

The plant has demonstrated its ability to handle the quantity of material for which it was designed, but owing to lack of supplies of raw material and shortage of labour it has seldom been operated to capacity. After the plant had been in operation for some time an investigation of process costs and plant performance was carried out in order to determine the course of further development work.

Since machinery for apple preparation which had been ordered from abroad did not arrive until late in 1943, it was not possible to start apple dehydration until March of this year.

New developments in technique are being closely followed, and a considerable amount of work has been done on improved methods of peeling vegetables and on the compression of the dehydrated product. The latter work has been done in collaboration with the Auckland Technical Committee.

The drying plant for Chewings' fescue seed mentioned in last year's report has now been tested in commercial operation with satisfactory results, and there are indications that other units may be installed in other commercial seed-stores.

In addition to the work outlined above, advice has been given on various drying problems, and preliminary work on other drying plants is in hand.

At the request of the Director of Scientific Developments a water-purification filter was designed for Army field use. Special attention had to be paid to lightness in weight, compactness, simplicity, and mechanical strength, and it is believed that these requirements have been fulfilled in the design submitted. Tests with prototype models confirmed the efficiency of the design.

The Chemical Engineering Section has continued to carry out the testing of aviation fuels for knock rating on the C.F.R. engine. During the year over eight hundred samples have been tested for the R.N.Z.A.F.

As in previous years, members of the chemical engineering staff have been called upon to give advice on various matters connected with industries and on problems arising in other branches of the Department.

ORGANIC SECTION

Medicinal Plants.—A considerable number of medicinal plants grown at Lower Hutt and Hastings were analysed, and the results in most cases were highly promising. The plants examined were *Atropa belladonna*, *Datura stramonium*, *D. metel*, *Digitalis purpurea*, *D. lanata*, *Hyoscyamus niger*, and *Papaver somniferum*. Other samples examined included castor beans, olives, peppermint flowering-tops, and rhubarb root.

A start was also made on the examination of native plants which have been suspected of causing stock-poisoning. These included *Nothopanax arborescens*, *Beilschmiedia tawa*, *Hedyocarya arborea*, *Parsonsia capsularis*, and *Pittosporum tenuifolium*. Several Fijian plants were also examined for active principles.

Miscellaneous. A number of samples of foods were analysed for vitamins B and C.

Several problems were investigated for the Armed Forces, such as research into the formulation of insect repellants and shark repellants.

PHYSICAL CHEMISTRY SECTION

The work of this section is mainly spectrographic analysis. The large quartz spectrograph has been chiefly used for the examination of metals, but much miscellaneous work has included the analysis of luminescent powders and the estimation of toxic elements dissolved from a saucepan made from scrap aluminium. Spectrographic as well as micro-chemical and physicochemical methods have been used in an increasing number of corrosion problems, many arising from war conditions. The small glass spectrograph is much used for rapid and routine work, and a suitable method has been worked out for using it in the rapid identification of special steels. It was also used for the estimation of chromium in plant ashes.

Occasional forensic work is required. One problem was the identification of a fragment of metal from a human eye. The most interesting case was one in which various methods for the detection of traces of other metals in gold were worked out in connection with a charge of stealing bullion from a dredge on the West Coast. The most rapid method was to ignite a globule of the metal in the graphite arc, and by this method it was shown that large variations in these trace metals occurred in gold samples from different parts of New Zealand. To compare the bullion with gold from thirteen dredges on the West Coast, it was necessary to concentrate chemically the trace metals from 1 gram of gold. Finally, to detect platinum metals, the trace metals were concentrated from 10 grams of the suspect bullion, and of bullion known to come from the dredge in question. The agreement in trace-metal content by all these methods indicated strongly that the bullion came from a particular dredge, and could be distinguished from the gold from twelve other dredges.

Other physicochemical work has included the determination of the transmission of light filters and transparent plastics. The electrical resistivity of river-waters is occasionally determined for the Hydro-electric Branch, Public Works Department. Apparatus was prepared for measuring the conductivity and temperature of sea-water at small depths. Some photographic problems were also investigated.

A considerable amount of analysis and advisory work is required in connection with electroplating, anodizing of aluminium, and surface films on metals. Apparatus was improvised for determination of the thickness of electroplating on steel by a magnetic method, and two of these are now in use by Inspectors of the Munitions Department. A method was devised for the Radio Development Laboratory for plating silver rings on bakelite disks.