

2d. It dissolves the oxychlorids of copper, by whatever means produced, changing them into a mixture of protochlorid and dichlorid of copper, and thus prevents any deterioration of the copper solution by the action of the air or of carbonate of lime.

The Hunt and Douglas bath may be advantageously applied:<sup>1</sup>

I. To effect more cheaply and more completely the chlorination and the amalgamation of such silver ores as are now treated in the raw state with chemicals, as they are called,—that is to say, sulphate or chlorid of copper with common salt.

II. To chlorinate such silver ores as have been calcined without the addition of salt.

III. To complete the chlorination of silver ores which have been partially chlorinated by calcining with salt, thus securing a much more complete extraction of the silver than has hitherto been attained.

In all of these cases it will be understood that some oxydized form of copper, such as carbonate, native oxyd or calcined sulphuretted ore, is to be added, unless it is already present in the silver ore to be treated. It may be added even in large quantities with advantage, and from the solutions charged with copper a portion, or the whole of this metal may be precipitated from time to time by metallic iron as cement copper.

In localities where salts of iron are not readily obtained, and where sulphur ores are abundant, it will be found that by passing sulphurous acid gas into or over a solution of salt holding pulverized oxyd or carbonate of copper in suspension, a solution of dichlorid of copper will be readily formed, and this reaction may be rendered available for the treatment of silver ores. By precipitating the copper solution thus obtained with metallic iron, protochlorid of iron is at once readily and cheaply obtained.

Silver ores chlorinated by the Hunt and Douglas bath, may be subsequently treated, either by dissolving the silver from the washed residues by a solution of hyposulphite or of chlorid of sodium, or by amalgamation. The use of mercury is to be preferred for ores holding, besides silver, a portion of gold. Such ores should be treated with the bath in the raw state, or after simple calcination, roasting with salt being for them objectionable.

United States letters patent (No. 151,763) for the use of the Hunt and Douglas bath of protochlorid of iron and common salt, conjointly with sulphurous acid, for the treatment of silver ores, or silver and gold ores, mixed with oxydized ores of copper, were granted June 9, 1874, to James Douglas, Jr., Thomas Sterry Hunt and James Oscar Stewart. This process has now been most successfully applied for more than a year on a large scale in the working of silver ores by Mr. Stewart, who will publish in the

<sup>1</sup> Later observations show that this process may be advantageously applied to the treatment of the tellurids of silver and gold.