were exhausted, and the sulphides or complex ores came before the public. It became necessary to find some method of extracting all the values from these ores, and process after process was evolved for this purpose. Although most were failures, each one taught us some lesson on the treatment of zinc and put us probably one step further toward the goal of treatment whereby all the values of ores of this and other complex class could be recovered.

James Process.—It would take too long to epitomize all the processes brought out, so I will confine myself to those that I have been personally more or less intimately connected with. The first of these being by a metallurgist named Christopher James, who worked on the chemical fact that on the meeting of sulphides and oxides under heat, reduction takes place. A number of experimental charges were worked and some results obtained, but the mechanical difficulties did not warrant any further experiment on these lines.

An Improved Process.—Then came another process, where this principle was acted on, together with the principle employed in Parkes desilverizing process, and some better results were obtained. This process consisted in passing the finely ground blende, or complex ore carrying silver or gold values in addition to the zinc and lead, into a bath of highly heated litharge. Reduction took place and as fast as this occurred the face of the bath, at least, was further oxidized by means of an air blast. When the bath was considered sufficiently enriched or in danger of overflowing the fire was damped and the bath cooled back. While cooling it was agitated with paddles until below the melting point of zinc. The zinc contained rose to the surface of the lead in a crust carrying most of the silver, gold and copper with it, and was skimmed off. The zinc was then distilled off leaving the copper and other values in the distil pot or in the zinc pot residues for subsequent treatment. This process gave good results, and I cannot say why it was not prosecuted further.

The Burnham Process.—Next came the "Burnham" process, so called after the metallurgist who brought it out. It was taken up by a London syndicate, and a lot of money was spent on it. It consisted of an agglomeration of the crude ore with nitre cake whereby, it was claimed, the zinc was converted into zinc sulphate. The soda absorbed the siliceous gangue of the ore forming sodium silicate which passed through the subsequent blast furnace treatment practically without change. The resulting scoria from this treatment was then either treated in a spelter furnace or by leaching. It, however, did not work out as claimed and so was not continued.

An Electrical Process.—Next was an electrical process patented by a metallurgist named Grant. This consisted of the deposition of the zinc from its solutions by electrolysis. It was found so difficult to maintain the necessary absolute evenness of current to this end that this process also was relegated to oblivion.

Sulman-Picard Processes.—Later have come the two processes of Messrs. Sulman & Picard. The first of these was worked at the Emo Works, just outside Swansea. It consisted of the briquetting of the ore with coking coal, pitch being used as the bond, and the subsequent distillation in the spelter furnace. The zinc was distilled off and caught in the usual way. The silver, lead, copper or other metals were left behind in the coke formed. This was the most feasible process up to that time, but unfortunately they reckoned without the silica, and instead of metallic lead carrying the silver or gold values being formed, a basic-silicate of lead was the result. This is exceedingly difficult of treatment and results in heavy losses of the higher values. So the process was abandoned. In the opinion of the writer, it might have been made a good and paying process, by research into the field of fluxes.

The Bi-sulphite Process.—These gentlemen next brought forward the process known as the bi-sulphite process, now the property of, and exploited by the British Metal Extraction Co. The company has spent an enormous sum of money on experiments to perfect the mechanics of the process. The process consists of the elimination of the zinc from the other constituents of the ore by means of its own sulphurous acid. The bi-sulphite of zinc thus obtained is converted into zinc oxide by heat. The operators have obtained the zinc oxide; but are still faced by the difficulty of smelting to metallic zinc by ordinary methods. As the oxide of this metal is light and bulky it is very difficult, if not impossible, to get anything like a full charge on to the spelter furnace. This will entail increased cost in the treatment and I much doubt if the materials will stand it. However, I wish them every success.

Conclusion on Treatment Methods.—From the foregoing list of failures, and partial failures, it will, perhaps, have occurred to your minds that zinc looks impossible, but this is far from being the true state of the case. Zinc is just as amenable to treatment as any of the other metals, given the necessary environment, and the proof of this is that the metal is being worked at a profit on a very large scale to-day.

It is not my intention to go into figures, as these may be obtained from the Governmental Blue Books of the various countries that work this metal. What I have been trying to impress by the foregoing, is the fact that zinc in some of its phases is not so amenable to chemical treatment as its metallurgy would lead one to believe. But my opinion, based with all respect, on twenty-odd years experience of this metal in both its docile and refractory forms, is that the present method in common use is the best up-to-date, and that consists of an initial concentration of the ore, calcination and subsequent treatment by means of the furnace employed in Swansea which combines all the best points of the Welsh, Silesian and Belgium furnaces, and is, I am firmly of opinion, the best for the purposes.

Application to British Columbia Ores.—The deposits of British Columbia, at least those I have seen, appear to be quite amenable to concentration even when in admixture, as some of them are, with copper. Such being the case, the subsequent treatment should present no difficulty by the ordinary direct smelting method. If copper and other values are present they can be recovered by the subsequent treatment of the residues.

Importance of Mechanical Arrangement of Ore Particles.—There are methods other than chemical, which will do this concentration and separation, but I would like at this juncture to point to one fact which I think many engineers overlook, and that is that although the ores come from the same district and even from the same lode, they vary enormously as to their mechanical arrangement. This is one of the most difficult points to be faced by the concentrator, and although the general principles of any concentration process may be the same, yet the details must be worked out to suit each individual ore.

Reason for Neglect of B.C. Zinc Ores.—We have in British Columbia huge deposits of zinciferous ores