

amalgamation has been successful, and smelting, except for the very richest ores, unsuccessful. California has expended thousands in attempting to smelt such of her ores as could not be amalgamated, and the result has been, in an economical point of view, uniformly unfavorable; technically, the smelting has been all that could be wished for—the metal or regulus has separated clearly from the slag, and the precious or useful metals have been obtained as perfectly as in any of the European works, but it has always failed to pay. And why? For the simple reason that in smelting, too much handling, too much manual labor was required. This is an obstacle which time will overcome, but in a manner the reverse of agreeable to the laborer. The amalgamation, on the other hand, is almost entirely accomplished by machinery; a few attendants only being required to overlook the tireless stamps and the obedient grinders in the pans. Mines yielding free gold may be worked to a profit in California, under favorable conditions as to size of vein, proximity to lines of easy communication with the great cities, etc., when the yield per ton is only \$5; and on the average, in the State, when the ores contain about \$15 per ton. Free gold in Montana may, also, be worked to a profit where the average yield is about \$15 per ton.

If the metal be locked up in sulphurets of iron, (pyrites), it may be very satisfactorily extracted by roasting and by Plattner's chlorination process, which would not cost, under average conditions, to exceed \$20 per ton.

Amalgamating silver ores must contain at least \$30 per ton to cover the cost of extraction, and that only where a preliminary roasting is not required. When the latter is the case they may cost from \$6 to \$10 per ton extra for calcining.

Lead ores, which contain silver, can only be reduced by the smelting process, and must contain at least \$60 per ton to pay expenses under the now existing conditions. In the new Territories, the lead now produced is practically valueless, since the cost of transportation to a market renders competition with the lead regions of the West impossible. This, more than any other circumstance, renders smelting the least desirable. It is true that, by the fire process, there is saved a greater percentage of the precious metals contained in the ore, but, as an offset, there is required a far greater expenditure of labor and a more frequent reworking of the by-products. The amalgamation has, we may say, no by-products which require a reworking. The tailings are frequently of sufficient value to warrant a rehandling, particularly where the ore is rich in sulphurets. These, by the action of the moisture and oxygen of the atmosphere, aided frequently by a small addition of common salt, become decomposed and the contained precious metal or metals then readily lend themselves to the process of amalgamation.

To return, however, to the flux of Stevens. It is stated "that sulphuretted ores, which, by common process, yielded \$300 per ton, were by smelting with the cryolite residuum, made to yield \$1,400 per ton." The report is not sufficiently definite; it does not state in what form the gold was reduced nor in what metal, probably lead, the reduced gold was collected. That the gold was obtained at once in a button of the pure metal is improbable, not to say impossible, and the same or greater advantages as a flux might, with better reason, be conceded to pure soda, litharge or borax. Most absurd and illogical of all is the statement in regard to the 2,500 lbs. of Aekworth ore from the State of Georgia. According to the mint assay, there was contained the sum of \$22 per ton, and this miraculous flux succeeded in extracting \$431 per ton. In such a case we have a choice between two conclusions; that is either the mint assay was incorrect, or that Colonel Stevens has discovered the true philosopher's stone, and can put gold where nature has not been so accommodating; or to make use of an expressive vulgarism, Colonel Stevens is able to "extract blood from a turnip."

It is worse than absurd to credit the flux with these superhuman capabilities, and the conditions of the experiment are not stated in sufficient detail to render it worthy of more than passing criticism. The report further states that "the flux is efficacious in detaching the gold from the sulphurets of iron and copper, and that to the presence of fluorine is due the remarkable fluidity of the melted mass, which allows the unoxidized metals to sink to the bottom of the crucible in clean detached globules." All this is entirely an error. If the gold be free there is no need or smelting, and if in combination, the fluorine of the flux will not separate it. On the contrary, the fluorine attacks the quartz preferable to the sulphurets, and eliminating one portion of the quartz as fluoric acid sets the calcium free to unite with another portion of the quartz to form a slag. The metals, whether free or combined with sulphur, will sink to the bottom, and in the latter case, will form a matter which must be subjected to a new treatment before the precious metals can be obtained free. To bolster up the flux, the name of Dr. A. A. Hays, of Boston is introduced, who indulges in some glittering metallurgical generalities in regard to smelting with the flux, with or without common salt. Dr. Hays is doubtless a good practical chemist; but his remarks in regard to smelting with salt shew an entire misconception of the uses of that material. Salt has been used in smelting sulphurets, and then only with a view to making the matter more easily breakable; the sulphide of calcium formed in the process of reduction, is a deliquescent body; draws water from the atmosphere, and, as a result, the matter crumbles to powder, at the same time emitting sulphuretted hydrogen. It has always been found too expensive an adjunct to be at all universally introduced; and if too costly where labor is very cheap, it would be still more applicable to our territories, where labor is so high.

In fine, whatever may be the merits of the cryolite residuum, salt, &c., as a laboratory flux, they have only a very circumscribed applicability, and even then would certainly yield the preference to borax or litharge, which, in a far wider sense, may be nominated universal fluxes. Sulphuret, yielding gold well up in the hundreds, are quite the exception, and for such Plattner's chlorination process affords the best and speediest method of reduction. Quite a number of such works are now in operation in California with uniformly favorable results.

Colonel Stevens has made a "mountain of a mole hill," and his so-called discovery might as well, for all practical purposes, be at once "consigned to the tomb of the Capulets."

THE CHLORINATION PROCESS.—This process, which is spreading rapidly in California, and has proved profitable in every case where there was a good supply of sulphurets and management by competent men, is to be introduced in Arizona. A gentleman familiar with the process has gone to erect a furnace at the Sterling mine, near Prescott, and it is reported that a contract has been made that if the rock yields well to chlorination, certain gentlemen of San Francisco shall buy the mine for \$80,000. There is a lode, ten feet thick, full of metallic sulphurets, and near the surface it yielded a large amount of free gold, as much according to rumour, as \$500 per ton. A mill, however, with the common apparatus for amalgamation failed to pay after the decomposed quartz had been worked, and all the attempts made to extract the gold from deep-lying sulphurets have failed. If chlorination succeeds with one it is supposed that Arizona will come right up, for there is more quartz in one county of that territory, than half of California. The gold, however, is found in connection with the sulphurets of lead and Antimony, and will not be caught by the copper plate or quicksilver. The quartz lodes have the same general character throughout the Territory, being highly mineralized.

MINING LAWS.—As the Gold Mines have become an acknowledged branch of industry and one of the main sources of revenue to the Province, it behoves the Government to foster them in every way by protecting the rights of honest miners and giving increased security and encouragement to investors. Among the improvements which suggest themselves or from time to time have been suggested to us, we enumerate the following, though some of them have been already noticed:

In order to test the depth to which quartz mining may be extended, the Government might meet half the expense of carrying down a shaft to eight hundred feet; the other half being borne by the principal Gold Mine proprietors in the Province.

Now, with an accumulation of evidence in its favour, the prosecuting a deep search in this country is no lottery, but rather a duty owing to science and investors; it is more than probable that good paying ore would be met with in the descent which would cover the whole cost of the experiment; and, even, if it did not, the knowledge to what depth the quartz veins may be safely followed is one of such pressing importance that it can hardly be too dearly purchased. To abolish royalty, and sell the land in fee simple; or exact royalty from net profits, only. To credit mine owners with the full amount of work executed by them in the Province. A mine owner may have several interests in one field; or in different districts, one of which only, may call for his preference or attention, and though upon that one he may have performed one hundred times more labour than was necessary, he is still liable for a certain amount of work for each other area not in the same lease. Again, one year a company's means may be absorbed in erecting machinery, building dams, &c., and other dead work; and yet the excess of labour beyond the statute requirements will not be taken into consideration in the next year's account with the Dominion. Not to issue a prospecting license for private lands, until the owner has had fourteen days notice of the application. Not to issue a receipt for mining leases on private lands, until the application can show the owner's consent. To encourage prospecting and substantially reward discoverers. The single free claim is often no better than a white elephant. To abolish all small areas. To have lithographed maps for each district. To appoint a registrar in every proclaimed district, and in the unproclaimed to have, always, an acting deputy commissioner. To publish statistics regularly and frequently. To modify the form of statistics so as to give fuller information. To compel mining records. To institute fees for search or enquiry at the Mines Department Offices. To purchase the best quartz specimens that may be found, and to preserve them in the country. To engage the professors of Geology at the Provincial Colleges occasionally to visit and report upon the districts.—From *Heatherington's Guide to the Gold Fields of Nova Scotia*.

COAL MINING.—The Montreal Gazette says:—

A company is being formed in this city for the purpose of developing and working a newly-discovered coal deposit at Pictou. This deposit has been examined and favourably reported on by Sir WILLIAM LOYAN, and lies along the track of the Pictou extension railway, in the immediate vicinity of the intercolonial mine. The capital of the new company, which is to be called "The Pictou," has been fixed at \$50,000, and a considerable portion of the amount has already been subscribed for.

—The Huron Copper Bay Company has declared a dividend of 15 per cent for the half year, making 45 per cent for the year, payable on November 6th. Transfer books will be closed from 12th of October to the 4th November.

—New fish rails are being laid on some portions of the Port Hope and Beaverton Railway. The embankment at Galloway Bridge is almost completed.