treating ores; but, alas! it did not come up to expectations, as the character of the ore was not suitable to this process of treatment, owing to the large expense of procuring flux, and also the large amount of flux required to conduct the operations. This mode of treatment is suitable to the class of ore there is at Sunny Corner, and for many of the mines in the Silverton district in New South Wales, where gossan and galena are abundant in the stone, which are the principal fluxes required; and where the stone is poor in galena, copper also is said to serve the same purpose. At Sunny Corner the ore contains copper, galena, and a very large percentage of gossan, along with gold and silver; so that the expense of smelting is almost reduced to a minimum, there being nothing but lime to purchase to mix with the ore, which is delivered at the works at a cheap rate. At the time of my visit to the mines in the Sunny Corner district, one of the La Monte furnaces was in operation, and was giving satisfaction as far as extracting the metals from the ore was concerned. The only thing that the company complained against was that the furnace did not smelt the quantity of ore that the patentees guaranteed it to do; and when in Sydney, one of the patentees, Mr. Kahlo, showed me the different monthly sheets of expenditure in connection with the amount of ore smelted, which ranged from £2 3s. to nearly £4 per ton. The average cost of treating 4,950 tons was £3 4s. 2¼d. per ton. It will therefore be seen that if it costs this amount to treat ores which do not contain a large percentage of silica, but contain the principal fluxes, the cost of treating the class of ore there is on the northern fields must be considerable, when the ore contains over 90 per cent. of silica, and does not contain the fluxes required. The La Monte furnaces are suitable for galena ores; but for the form in which silver occurs in the Karangahake and Waihi districts, being principally as sulphides, chlorides, and tellurides, with at least 90 per cent. of silica, these furnaces are not suitable, because the large amount of flux required to make the slag run freely prohibits this class of treatment from being adopted. Two of the La Monte furnaces are erected, one at Grahamstown, and the other at Karangahake. The former was worked for several months, and the latter only made a small trial-smelting.

Another new plant has been recently erected at Karangahake, and only started operations on the day of my visit to the district. As this plant is quite different from any there is in the colony, and great expectations are entertained as to its success, a description of it will not be out of place. Mr. Railey, the owner, kindly gave me the use of the plans, so that I could make myself acquainted with the design, and he also explained to me the mode of treatment at the different stages.

Railey's Plant.—This is a combined stamping- and grinding-plant, but still quite different from any that has heretofore been erected in the colony. The machinery is driven by a Pelton water-wheel 6ft. in diameter and 18in. in breast, working under a head of water equal to 44ft., and is calculated, when driving the machinery at full speed, to make ninety revolutions per minute, which appears to me to be driven at too high a speed to give the greatest percentage of power. According to the experiments made with this wheel in California, the most efficient effect was obtained when the periphery of the bucket-line of the wheel was travelling at about half the velocity of the water. The velocity due to 44ft. head, taking fractions into account, is about 50ft. per second, and, the diameter of wheel being 6ft., the velocity of the periphery would be 25ft. per second if based on the experiments mentioned, or eighty revolutions per minute. This water-wheel is placed at the side of the Waitawheta Creek, at as low a level as can be got for floods not to interfere with its working. It is geared with bevel-wheels to a vertical shaft, about 60ft. in length, which in its turn is geared to a horizontal shaft with bevelled gearing, on which shaft pulleys are fixed for belts to work to drive the whole of the machinery.

In order to lift the water out of the Waitawheta Creek for the purpose of driving the machinery, Mr. Railey constructed a timber weir across Waitawheta Creek, which raises the level of the water 9ft. This weir is on a similar principle to the timber dams that are constructed in cañons in the mining districts of America. It is made of frames of squared timber of 12in. by 10in. and 12in. by 13in., set about 5ft. apart, and standing edgewise up the stream. The up-stream side has a slope of 1 to 1, and the uprights, which are three in number, are standing at right angles to this slope. The ends of the sloped beams, as well as the bottom of the upright pieces, are well stepped into the bed-rock. There are longitudinal beams bolted on the face of the frames about 3ft. apart, the ends of these beams being let into the rock on the sides of the creek; and on to these beams are spiked two thicknesses of 2in. planking, to make the dam or breast of the weir water-tight. There is no puddle or concrete used to make it watertight, but simply some loose stuff thrown in on the bottom end and at the side of the planking where it butts on to the rock.

At one side of this weir there is a sluice-gate constructed to regulate the flow of water into the flume which conveys it to the battery. The width of the weir on top is 130ft., and since its construction there has been as much as 4ft. deep of water flowing over this width, and the structure shows no signs of weakness. This is a cheaply-constructed weir where there is solid rock to be got in the bottom and sides, but it is not suitable when there is only a loosely-cemented gravel bottom and similar sides.

The stamping-battery consists of ten heads of stamps of the same description as that ordinarily used; but, instead of quicksilver and blanket-tables being used, the tailings are discharged through the gratings into a small chute, and are carried into a series of settling-vats. No attempt, so far, is made to save any of the metals. These settling-vats are twelve in number, each 6ft. by 5ft., and 3ft. deep, placed in two rows alongside each other, and have openings at the top which allow the muddy water to flow out of one into another until it has passed through eleven of these vats. By this means, the metals having a higher specific gravity than the slime, they are supposed to all settle in the vats. When one of the vats is full, the tailings are taken out of it on to a platform ready to be treated in the grinding- and amalgamating-pans. Having twelve of these vats, it always allows eleven of them to be used for settlers while the other is being cleaned out.

The tailings that were taken out of the settling-vat are now put into the grinding-pans,