appearance seems to indicate that it is one of the best mining properties ever opened up in the colony. No one can state with certainty the quantity of payable ore in such a lode, or define without properly testing it the length and depth of the shoot of payable auriferous and argentiferous ore. It is well known that gold runs in shoots and ledges, and that hitherto these shoots have not been found to run for any long distance in the lodes found in the colony without a break. Having taken all the *pros* and *cons* with reference to the quantity of payable ore above the present level into consideration, this guided me in estimating that there must be at least 77,000 tons. At the same time, there might be a large increase on this quantity; but it must be borne in mind that all calculations of this nature are of a speculative character.

There appears to be a want of a proper system in working the mine. The lode being of far greater dimensions than any yet found in the colony, a different system will have to be adopted in timbering the stopes, and in taking out the ore. The lode will have to be worked in a face, and not by bord-and-pillar, similar to working a coal-mine, such as was being done at the time of my visit, as the latter system is only mullocking up the mine, and rendering it difficult to take the ore out afterwards. There is no difficulty in taking the whole of the ore out even should the lode prove to be 70ft. wide, but in commencing to stope out from the level a proper system of timbering with sills will have to be adopted to allow the whole of the lode from the next level to be taken out with safety.

The dimensions of the lode are so great that the present plant will not be sufficient to pulverise and treat the quantity of ore obtainable, neither does it extract a fair percentage of the bullion. The present plant nevertheless may be looked on as one of the best in the colony for dry crushing. The ore as it is taken from the mine is dumped into a kiln cut out like an inverted hollow cone in tufaceous sandstone, having the sides lined with firewood, with a certain quantity of wood covering the bottom. A layer of ore is then dumped in, then another layer of firewood, and so on until the kiln is full, and the ore heaped on the top. This system of drying the ore is expensive, as the whole of the heat from the large quantity of firewood consumed is not utilised. It is of no service to attempt to roast the ore in large blocks. If roasting is required to extract a larger percentage of the metals, then this should be done with the ore pulverised. The kilns are useful only for expelling the moisture. The effect of attempting to roast the ore in blocks is to have some of the metals in the form of sulphates, while others are in the form of sulphides.

The ore is taken from these kilns and hoisted up with trucks and cages, and dumped on the floor where the stone-breaker is placed; from this it passes into ore-bins and thence into Challenge feeders, which feed the stamps. Formerly a forty-mesh screen—1,600 holes to the square inch—was used, but a sixty-mesh screen—3,600 holes to the square inch—is now adopted, as it is found to be the most economical. The stamps are about 900lb. each, and have a drop of 7in., making, when going at full speed, about ninety drops per minute, and each stamp crushes about $1\frac{1}{6}$ tons in twenty-four hours. Formerly, when the forty-mesh grating was used, the crushing capacity was said to be 2 tons each stamp, but the sixty-mesh screen reduced their capacity by nearly 1 ton each in the twenty-four hours. This shows that it requires a force of 58,320,000 foot-pounds to pulverise 1 ton of quartz to such a fineness as will pass through a sixty-mesh screen. The ore is then treated by hot amalgamation in combination-pans, which is said to give about 68 per cent. of the assay-value of the gold and 45 per cent. of the silver.

As previously stated, this is one of the best plants in the colony, and one where there are assayers constantly employed in assaying the dry-pulverised ore before subjecting it to treatment in the pans, so that the value of the bullion in the ore is accurately ascertained, yet the low percentage of the metals extracted is very marked; but it only shows that where the older methods are adopted, and no assays made to test the value of the ore, the loss in gold and silver must in many cases be alarming. The question that presents itself to my mind is, Will Cassell's process be an economical one to adopt? It certainly gives a larger percentage of the bullion, but the expense of treatment, together with the royalties the company are at present asking for the use of their patent rights, is almost prohibitive.

The value of the bullion in the ore from the Martha Mine is said to be about £1 2s. 6d. per ounce. Taking this amount as the value, and that 68 per cent. of the assay-value of the gold in the ore is being extracted and 45 per cent. of the silver, this means that about 66 per cent. of the value of the bullion is saved by a process the cost of which does not exceed 15s. per ton. To compare this with the Cassell process, and allowing that 85 per cent. of the assay-value of the ore is saved by leaching with potassium-cyanide solutions, at an expense of about £1 2s. 6d. per ton—that is, allowing 10s. per ton for drying and pulverising and 12s. 6d. per ton for leaching—then, in treating ore of an assay-value of £3 per ton, the Cassell process would extract bullion to the value of £2 11s. at a cost of £1 2s. 6d. for treatment, to which must be added 8 per cent. royalty, or 4s. 1d., making the total cost of treatment £1 6s. 7d. per ton, thus leaving £1 4s. 5d. to cover the cost of mining and for profit. If the same class of ore is treated by the Waihi plant, and 66 per cent. of the assay-value of the bullion obtained, then this means that the value of the bullion extracted would be £1 19s. 7d., and the cost of the treatment being 15s. per ton, leaves a margin of £1 4s. 7d., as against £1 4s. 5d. by the Cassell process, showing that there is no inducement for mine-proprietors to incur a large expenditure in attaching Cassell plant to their mills unless the ore be rich. Again, if we take the assay-value of the ore at £10 per ton, the Cassell Company require 15 per cent. on all ore above the value of £8 per ton. Thus the value of ore extracted on the same basis as already stated would be £8 10s. per ton. The royalty on this is £1 5s. 6d., which, added to the cost of treatment, makes £2 8s., leaving a margin of £6 2s. per ton, whilst the same ore would yield by the Waihi process £6 12s.; deducting from this the cost of treatment—15s.—it leaves £5 17s., as against £6 2s. by the Cassell's process. This shows that high-grade ores would pay to adopt the latter mode of treatment, but unquestionably the royalty charged is too high for the process to be adopted.