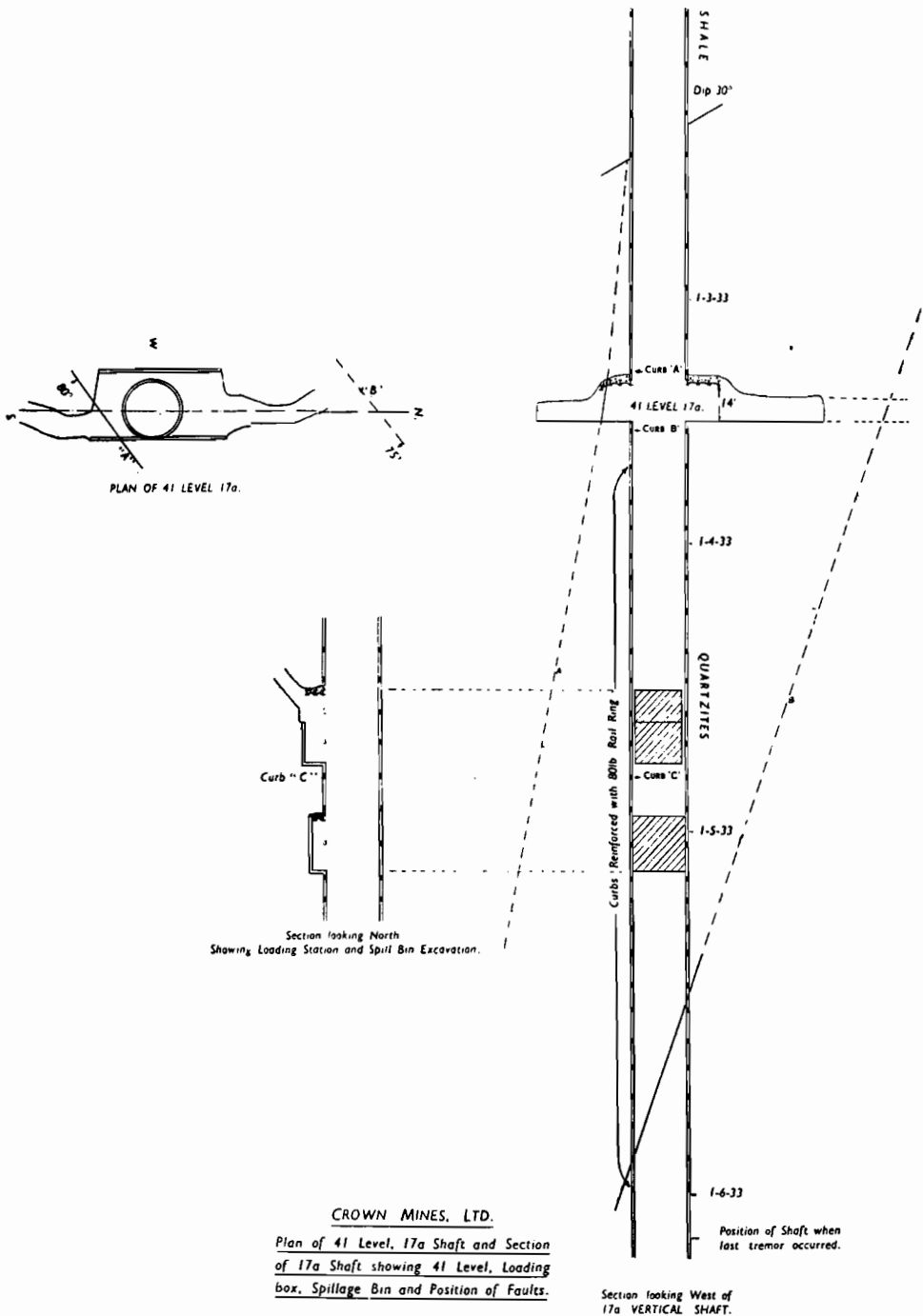


FIG. 29.

When the shaft was cleaned out after the completion of the station it was found that Curb B and the brickwork for about 5 ft. of the circle on the north had been kicked up about 1 ft.; this was taken out and rebuilt. About ten days later when the shaft bottom was about 60 ft. below 41 Station another severe "tremor" was felt, which broke Curb B and kicked up the brickwork about 1 ft. for about 5 ft. of the circle on the west, but did no damage to the side walls of the station. This portion was also taken out and rebuilt.

When the Loading Box Station (Fig. 29) had been completed and walled, a severe "tremor" was felt which broke Curb C and kicked up the brickwork on the station about 1 ft. and cracked the side wall from floor to roof, but otherwise did no damage to the shaft walling.

On another occasion just after drilling had been completed a severe "tremor" was felt which shattered the shaft bottom, and 9 tons of broken rock were hoisted before the holes could be charged up.

A very severe "tremor" was felt when the shaft was below Fault B. This was the last "tremor" felt, but was so severe that the Gallo-way Stage was taken up to above 41 Station to examine the shaft. No damage was found, and all the brickwork which had been previously repaired was in good condition.

During the sinking of this portion of the shaft the sides stood up very badly, and walling was done in short sections, but even so, on two occasions when "tremors" occurred natives were injured by the side coming away. Native workers got rather "jumpy" and many of the old sinking boys went home.

The concrete curbs from 41 Station to where Fault B intersected the south side of the shaft were reinforced with an 80-lb. rail ring.

As soon as Fault B was clear of the shaft, settled strata were encountered and good sinking progress made. 44 Station at 6,893 ft. and 47 Station at 7,343 ft. below the surface have been completed without any difficulty.

*19th January, 1934.*

