

there are furnaces in constant work. Even by careful examination it is often very difficult to determine whether the spots are due to the action of acid vapours or parasites. Leaves from plants near the Castlemaine works showed spots of a dark-brown, almost black, colour, with and without an encircling parasitic growth; and leaves from plants growing in the suburbs of Melbourne were found in exactly the same condition. Spots made on leaves by applying dilute acid were without any encircling parasitic growth, though allowed to remain on the growing plant for several weeks.

"Some experiments made since this inquiry began show that in a moist warm atmosphere sulphurous acid has comparatively very slight effect on the leaves of plants. When the atmosphere is cooled the moisture condenses on the leaves in drops, each to a certain degree charged with sulphurous acid, which then begins to act on the plant, chiefly, it seems, by the sulphurous acid being gradually converted into sulphuric acid, which, being concentrated by the evaporation of the moisture, destroys the portion of the leaf on which it rests.

*"The Action of Fumes on Iron Roofs."*

"The fumes from roasting pyrites attack the zinc on moistened galvanised iron, forming sulphate of zinc. Dry zinc is not attacked by the fumes.

"Several samples of water from the galvanised iron roofs of houses near pyrites works have been tested in the Technological Museum laboratory, all of which have been found to contain sulphate of zinc in quantity, but only very minute traces of arsenic. The first water from these roofs, after periods of heavy dews, should be allowed to run to waste, and not stored for domestic purposes.

*"Poisonous Waters from Condensers."*

"Numerous methods may be suggested to remove the acids dissolved in the water flowing from the condensers; but their adoption will depend on local circumstances.

"1. Where motive power can be cheaply applied a pump might be arranged so as to continually use the same water in the condensers. The arsenious acid would gradually deposit from the water as the solution became concentrated, or it could be wholly removed by sulphuretted hydrogen, generated by the action of the acid waters on sulphide of iron in a covered tank; a pipe from the tank to the furnace would convey the excess of gas away so that it might be burnt and cause no nuisance.

"2. By filtering through hydrous oxide of iron and lime in layers.

"3. By running the water into abandoned workings.

"4. By converting the sulphurous acid into sulphuric in lead chambers, and removing the arsenic from the sulphuric acid by sulphuretted hydrogen, as in 1. Owing to the inferior quality of the acid produced it is doubtful whether the manufacture of acid for commercial purposes would be profitable; but were large works established for treating pyrites the acid formed would be required for the economical treatment of the ore.

*"Loss of Mercury, &c."*

"In a series of laboratory experiments, we find that partially-decomposed iron pyrites causes more 'flouring' of mercury and consequent loss than undecomposed pyrites, arsenical pyrites more than iron pyrites, and sulphide of antimony more than arsenical pyrites.

"We have failed to unite the globules of mercury, divided by sulphide of antimony, by the use of sodium amalgam or other specific, but found the globules more readily collected on an amalgamated zinc surface in the presence of weak acid than in any other way. A large number of specifics have been suggested to assist amalgamation and prevent loss of mercury and amalgam, among which maybe mentioned—

"1. *Sodium Amalgam*.—Found to be useful in keeping the surface of the mercury bright and quick, causing it to adhere easily to copper plates, and in collecting floured mercury and preventing its 'flouring.' When the method of using sodium amalgam is more thoroughly understood, it will probably come into greater use: at present many find fault with it for collecting base metals, and for causing a loss of mercury; this latter is probably owing to their allowing the sodium to be all converted into soda.

"2. *Solution of Soda*.—The surfaces of the particles of gold sometimes resist the action of mercury, and appear to be greasy, through what cause cannot be explained; but if they are rubbed with mercury in a solution of soda they are soon amalgamated. It is sometimes used in Chilean mills and in pans: it keeps the mercury-surface clear.

"3. *Solution of Potash*, same as soda.

"4. *Lime* has somewhat the same effect as soda and potash. The amalgamator collects better in an alkaline solution, which keeps the surface of the particles clear.

"5. *Cyanide of Potassium* keeps the mercury bright and clear; prevents flouring.

"6. *Sulphate of Copper*.—Laboratory experiments show no advantage from amalgamating in the presence of this salt.

"7. *Sulphate of Iron*, same as sulphate of copper.

"8. *Common Salt*, same as sulphate of copper.

"9. *Nitre*, same as sulphate of copper.

"10. *Sulphuric Acid* tends to keep the mercury bright, and to collect floured mercury. In this respect it appears to act better than either nitric or hydrochlorine acids.

"With the exception of sodium amalgam, none of the so-called specifics can be applied except in amalgamators, such as the Chilean mill, Wheeler's pan, or arastra.

*"Burning Pyritous Quartz."*

"As regards the burning of the pyritous quartz previous to crushing, we consider it very disadvantageous, for the following reasons:—

"1. Supposing the stone only to contain true pyrites (species free of galena), the burning,