

1930.
NEW ZEALAND.

ARAPUNI HYDRO-ELECTRIC POWER-STATION

(REPORT ON).

Presented to both Houses of the General Assembly by leave.

REPORT

RELATING TO THE DAMAGE THAT TOOK PLACE AT ARAPUNI HYDRO-ELECTRIC
POWER-STATION ON THE 7TH JUNE, 1930.

In order to make it possible to propose suitable remedial measures for the damage that occurred at Arapuni on the 7th June, 1930, I have elaborated a definite theory as to the cause. The data that have served me in this work have been derived from inspections on the site in August and September, 1930, from discussions with geological and physical experts taking part in these investigations, from information given by the engineers connected with the works, and from various geological and technical reports previously submitted, and from certain drawings prepared by the Public Works Department.

The main factors that must be considered as having a possible influence on the occurrence, are as follows :—

- (1) The geological character of the ground :
- (2) The geomechanical properties of the ground :
- (3) The periods of time during which the geomechanical agents have been working :
- (4) Certain temporary phenomena, such as the subsequent closing of the crack, and the escape of nitrogen-gas out of the bottom of the headrace.

As regards the purely geological factors, I agree with the geological experts that there is no evidence of failure due to crushing in the columnar rhyolite tuff or in the underlying strata.

Concerning the geomechanical character of the ground, it has been ascertained by tests that the columnar rhyolite tuff and the underlying breccia possess some physical properties that deserve the greatest attention. These properties may be summarized as follows :—

- (1) The columnar rock and the breccia absorb water avariciously when dry :
- (2) They expand with absorption of water :
- (3) They have an exceptionally small modulus of elasticity.

Considering the small modulus of elasticity of the columnar rock, the crack might tentatively have been attributed to hydrostatic pressure against the eastern side of the headrace, causing a compression of the ridge between the headrace channel