

locking the inner ram and allowing the outside one to move the greater force can be exerted. These hydraulic cranes were all constructed by Sir William Armstrong of Newcastle-on-Tyne, and are stationed at different places all along the wharf, so that a number of vessels can be loaded at the same time.

There are two stationary steam cranes at the upper wharf, which lift the wagons equally as readily as the hydraulic cranes, and when these steam cranes are not fully employed they can be worked more cheaply than the hydraulic ones.

The coal-wagons are all made on the hopper principle, holding about 7 tons each, having bodies to lift off the frame. This is certainly a great improvement on the coal-wagons used on the west coast of the Middle Island, which require men to shovel out the coals after the bottom door is opened.

DIAMOND MINING.

Diamonds are found in the vicinity of Cudgegong and Bingera. I visited Bingera only, which is situated about seven miles, in a south-westerly direction, from the Township of Bingera, a hundred miles distant from the Northern Railway line at Tamworth.

This field was first opened in 1872, but mining for diamonds was soon abandoned, and it was not until November, 1883, when an Australian company took up a lease of the ground and commenced to work, that the value of it became known.

Very little work has yet been done on the field owing to the extremely dry seasons in this district. Indeed, the small patch washed away would not employ four men for more than three months, but, at the same time, there has been a good deal of prospecting, and a small plant erected on the ground with which to puddle the wash-dirt.

The wash-dirt from which the diamonds are obtained resembles gold-bearing wash to a great extent, and contains a little gold, but not sufficient to pay to work for gold alone. The wash is mixed with garnetiferous sand, jasper stones, black tourmaline, and stones of a sedimentary character, such as one would expect to find in a river-bed, which I think the place where the diamonds are found must have been at some former period. The source from which the diamonds originally came must be some, distance from where they are now found, as the stones among the wash-dirt are considerably rounded as though they had been turned over and over for a long distance by the action of water. The wash-dirt lies on a soft sedimentary reef, intermixed with either magnesia or carbonate of lime. The diamonds found as yet are all very small, the largest being about $1\frac{1}{2}$ carats, but the quality is said to be superior to the Cape diamonds, and that they are also said to be very suitable for diamond-drills. Up to the time of my visit the Australian company had obtained 1,100 diamonds from their ground. Mr. Barnes, the manager, who has been connected with the diamond mines at Kimberley, in South Africa, for a number of years, has erected machinery for saving these precious stones on the same principle as adopted there. The process is to empty the wash-dirt into a hopper, which carries it into a puddling machine. This machine is 10ft. in diameter, having the outer sides 16in. in height; the inner circle is 3ft. in diameter, leaving the width of the puddling-trough 3ft. 6in. across. The shaft, which stands vertical in the centre of the machine, carries four arms, in each of which are fixed a row of five teeth; the bottom of the machine is made with a slight inclination outward, so that, by the centrifugal motion of the water and slight angle of inclination of the bottom, it keeps the particles of greatest density always on the outside. As the wash-dirt gets puddled and the water thickened it is allowed to run off from the inner edge of the machine, and it goes through a similar puddler below the top one before the sludge is allowed to run away, care being always taken not to allow too much gravel to accumulate in the machine, but to always have the bottom as clear as possible. When the gravel accumulates it is taken out of the machine and put through a revolving screen, which separates the fine grit from the stones. Afterwards the stones are taken away to a table and all hand-picked. The puddling machines are made of steel plates rivetted together, and, when working, the arms carrying the teeth revolve at the rate of about twelve revolutions per minute. The cost of these machines erected is £500, and Mr. Barnes states that they are each capable of puddling 200 loads of stuff in eight hours.

This company have now arranged to lay down a tramway from the mine to the Bingera River, a distance of nearly four miles, and to shift their plant to that place in order to insure them having a constant water supply. When these works are completed they will be able to keep their puddling machinery fully employed.

PART II.

DIGEST OF THE PRINCIPAL IMPROVEMENTS IN CONNECTION WITH MINING, MACHINERY, SCHOOLS OF MINES, ETC.

HAVING given a description of the mines and plants that I visited, I will now call attention to the several improvements and appliances that would likely be beneficial to the mining community in New Zealand, and tend to further the development of our mineral resources; also to give a synopsis of the system of conducting mining surveys and the organization of the Mines Departments of Victoria and New South Wales, together with the advantages derived from scientific instructions imparted by the schools of mines.

Mining has hitherto been chiefly confined in New Zealand to gold and coal; but I am fully convinced, from what I have seen in New South Wales, that New Zealand is rich in other minerals, such as silver, copper, and tin. The latter mineral would likely be found near the junctions of the granite and silurian rocks; but, at the present time, the greater portion of our mining community is not sufficiently educated with regard to the different characteristics of those minerals and the various forms in which they are found. The same principle is involved with regard to gold in