many other duties about the cyanide plant, most of which, however, are purely mechanical. The air lift is used for elevating both pulp and solution, and compressed air is often used in connection with filtration, the separating of the solids from their treatment solutions. The precipitate resulting when gold and silver are thrown out of the solution is pumped through a filter press, either by means of direct-action pumps or by a monteju, and the cake formed is often partially dried by passing compressed air, sometimes heated, through it. Compressed air is largely used in the operation of fuel-oil burners to melt the precipitate into bullion, and in many other ways this transformation of energy may be considered almost indispensable about the modern cyanide plant. While all of these uses are important, naturally the one in which both chemical and mechanical properties are utilized is most prominent.

THE TREATMENT OF ZINC ORES*

By A. J. Colclough Nettell.

It will be my endeavor to point out that the deposits of British Columbia are capable of treatment locally, and by methods that are in every-day use in Wales. To this end I will roughly sketch the history of the zinc industry from its inception in England, and the various processes employed, both for the smelting of docile and refractory ores.

The real history of zinc starts in Silesia. It was from the deposits there that the first metal came. The furnaces of to-day have many of the characteristics of the original Silesia furnace. It is my intention, however, to deal with the English history of the metal.

Zinc was first known to English miners in the mines of North Wales, where it exists in mechanical mixture with galena. The charter for the oldest of these mines, "the Halkyn," was granted by Charles I. At this time zinc was unknown to commerce, and for many years after it was of no value to the miners. As time passed along the Silesians began to mine and produce zinc, and it then became necessary for a process to be discovered to separate and concentrate the metals from the above ores.

A Concentrating Method Devised.—After years of trial and experiment, Messrs. Green, of Aberystwyth, to some extent perfected a process sufficiently good to enable the zinc blende to be commercially treated. This process consisted of a water concentration over jigs and buddles and treatment in huge tubs called "Gogwrs" in Welsh, and "dollies" in English, and this process with improved type jigs, percussive tables of the "Wynne type" replacing the "buddles," is the one in general use to-day, and is giving every satisfaction.

The Morriston Spelter Works.—Once it became possible to separate satisfactorily the blende and the galena, it became necessary for a smelting process to be evolved to deal with these products. The lead was already provided for, and the Silesians had been for some time treating blende, and that very big and powerful corporation, known to the world as the "Vieille Montagne," was operating at Liege, in Belgium. The late Lord Swansea, afterwards head of the firm of Vivian & Sons, then turned his attention to this industry, and about halfway through the last century inaugurated the smelter, known from that time to to-day as the Morriston Spelter Works. He engaged a French metallurgical engineer, named Alfred Borgnet, to take up the control of this department, and work was commenced. The process then used was in general principle that used both in England and elsewhere, and although the furnaces have undergone a very radical and complete change, the general principles are much the same now.

The Welsh Furnaces.—The early furnaces, or, as they are now called, the Welsh furnaces, consisted of huge fire grates built below ground level in pits, known as "caves," and from ground level up of huge brick boxes into which were placed tiers of clay pots to the number in some cases of sixty pots arranged in five tiers. This portion of the furnace was known as the "Block," and in this the flames from the underground fire places circulated around the pots, raising the heat to the necessary point for the distillation of the metal.

Above the "Block" was built a calciner, or roaster, operated by the surplus heat from the block below, the whole of the gases from the spelter furnace and calciner being carried into the smoke stack provided for each furnace.

The charge for the largest of these furnaces was 3,000 pounds and the yield of metal was considered good at 50 per cent. of the metal contents and more frequently was below rather than above this figure.

Gas Producers Used.—This class of furnace continued in operation in all the spelter works in Swansea until Siemens perfected his gas producer, when the spelter-men grasped the possibilities of a furnace in which the heat was obtained from this source. Then came a period of radical change, the calciners were built separately, each smelterman using the one that suited his fancy, the number of tiers of pots was reduced to three and the length of the furnaces increased to give room for the same, and even a greater number of pots, and, consequently, greater charges, and so was gradually evolved the present-day furnace of 154 pots and four-ton charges.

But even whilst the furnaces were being so improved the yield of metal did not increase with the same rapidity, and all the metallurgists were keenly at work trying various fluxes to aid in increasing the yield of the, by this time, very valuable metal. So by slow stages was evolved the present-day process as worked in Swansea, whereby a yield of 90 per cent. is obtained and under good conditions even higher than this.

Welsh Ores Contain Fluorine.—The ores treated now are principally obtained from Spain and Algiers. Although there are still great quantities in the North Welsh mines, they unfortunately now carry fluorides. Until some means is found of eliminating this element, the Welsh can only be worked in very small quantities. Fluorine is fatal to the pots.

Broken Hill Ores.—A period of experimenting was started when the Broken Hill deposits of docile ore