

which are four in number, in certain charges. These grinding-pans are a combination of the Spanish arastras and Wheeler's pans, and are similar in construction to those used by Mr. J. Brown, of Tararu, only the muller is differently constructed. The annexed plans of these pans and separators will enable any one to see the principle on which the ore is dealt with. There is a false bottom cast in one piece, and held to the bottom of the pan by bolts. The inside diameter of the pans at the bottom is 4ft. 2in. and at the top 4ft. 8in., and they are 18in. in depth. There are twelve cast-iron shoes of hæmatite iron, held to the bottom of the muller with one rivet in the centre, and cast-iron catches, which go into clutches in the bottom of the muller to keep each shoe in its place, and prevent it from swinging on the single rivet with which it is held. These shoes are placed about 1in. apart, and are also placed so that there is a space of about 4in. between them and the outside of the pan, and there is also the same space left between the outer edge of the false bottom and the outside of the pan, while the space between the inner edge of the false bottom and the inner side of the pan is filled up with wood, the space left on the outer side being for quicksilver. On the top of the muller three curved guides are placed to regulate the grinding of the tailings.

Before starting these pans they are first charged with quicksilver in the recess between the edge of the false bottom and the outside of the pan. The charge of tailings is then put in with water, and also a little salt and sulphate of copper, and a wooden cover is bolted on the top, after which the pans are set in motion. A jet of steam passes through the cover into the pan, and the temperature is maintained up to about 210°. After each pan has been working for about three-quarters of an hour more quicksilver is added, and the grinding continued, the pans being driven at sixty-five revolutions per minute, until the whole is in a pulp. The stuff is then run out of the pans from a cock at the bottom into small chutes, which carries the stuff into the separator. The pan is then charged as before and grinding continued, the principle being to grind each charge separate, and not to be continually grinding and continually running off the slimes.

There is a separator to each two grinding-pans. These separators are 6ft. 6in. in diameter and 2ft. 6in. in depth. The bottom and flange round the bottom are made of cast-iron, but the sides are made of wrought-iron plates. There is no grinding done in this pan. On the bottom of the muller there are fixed curved wooden slips, 2in. in depth. The muller, revolving at the rate of twelve revolutions per minute, with these curved wooden slips, causes a contracting influence to the centrifugal motion of the water, and tends to collect all the fine particles of quicksilver and amalgam which come from the grinding-pan. This process is carried on for some time with a plentiful supply of clean water, until the whole of the quicksilver is separated from the slime. A cock is then opened, and the slime run off into a chute and over a ripple-box before allowing the tailings to run to waste. The quicksilver and amalgam are then run off into bags and filtered, after which the amalgam is ready for retorting.

In erecting this plant there is provision made for erecting a dry crushing-plant for rich ores, which Mr. Railey contemplates doing as soon as the plant comes to hand. Mr. Railey states that he was for several years employed at a plant of this description in Mexico, and there the company guaranteed the owners of the ore 80 per cent. of the metals it contained by assay; and if he succeeds in giving the same percentage on this field—which I question—he will have accomplished far more than has heretofore been done, and be the means of making many of the mines in this district remunerative for working.

The following process is described in a late copy of the *Mining and Scientific Press*, of California, which is almost similar to the plant that Mr. Railey has erected:—"The process of working gold- and silver-ores varies more or less with the character of the ore, but where they are free-milling and do not require roasting or previous preparation the process is very much the same all over the Coast. To those not familiar with the process of milling gold-ore or silver-ore the following brief description will be of interest: In gold-mills the ore coming from the mine is dumped upon the grizzly, where it is screened. That portion which is less than a two-inch cube passes into the ore-bin, from which it passes by gravity into the hoppers of the ore-feeders, and is fed automatically into the mortars as required. The size of the screen generally used on the mortar is a forty-mesh or a No. 9 to 10 slot-punched screen. The ore, after passing through the screen, falls directly upon the plates: if the ore contains free gold only, it is allowed to run to waste as tailings, but if the ore contains sulphurets it is conducted from the plates to concentrators, where the sulphurets are collected and taken out. The style of mortar generally used is of single discharge, with copper plate at the back, which can be removed for cleaning. Each mortar (five stamps) weighs about 5,000lb. The stamps weigh about 750lb. to 800lb. each, and are usually run at about ninety drops per minute. In silver-mills ore from the mine is dumped upon the grizzly, which screens that portion small enough to go into the mortars. The balance is passed through the crusher, which falls into the ore-bins, from which it passes by gravitation into the hoppers of the feeders, from whence it is fed automatically into the batteries. These mortars are generally single-discharge, and are provided with a forty-mesh steel-wire or brass screen, or a No. 9 or No. 10 slot-punched Russia-iron screen.

The ore from the batteries is conducted into settling-tanks, from which it is shovelled into the pans. Quicksilver is introduced (200lb. to the pan), and the process of amalgamation goes on. After remaining in the pans from five to eight hours (according to the character of the ore) it is drawn off into settlers, when by gentle agitation the amalgam and quicksilver is settled and drawn off into canvas straining-sacks, the amalgam remaining in the sack while the quicksilver passes to a tank, from which it is elevated to the pan-floor, to be used again in the same manner as before. The amalgam is taken from the sacks and placed in retorts, where, after being heated for from five to six hours, all the quicksilver it contains has been drawn off and condensed for use again. The retort is then allowed to cool, when it is opened and the silver taken out, which is in the form of a porous spongy mass, usually called by millmen crude bullion. This is broken up and placed in black-lead crucibles, and melted with borax and other fluxes to collect the impurities contained, and cast into ingots or 'bricks,' weighing about 1,200oz. troy. It is then ready for mar-