

As soon as the charge has been fed into the upper hearth the hopper is closed, the usual burning and raking takes place for a specific period, and then the partly-calcined pyrites are raked into the drop-flue, where they descend like a thin sheet into the ascending flames, which latter subject any particles of these sulphurets to severe calcination. At the bottom of the drop-flue is what is termed the 'back-hearth,' whence the roasted ore can be withdrawn for outside treatment by means of a trap-door. If, however, the ore is to be calcined further in the lower hearth it is raked into the latter, and the final roasting takes place, including the addition of coarse salt after three hours' work. By means of this salt the gold is freed from the oxides, and is besides rendered easier for chlorination by removing lead or other sulphates obnoxious to the final process; consequently the quantity of salt to be added depends on the greater or lesser percentage of lead in the ore."

It will be seen, therefore, that in the Australian colonies, America, and Europe attention has been specially directed to extracting all the various minerals from gold-bearing lodes, and that the proper treatment of pyrites has resulted in giving large profits to the shareholders who have undertaken the manipulation. I have dwelt at considerable length on this subject, as it is a process that will be the means of making many of our quartz-mines, now lying idle or worked without paying any interest on the capital invested, give fair returns.

AMALGAMATION.

I have not seen any appliance for amalgamation at work on a large scale which may be said to be complete. The great object in amalgamation is to mix the mercury with the ground or crushed material as much as possible, and to prevent it from becoming floured, or, at least, to be able to collect the floured mercury again before it leaves the amalgamator to run away with the tailings.

The best principle of an amalgamator that I saw was that of "Barker's Patent Electro Amalgamator," which was discovered, or, rather, perfected, by Mr. Richard Barker, F.G.S., of London, in the beginning of 1883, and is now being introduced into the Australian Colonies. This amalgamator has been tested by a number of scientific gentlemen and mining managers, who all agree that it is one of the best processes yet found out for preventing the mercury getting sickened by coming in contact with the base metals, and likewise from getting in a floured condition. The following is a translation from an extract from the *Pesther Lloyd* (*Times* of Hungary) of the 6th October, 1883:—

"We have had a series of very interesting trials of Barker's discovery, under the superintendence of Mr. Henry Tapp, representative of the Electro Amalgamator Company, London, which system permits of direct amalgamation by means of electricity, so that gold, silver, and copper may be recovered from very inferior ore in a most simple way, and at a minimum expense of 5s. per ton, while the 'Designole system' hitherto applied in our establishments has proved as tedious as it is costly and imperfect. . . . When Nature provides gold, silver, or copper ores in metallic condition, they seem to be predestined for this method; but with us the metals are found in combination with sulphur, arsenic, and antimony, and this combination is indissoluble by mercury. To apply the 'Designole system' to ores containing this combination, it is necessary in the first place to reduce the metal into such a state as to admit of the iron combining with the chloride of mercury. This can only be brought about (and that not satisfactorily) through calcination or chlorination, which renders the 'Designole system,' that ought to be very cheap, a costly one, the treatment of inferior ore being in consequence altogether impracticable. 'Barker's' invention renders all this feasible in the simplest possible manner. It consists in the discovery that mercury will amalgamate direct under the influence of electricity. The process is as follows: The ore, reduced to a powder, is carried over an inclined plane, where it must pass over several stages, consisting of a copper plate and a layer of mercury. If these plates are connected with the positive pole of a battery and the mercury with the negative pole, the mercury receives at once all the precious metals, which collect at the negative pole, while sulphur, arsenic, and antimony adhere to the copper, the tailings being forced down by water. If the mercury be sufficiently saturated with precious metals, which can be easily ascertained, the superfluous mercury, which has become amalgam, is drawn off in a simple way, the amalgamation continuing without interruption. The trials to-day in the presence of Government Councillor Belhazy and Mining Captain Reitzner, also of Director Meechworth and other scientific authorities in chemistry, mining, and electricity, were all most successful.

"They commenced with the poorest ore, both raw and calcined, which had been reduced to powder by Ganz's crushing machine. The result was very striking, even with the Kapnik sulphur pyrites. Such of the pyrites as had passed over the surface contained barely 2 per cent. of the original metal. All the rest was perfectly amalgamated. . . .

"Thus the problem is solved of bringing all those hundreds of thousands of tons of inferior ore within the reach of profitable treatment, that up to now, owing to the poorness of quality and cost of manipulation, have been all but lost to our industry; and this seems to open up a new and more cheering prospect for our mining. The well-known geologist, Dr. Robertson, who a few weeks ago visited Hungary in order to study our mineralogy, has expressed his opinion that Hungary, through this (Barker's) process, may become the California of Europe."

The *London Times* of 8th February, 1883, likewise states that trials were made with this appliance at the company's works, near London Bridge, in the presence of a number of gentlemen interested in gold-mining, who assembled to witness a demonstration of the invention, and were highly satisfied with the results obtained. The *Engineer* of the 9th February, 1883, in an article describing this process, states: "We have seen quartz heavily charged with sulphur and arsenic from sulphur pyrites. One shovelful of this stuff sufficed to sicken all the mercury in the riffle, and the mercury was brought back to condition in less than a minute after the current was turned on. With the current flowing, the mercury could not be made sick. One experiment which we witnessed showed in a startling way the effect produced by the passage of the current. Four or five pounds of clean mercury being put into a china bowl, some oil was added, and the whole