

ENGINEERING LABORATORY

The following matters have been investigated during the year :—

(1) *Karapiro Dam : Examination of Setting Concrete*.—Equipment was designed and manufactured for the analysis of the expansion, contraction, and heat generated in a large body of concrete during setting. It comprised resistance thermometers and strain gauges which could be placed in position during the pouring of the concrete and become incorporated in the structure.

(2) *Vibrations of Turbine*.—Vibrations in a hydro-electric turbine generator were recorded and an analysis made to determine the position, magnitude, and cause of the vibration.

(3) *Hydraulic Tests on a Model of a Proposed Spillway for Maraetai Dam*.—A model of a proposed diversion tunnel and spillway intake for the Maraetai Dam was made and tests undertaken in order to determine the flow of water as well as the character of the flow under various conditions.

(4) *Particle Sizing*.—Equipment was built to investigate rapid sizing of pumice particles by centrifugal action.

(5) *Dynamic Stress Equipment*.—Resistance strain gauges were built, together with an A-C bridge to measure dynamic stresses in structural numbers.

(6) *Routine Work covered*.—Pyrometers (33) ; thermocouples (15) ; special tests (67), including conductivity of refractories at high temperatures, x-ray examination of Pelton buckets, 119 fuses, railway coupler castings, mechanical tests on bolts, webbing, crane hooks, spring steel, piston-rings, .303 cartridge cases, paravane shackles ; metallurgical inquiries (52), including the determination of S curves for tool steels, electrolytic polishing, plating of chrome nickel cadmium, finishing of metal parts.

DESIGN AND DRAUGHTING SECTION

The end of the war has brought a large increase in the number of requests for special instruments and equipment from local industry. This has further overloaded the already understaffed Design Section. The following are the major design projects handled during the year :—

(1) *Pyrometry* : (a) Design of indicator type B having increased sensitivity, reduced time to assume deflection, and decreased coil resistance. This instrument is suitable for measurement between the ranges 0-300° c. and 0-1,000° c.

(b) *Controlling pyrometer type 104*. This can be made at a lower cost than type 103 and is arrived at by simple attachments to the indicator type B. It is suitable for controlling temperatures within the same ranges as above. Photo-cells are replaced by an inductive circuit.

(c) *Indicating-controlling-recording pyrometer (thermocouple type)*. This instrument, the design of which is nearing completion, can be modified to be either simple indicating, or indicating-recording, or indicating-controlling, or indicating-recording-controlling. It is of the self-balancing potentiometer principle, incorporating the latest electronic devices, and operates off thermocouple potentials.

(d) *An indicating-controlling-recording pyrometer (resistance type)* is being worked on.

(e) Two special pyrometric installations of some complexity have been installed in a New Zealand paint-manufacturing factory which will materially reduce the fire hazard attached to the mixing of resins.

(2) *An electron microscope* is being designed in collaboration with the Physics Department of Auckland University.