Mobile Drilling-rig.—Designs have been completed and all arrangements made for the supply and manufacture o' drill rig.

Dynamic Balancing-equipment.—After some unsuccessful experiments with various designs for which experimental pilot plants were made, a design was finally decided on and completed involving a mechanical pick up which resonates and excites a strobe lamp through a vibration pack.

S Curves for Tool Steel.—The recent advances made in the heat treatment of tool and die steels have made it necessary for a full survey of all steels used in New Zealand and of the use of the recently published time-transformation (S) curves. Heat treatment under these conditions consists of quenching the hot steel into a salt-bath furnace held at high temperatures. The hardness of the steel depends upon the temperature and the time held in the bath. This method eliminates stress cracks due to quenching.

Sand-testing Equipment.—In order to undertake the control of moulding and care of sands in New Zealand foundries, equipment has been built to test the moisture content, grain fineness, permeability, and tensile and compression strengths of sands. It is proposed to make a thorough investigation of the moulding properties of New Zealand sands as soon as staff permits.

Recording-equipment for dynamic stress and production of wire-strain gauges. Experimental pilot plant for wood fibration, using waste wood. Electrolytic polishing.

Weld Tests and Metallurgical Investigation of Welding Technique: Welding of Rock-drilling Tool Bits.—A general research was carried out on the metallurgy of welds. Particular reference was made to the heat-treatment effect of each run of weld. The crystallographic structure so obtained was allied to the time transformation (S) curves for the steel. Results obtained from these experiments were used to study the reclamation of tool bits by welding the tips up to normal size.

## Investigation of die-casting technique.

Strain-hardening of Metals.—Investigations into the hardening effect of metal due to the application of load (work-hardening) and the results of this upon the ultimate tensile strength, ductility, &c., of the steel sample.

Portable X-ray Equipment.—Designs have been completed for making the 250 kV. x-ray plant portable so that it can be conveyed per trailer to any part of New Zealand. A 15 kW. trailer-borne power plant acquired as reparations will further extend the use of the equipment to remote parts of the country where electric power is not available. It is proposed to include with the x-ray trailer, equipment for measuring strain in metal structures by electrical means. With the double unit it will be possible, therefore, to examine bridge and similar structures.

*Ironsands.*—Equipment is being built and experimental work started in an endeavour to separate iron, titanium, and vanadium from Patea ironsands.

The following routine work has been dealt with (the Engineering Laboratory is the official test-house for the Civil Aviation Department in matters relating to materials testing): calibration of pyrometers and thermocouples (45 separate applications) for assistance); metallurgical and strength tests on welded metals (78 separate applications); strength tests on miscellaneous metal components covering steel bar, steel plate, bolts, 115 aircraft rocker-arm bolts, knives, concrete blocks, aircraft spar attachment plate, aircraft metal links, disc-harrow blades, aircraft engine push-rods, crane hook, aircraft engine exhaust-valves, aircraft fittings, toggles, chain slings, washers, rivets, aircraft propeller oil-line, aircraft counter-weight bearings; aircraft glue samples; millingmachine cups; melting-points of Seger cones; x-ray examination of castings and welds; 28 applications for metallurgical examinations of metals and examinations of heattreatment procedures and foundry practices; hard chroming of steel tools (5); crack detection in die; concrete chimney section.