

(4) METALLURGICAL LABORATORY

An engineer from the staff was sent to Australia for training in metallurgy, chiefly the metallurgy of ferrous metals, in order that the heat treatment of tools and gauges might be efficiently carried out. This has proved to be of great service to all types of industry, quite apart from munitions, and active steps are being taken to develop the service. The furnace-room, where the tools and gauges made in the Laboratory's tool-room are hardened, comes under the guidance of officers of the metallurgical laboratory. Two electric salt-bath furnaces of 25 kW. capacity, 1,000° C., and a third of 50 kW. capacity, 1,400° C., are in continuous use, the former being automatically controlled by the pyrostat mentioned in (2), above. A special furnace for the nitriding of steels is to be installed.

Apart from heat-treatment work required by the Laboratory's tool-room, special work has been sent from outside firms. Usually this has consisted of high-speed steel tools requiring careful heat treatment, and in some cases the nature of the steels had to be determined before a hardening procedure could be laid down. In the latter cases samples of the steel had to be sent for analysis to the Dominion Laboratory. Some idea of the volume of work passing through the heat-treatment room can be gained from the fact that two hundred and sixty items of high-speed steel tools, dies, &c., have been successfully treated for outside firms.

The metallurgical laboratory has also been called upon to calibrate pyrometers *in situ* and at various factories throughout New Zealand. For this purpose, portable equipment is used, and this is first calibrated against standards held by the electrical laboratory. The latter standards were in turn calibrated at the National Standards Laboratory, Sydney.

For the examination of castings, finished components, &c., 250 kV. X-ray equipment is being installed.

Considerable attention has been given during the year to the question of substitute solders.

(5) THE DESIGN SECTION AND INSTRUMENT SHOP

The work of the design section is divided into two parts—viz., the design of tools and gauges and the design of instruments and equipment. The major portion of the work this year has been for the Director, Scientific Development, the Armed Services, and the Directorate of Production, and has covered a wide variety, including the following equipment constructed: Glass-grinding equipment and tools for the production of standard interchangeable ground-glass joints and taps; electric-wire-wound salt-bath furnaces for heat treatment of small metal parts; optical projectors for gauging munitions components; mechanical device to operate valves when exposed to daylight; anti-aircraft plotting equipment; aerial-mapping equipment; surface metallizing of mirrors apparatus; minute mandrels and wheels for electric lamp coil filament manufacture; recording hygrometers using bimetallic strip; refrigerator unit for testing low-temperature thermometers; lever type 0.001 in. dial gauges; pyrostats; portable field filter-pump for Army use; model to show precession of 18-pr. shell; apparatus for developing and viewing 35 mm. film strip.

In addition, the instrument workshop dealt with over two hundred and fifty instrument-repair items received from outside sources.

(6) MUNITIONS TOOL-ROOM

The tool-room has been expanded to cope with the increasing demand for tools and gauges; since moving into the new premises the efficiency of the workshop has improved considerably, and the output is rapidly approaching the maximum to be reasonably expected from the machines and personnel employed.

GEOLOGICAL SURVEY

REPORT OF DIRECTOR (Dr. J. HENDERSON)

During the past year the Director, in addition to his normal duties, visited Macrae's, Clarendon, and other localities in the South Island in order to inspect mineral deposits.

Little regional mapping was carried out, field officers using most of their time in examining and mapping deposits of possible economic value. Dam-sites and rocks for concrete aggregate were reported on for the Public Works Department. Sites for bores to test underground water-supplies were selected, many of them for the military authorities, for whom also four officers made special examinations and reports on other matters. Geophysical work was carried out in several localities, some of it in connection with a proposal to utilize the "thermal heat" of the volcanic zone, and a few test bores were drilled for steam.

REGIONAL SURVEYS

Mr. H. W. Wellman's mapping of D'Urville Island was the only regional work undertaken. A fair part of the island had already been mapped in connection with special examinations for serpentine tale and sulphides, and Mr. Wellman completed the work.

COAL SURVEY

Persistent bad weather and the absence of a geologist for some months on work for the Military Authorities retarded the survey of the Grey Coalfield. The usual assistance in the elucidation of faulting, thinning, and boring problems was given to the industry without any charge, and consumed much time. Mr. M. Gage also made a preliminary examination of a coal-bearing area in the basin of Flaxbush Creek, Inangahua Survey District.

The detailed examination of the Ohai Coalfield, required in order to assist in its prospecting, was begun in January by Dr. A. R. Lillie, assisted by Mr. R. L. McHenry.