Physical Laboratory

Major projects which have been worked on during the past year in the various sections are as follows:—

General Physics and Materials testing

(1) *Heat Insulation of Houses.*—The thermal transmittance values of walls, ceilings, and floors of several State houses have been measured by a modified "guarded hot-box" method, and comparisons have been made between different types of constructions—*e.g.*, brick versus asbestos, cement sheet versus timber weatherboard, and ventilated versus non-ventilated wall cavities and floor spaces. A report has been published giving some interesting data. Further work is at present being undertaken on a recently completed house with walls built of no-fines concrete.

(2) *Mould in State Houses.*—This project is nearing completion. Following a series of measurements of atmospheric conditions—temperatures and relative humidities—inside and outside of the houses and in the wall cavities, work has been completed on the calibration of the thermocouples and recorders used. A report is being drawn up on the measurements made.

Relating to this project, a technique has been developed for measuring the rate of ventilation of rooms, and a series of measurements is being made in several of the houses used in the above investigation.

(3) *Timber Impregnation.*—Vacuum-pressure impregnation of *pinus radiata* with plastic resins in a water-soluble state and then cured by heat treatment to an insoluble form has been carried out on lines suggested by the Forest Products Research Laboratories, United States of America. Two types of resin—a urea-formaldehyde (dimethylolurea) and a phenol formaldehyde—were used separately and marked improvements were made in certain properties. With phenol formaldehyde the swelling and contraction of treated wood due to moisture absorption or loss have been reduced to about one-third of that occurring in untreated wood. The work is proceeding, using different concentrations of solution to reduce the cost of treatment.

(4) *Hot-plate Investigation.*—A comparison of locally made electric oven hot-plates with imported ones according to an established British Standard Specification revealed some interesting and valuable information with respect to the design of hot-plates and the type of refractory material used. A detailed report was submitted to the Department of Industries and Commerce.

(5) *Fuel-conservation Survey.*—Preliminary work on the efficiency of open hearth fires was conducted in collaboration with the Dominion Laboratory, by measurement of the radiant heat output of an open hearth fire, using weighed amounts of coal, &c., of known calorific value. Approximate measurements of flue draughts were made. Calibration of the radiometer elements is required to complete this first investigation.

(6) *Rubber Air-hose.*—A comprehensive examination was made for the Army Inspection Department of rubber air-hose for use in pump connections for motor-vehicles. As a result of much preliminary testing, a uniform and high-quality tube was produced.

(7) *Maraetai Rock Investigation.*—The survey commenced about September, 1944, on the physical properties of the foundation rock of the new dam to be built at Maraetai by the Hydro Branch, Public Works Department, was completed and a comprehensive report supplied.

(8) *Electronic Magnetizer.*—An electronic apparatus for magnetizing awkwardly shaped magnets—*e.g.*, speaker magnets assembled with loud-speakers—was developed and a prototype constructed. This was so successful that two such electronic magnetizers have been ordered by private firms and a third is being made for the Laboratory's use.