

## VIII. TREATMENT OF SILVER AND GOLD ORES.

The use of soluble compounds of copper as an agent in treating silver ores and rendering them fit for amalgamation, has long been known, and is the basis of the Mexican patio process and its modifications, as well as of the Washoe process now largely employed in the west. The theory of the action of the copper salts in the first of these methods, where the materials are exposed for a long time to the action of the air, is still somewhat obscure. In the Washoe method sulphate of copper and common salt are added together to the ground ore mixed with water, and from these by the reactions which take place in the pans, dichlorid of copper is soon formed. This substance dissolved in brine is used directly with advantage in the treatment of silver ores by Janin and by Kröncke. From the results of various experimenters, it is clear that solutions, both of protochlorid and dichlorid of copper, mixed with common salt, when at an elevated temperature, effect a complete chlorination of sulphuretted and arsenical silver ores, or at least render them susceptible of ready and complete amalgamation.

The use of the chlorids of copper as hitherto applied, presents, however, several difficulties: 1st. The sulphate of copper from which they are generally prepared is costly, and in some places difficult to procure; 2d. Protochlorid of copper is readily decomposed and separated from hot solutions as an insoluble oxychlorid by the carbonate of lime often found with the ores; 3d. Solutions of dichlorid of copper in brine very readily absorb oxygen from the air, forming, besides protochlorid of copper, also an insoluble oxychlorid. These oxychlorids are without action on silver ores, though they attack the mercury when amalgamation is attempted simultaneously with the treatment by copper salts, forming an insoluble chlorid of this metal, and thereby causing a considerable loss.

To meet these objections there is needed a cheap and ready method of preparing the chlorids of copper, and a simple means of preventing their precipitation in inert or noxious forms by the action of the air or carbonate of lime. It will be apparent from the preceding account of the chemistry of the Hunt and Douglas copper process, that the use of a heated solution of protochlorid of iron and salt, aided by sulphurous acid, for the solution of the oxydized compounds of copper, meets the conditions of the problem in the following manner:

1st. The Hunt and Douglas bath gives readily and cheaply strong solutions of the mixed protochlorid and dichlorid of copper wherever carbonates, oxyds, or calcined sulphuretted ore of this metal can be had.