

10. In the case of sulphuretted ores, the first step in the application of our process has for its object to convert the metal into an oxyd soluble in the bath already described. This conversion is effected by calcination in the air, by which means all copper, iron and sulphur are oxydized. [Pyritous ores, holding much iron and sulphur, may be roasted in kilns, then ground and recalcined, but native sulphurets, rich in copper, or regulus, should be ground before calcination, which is best done in a muffle furnace. In either case] a low red heat suffices, and what is called a dead roast is to be avoided, not only because it involves a waste of time and fuel, but because the high temperature renders a portion of the oxyd of copper insoluble in the protochlorid of iron bath. The roasting need be continued only until the complete oxydation of the sulphuret of copper, and its conversion into a mixture of oxyd with a variable proportion of sulphate of copper. This product may be treated directly with the bath, without addition, as directed for non-sulphuretted ores, but the excess of sulphates thus introduced renders the bath impure, and much more metallic iron is required for the subsequent precipitation than when the whole of the copper is in the form of oxyd.

11. We therefore prefer to proceed as follows: We determine in the roasted ore the amount of copper present as sulphate, which will vary very little for any given ore roasted under constant conditions, and we add thereto an equivalent of lime, which gives rise to insoluble sulphate of lime and oxyd of copper. In practice it is well to leave undecomposed a small amount of sulphate of copper, which, in a subsequent stage of the process, will give with metallic iron the sulphate of iron required to replace the small loss already mentioned as occurring when sulphurous acid is not used. To an ore, for instance, with eight per cent. of copper, which after roasting contains three per cent. of copper as oxyd, and five per cent. as sulphate, we may add lime enough to decompose four-fifths of the latter, at the rate of 28.0 parts of pure lime for 31.7 parts of copper, or about an equal weight of ordinary non-magnesian lime; being four pounds of finely ground lime for each one hundred pounds of the above roasted ore. An equivalent quantity of carbonate of lime, or other alkaline or earthy base, may be used instead of quick-lime, but with less advantage. The roasted ore and lime may be