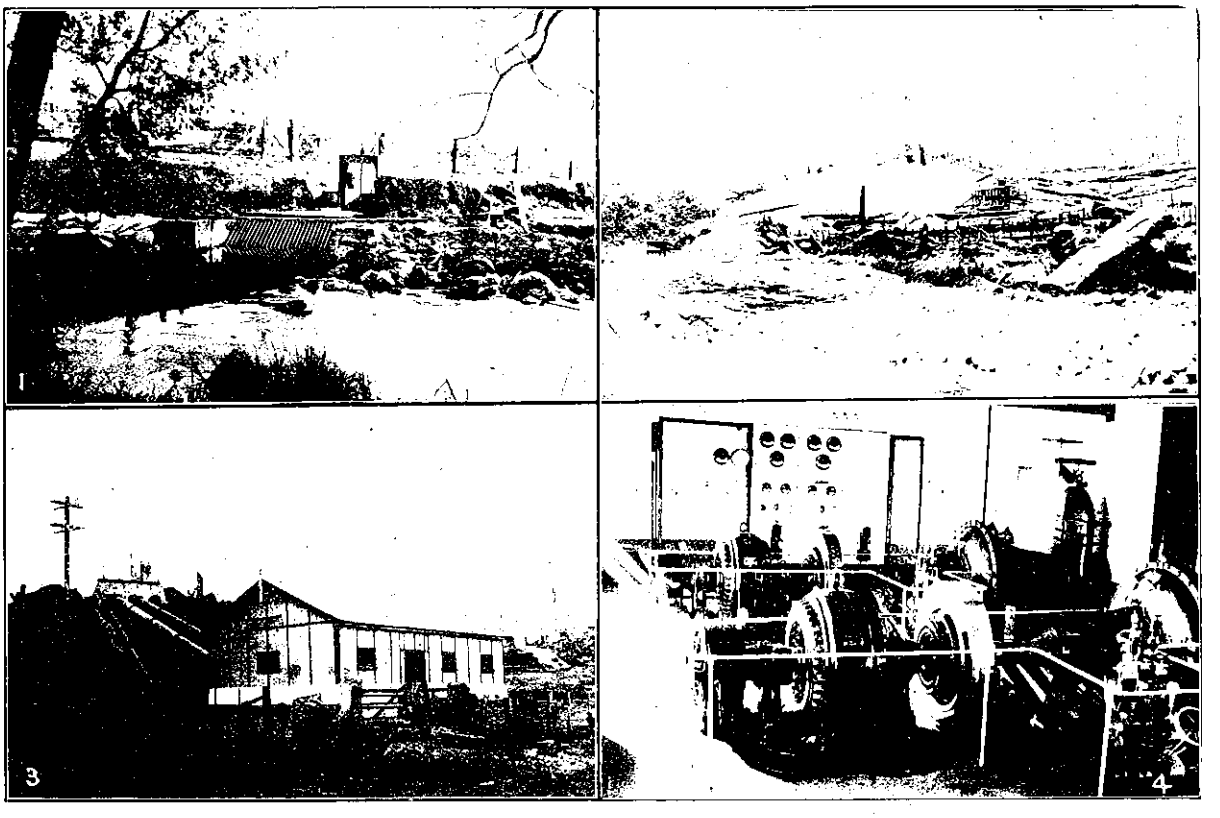
The Ohakune Hydro-Electric Plant

ANOTHER SUCCESSFUL SCHEME

Ruapehu, one of the snow-capped sentinels of the North Island of New Zealand, is the source of many rivers large and small. The Waikato rises on the north-east side of the mountain, while the Wangaehu takes its waters from the southern slopes, one of the principal tributaries of the latter being the Mangawhero, which flows through part of the Tongariro National Park and the Borough of Ohakune. would be found to have water power literally at their back door were the possibilities properly investigated. Ohakune is a typical example of this, for it was discovered by the engineers that within the Borough's own boundaries the Mangawhero river had enough fall for producing a sufficient supply of electricity for lighting and power purposes to meet the requirements of the town for some years to come.



1. Intake, shewing Screening and Headgate. 2. Site of Power House under snow. 3. Front view of Power House, shewing Pipeline and Spillway. 4. Interior of Power House.

A short time ago the Ohakune Borough Council raised a loan of about £9,000 for the purpose of installing an Electric Lighting Plant, and after appointing as their Consulting Engineers Messrs. Turnbull & Jones Ltd., who had designed and carried out a similar scheme on very successful lines at Mangaweka, the potentialities of the Mangawhero River were reported on and the scheme recommended by the Engineers was immediately proceeded with.

A description of the works should be of considerable interest to the engineering profession, and to members of other local bodies who may be contemplating electric lighting proposals. So many towns in New Zealand are situated close to rivers, and

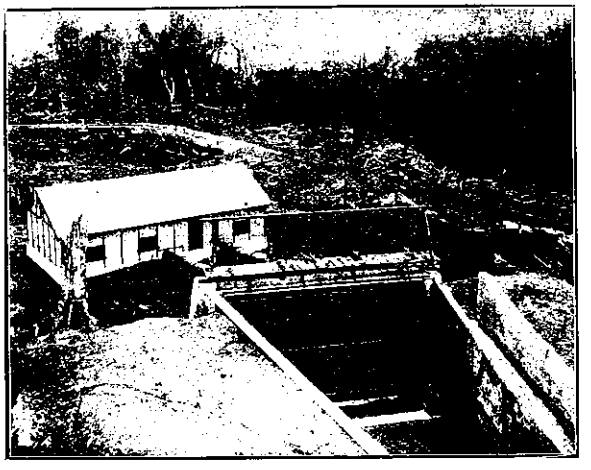
A low rubble dam was therefore thrown across the river a few chains south of the Main Trunk railway near Ohakune railway station, and the water diverted through a screen and regulating gate shown in Fig. 1, into the flume which conveyed it to the power station, less than half a mile distant. The flume has a cross section of five feet by four feet nine inches with a fall of 1 in 1,200 throughout its length, and is constructed principally of concrete. Where the flume crosses under the roads it has been roofed over with ferro concrete, the fluming in course of construction being shown in Fig. 6, and where it is carried over creeks or on artificial fillings timber fluming has been used.

At the extreme end of the fluming the water enters the forebay shown in the back view of the power house. This forebay is designed with a long spillway capable of taking all the water the flume can carry, viz., the equivalent of 250 horse power. When the turbines are not in use the water discharges over the spillway and down a race floored with brick into the underground tailrace, which also leads the water from the turbines into the river about 3½ chains away. The forebay is fitted with a sludge valve, which can be used for discharging into the tailrace any silt which comes down the flume. Screens are also provided for holding back any debris which might injure the turbines. From the forebay two penstocks of rivetted steel pipe, each 27-inches in diameter, convey the water to the turbines in the power house below, and provision has been made for the installation at a later date of a standby unit.

The present plant consists of two Reaction "Francis" type turbines made by Messrs. Boving & Co., and each capable of giving 100 brake horse power under a total head of 40 feet. The turbines run at a normal speed of 600 r.p.m., and each is controlled by a Boving patent automatic oil pressure governor guaranteed to control the turbines with a momentary variation of speed not exceeding 3% with 25% change of load, 6% with 50% change of load, and 15% speed variation with full load thrown on or off. The flywheels are of cast steel, accurately balanced and proportioned to prevent a pressure rise

in the pipe line exceeding 40% of the normal when full load is suddenly thrown off the turbines.

To each turbine is direct connected through a flexible coupling a 60 k.v.a. revolving field, 3-phase alternator, generating at 2,400 volts 50 periods. These alternators are fitted with ten poles and are star connected with the neutral terminal earthed. The exciter is direct coupled to each alternator shaft and bracketted on the same bedplate, making a most compact arrangement, as can be seen from the photo-



5. Forebay and back view of Power House.

graph of the interior of the power house. The alternators as well as the switchgear and instruments were manufactured by the British Westinghouse Electric & Manufacturing Co. Ltd., of Manchester, and the substantial apearance and compactness of design of the whole plant are the leading features which strike the visitor on first viewing the interior of the station.

The switchboard is fitted with all necessary instruments for indicating the current supply, and the machinery is effectively protected by Westinghouse lightning arrestors placed on the wall behind the switchboard. So as to protect anyone working on the outside lines, isolating switches are also fitted to the outgoing feeders.

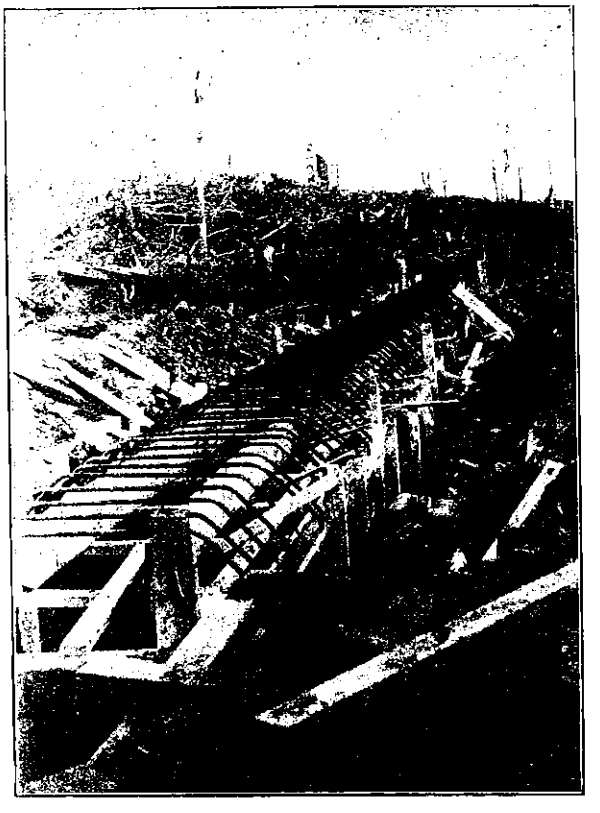
Although no storage of water has been provided in the present scheme, as soon as this is necessary, either because of the increase of load on the turbines, or owing to drought, an ideal natural storage is available with the expenditure of very little capital. This consists of diverting the Mangawhero into an extinct crater situated a few hundred yards upstream from the intake.

The power house building itself is worthy of some notice. It is about 50 feet long by 24 feet wide. The foundation walls are in concrete raised 2 feet 6 inches above the ground level, and the superstructure consists of a timber framing lined inside and out with Poilite. The concrete walls outside have been rough cast, and the Poilite painted giving the whole a very artistic finish.

The main streets of the town, including Ohakune East, have been reticulated for private and street lighting. The poles used throughout are of natural round Australian ironbark, the crossarms being of best North Island rata. The reticulation system is fed at 230 volts for lighting and 400 volts for power from 1-20 k.w., 2-10 k.w., and 1-5 k.w. transformers mounted on poles at different parts of the town. Seventy-five street lamps each of 50 c.p., have been provided for the lighting of the streets. The brackets used are of very neat design with special reflectors formed to the correct curvature for the effective reflection and diffusion of the light.

Already 50 consumers are connected to the supply mains, and the local picture theatre and foundry have motor installations. It is anticipated that before two years are over the whole of the houses in Ohakune will be connected up to the very efficient electricity supply which is now available for lighting and power purposes.

This power scheme is well worth investigating by anyone interested in electricity supply, and the com-



6. Ferro-concrete Fluming.

pactness and low cost of the scheme reflect great credit on the enterprise of Mr. T. P. Keily, late Mayor, who originated the scheme, Mr. G. Goldfinch, the present Mayor, who has seen it carried out, and the engineers, Messrs. Turnbull & Jones Ltd., who are responsible for the design and supervision of the work.