R. BUCHANAN AND SONS' IRON FOUNDRY, ST. ASAPH STREET, CHRISTCHURCH.

lie upon or very near the route of a transmission line supplying one of the larger cities, they do not form adequate markets. In parts of Switzerland, where there is a waterfall of some size or other in nearly everyone's back yard, demands of this character may often be met, but until towns in this colony acquire the habit of forming themselves on the lower slopes of alps, it would be preposterous to attempt it here. The nearest approach to this that we have at present is the case of certain mining towns, and as the power requirements of these are usually considerable, they at least offer a promising field for close examination. The hard fact has got to be faced that, with occasional exceptions, the only possible markets of any value for hydro-electric energy are the cities, and some sections of the railways, while, most unfortunately, the majority of the practicable water powers are many leagues from anywhere—and good coal is only 15s. to 25s. a ton in the heart of the market. To disregard this stubborn truth and expect power users to buy energy simply because it is hydro-electric energy, is foolish. Any glamour the water power may have will not last five seconds, if it turns a factory's monthly coal power bill from a sovereign into an electricity bill of a guinea, for the same output of wares. I do not hesitate to say that the only alternative to this, in many of the hydro-electric schemes now proposed, involving long transmission distances, is to sell the energy below cost price—very much below in most cases. If undertakings are to be run without becoming a direct burden on the general body of tax-payers (assuming there to be state ownership), long distance transmissions are inadmissable in New Zealand A 200-mile proposition might just as well be a 200,000 mile one—to the moon. There would be about as much supply done from the one as from the other

Finally, a word may be said as to the possibility of taking Mahomet to the mountain, when it costs too much to take the mountain to him. Can the market be taken to the water power? I see no possibility of doing so, but by the ordinary development of the country in population and industries If the raw materials of manufacture can be obtained cheaply near the water power, and the cost of transport of the finished articles to their market is not excessive, the market may eventually go to the water power. It is a moral certainty that the manufacturing interests of the existing cities cannot be transplanted from the sea-board to far inland sites all in a hurry, I, for one, do not think they will ever be transplanted, though it is reasonable to suppose that in course of years, as the country becomes more and more developed, and coal perhaps becomes a little more expensive, and city expenses heavier, that industrial development will gravitate inland. When that day arrives, the Huka Falls and Waikaremoana may come into their glory—but it is not yet.

While some people were dining at a Winchester (Eng) hotel a salmon was put on the table and it was found to possess two distinct backbones joined at the tail.

Manufacture of Malleable Iron.

MALLEABLE iron is now principally made from charcoal pig iron, to which is added a percentage of scrap and sprue, culled work, gates, runners, and shrinkers resulting from previous casting operations being suitable. When coke pig iron can be found, which has been made out of a good quality of coke, it is also used.

There are two principal kinds of furnaces used the cupola and the open hearth. The cupola is the cheapest and really the best of the lighter patterns, when a uniformly superior metal is not required. The open-hearth furnaces are much better for heavy work, and a much superior uniformity can be obtained by them There are in the United States, says a writer in the *American Machinist*, only ten foundries which use the open-hearth furnaces. To run them economically they must be run continuously, and have a skilled workman to run the mixer well. By means of the open-hearth furnace the iron is not only melted, but refined. The usual limits of these furnaces are from 15 to 20 tons at a heat. They will run 300 heats without repairing, and 1,000 heats before rebuilding. Still the cupola iron does the majority of the business, though it is considered inferior and requires 200° F. more to anneal than the open-hearth iron.

There are two kinds of fuel in general use for the furnace a hard, close-grained coal requiring a straight forced draught with an air pressure of about 4 to 5 ozs., or a Siemens-Martin furnace using fuel oil. Since sulphur is undesirable and is always contained, to some extent, in the hard coal, and not in the oil, it gives the oil an advantage. It is easier to regulate the oil burners, but the expense is slightly greater. The regulation is, too, a great advantage, for if the heat is run too high in the furnace it will burn the iron, especially if it is low in silicon. This does not show in the casting, but gives it a high tensile strength without elongation. This is due to the interior arrangement of the molecules.

After the castings have been chipped and sorted they are packed in iron annealing pots holding about 800 lbs of iron. The are packed into these pots together with a packing of clean, heavy forge scales. Great care must be taken in the packing in order to avoid distortion during annealing, and the pots must be packed full. A sprinkling of powdered quicklime, sal-ammoniac, muriatic acid or any oxidising agent is then put on to the packing to assist in the annealing, and also in dumping the pots afterwards. The fuel used in annealing is in most cases coal. However, many of the modern foundries use oil or gas burners. These latter are generally considered better, not so much on account of expense, but because they are cleaner and permit better regulation. Good iron can easily be spoiled in the annealing ovens unless the greatest heat is brought out at just the right time. This is very hard to do with coal ovens, and requires a great deal of experience. An experienced man can tell whether the heat is right or not by the colour of the inside of the oven. The time necessary for annealing varies with the mixture of the iron more than with the size of the castings, and is from three to ten days, including the time necessary to cool the pots. In the first thirty-six hours the oven is brought up to the maximum heat of about 1,250° or, better, 1,350° F. At this temperature it is kept for two days, when it is allowed to cool slowly until it reaches a black heat, at which time the pots are taken from the oven In the space above the pots in the oven the temperature runs some 200° above the values given. After annealing, the castings are sometimes dipped into asphaltum diluted with benzine, to give them a better finish. The cost of annealing is 1/- per lb. in a 30-lb. oven with two oil burners. Using coal as a fuel the cost is somewhat less

After the castings have been annealed they are unpacked, collected, and taken either to the tumblers or the sand blast The tumblers are the cheapest method of cleaning, but the sand blast has come into use, as it is much quicker. When cleaned, the castings are ready for shipment, and may be drop-forged or even welded when the iron has been made for that purpose.

A tram car equipped with roller bearings has been running in Hanover without special attention for six months. The bearings have shown no perceptible wear, and tests indicate an economy in power of 23 per cent., while the actual saving includes the usual cost of oiling and attendance.

INTERIOR OF R. BUCHANAN AND SONS' IRON FOUNDRY, CHRISTCHURCH.