placed in the furnace, so as to form a bath, and prevent the slag from corroding the bottom of the furnace. The first charge is made up and its behavior in the furnace carefully noted, so that any defects may be remedied in the succeeding charges. It is sometimes found necessary to return the slag to the furnace for re-treatment on account of the high values contained therein. The following is a brief account of a bye-product smelt.

Amongst the materials treated were, reverberatory pan furnace slag, bullion furnace ashes, extractor house sweepings, old cupels, brick from furnace bottoms, calcining trays, battery screens, elephant cord from battery, assay slag, etc.

The mixture was made up into 14 charges of about 900 lb. each, and contained 9 per cent. lithage and 5.5 per cent. iron, in the form of battery screen and old calcining trays.

The average value of the slag drawn off, assayed as follows:—

Gold, 3.99 dwt. per ton; silver, 337.59 dwt. per ton; lead, 6.5 per cent.

The weight of lead bullion recovered = 19,143 oz. troy. The total litharge added only accounts for 12,-711 oz,. thus showing a gain of 6,432 oz. After deducting 797 oz., the weight of the gold and silver recovered by cupellation, there remains a surplus of 5,635 oz. of lead, which has been recovered from the material treated.

In this smelt the last few pots of slag drawn off are put aside for treatment in the next smelt, since fine shots of lead may be skimmed off. Before tapping the lead bullion off, the metallic lead is concentrated and purified by oxidation and the dross afterwards taken off. In this particular smelt the dross carried 28 per cent. metallic copper, the remainder being oxide of lead and finer shots of metallic lead. The cupel used in this smelt was made of bone ash, manufactured on the mine. The bones were collected from the kitchen at the native compound, and burnt in the cupel furnace, an iron plate being inserted on the cupel so as to form a bottom for the furnace. The burning presented no difficulty, and the calcination was complete in four hours. It is most important that the bones should be completely burned, so as to expel all animal and carbonaceous matter. The loss in weight during calcination is about 54 per cent. The bone ash obtained was equally as good, if not better than than the imported article, at less than half the cost. In preparing the bone ash for making the test, I used 14 lb. caustic potash in solution to 400 lb. bone ash with satisfactory results.

In presenting these brief notes I do so with the hope that the members engaged in this class of work will raise a discussion which will serve to bring forward a few of the newer innovations in smelting on these fields, and so bring our published information up to date.

Coal Washing as Practised by the Nova Scotia Steel and Coal Company, at Sydney Mines, Cape Breton, N.S.

From Transactions of the Canadian Society of Civil Engineers.

By C. L. Cantley, Stud. Can. Soc., C.E.

The cleansing of coal to fit it for metallurgical purposes is a branch of the art and science of ore dressing which has become prominent only at a comparatively recent date in America. The reasons for this are quickly brought to mind when we remember the growing scarcity of pure fuel and the refinements of metallurgical methods which now make fuel treatment necessary, except where Nature has been especially kind to the metallurgist.

In Canada, the greater part of our fuel is not sufficiently pure for the economical smelting of iron, and hence it was that one of the first coal washers to be built and operated in America was laid down in 1892 at Ferrona, Nova Scotia, by the New Glasgow Iron, Coal & Railway Company, at that date a constituent of a company which afterwards became the title company.

The success obtained on the product of the neighboring mines induced Mr. Graham Fraser, at that time managing director of the Nova Scotia Steel & Forge Company, to carry out a series of experiments in and about the year 1894 on other Nova Scotia coals, and especially to test the coals of Eastern Cape Breton with a view of seeing whether a good enough coke could be made to warrant the establishment of an iron and steel industry on that island.

The experiments proved conclusively that by this method of treatment coals containing a high percentage of ash and sulphur could be so prepared as to make a coke of good quality, at atreatment cost not exceeding ten cents per ton, and it is largely to these successful tests we owe the establishment of the iron and steel industry of Cape Breton.

Thus we see, from the outset, the fundamental importance of this branch of ore dressing which has made possible one of the greatest industries in Eastern Canada; this is further emphasized by the recent troubles in Canadian steel-coal circles brought about by coal being supplied which, it was claimed, could not be sufficiently purified by washing to make good metallurgical coke.

The Nova Scotia Steel & Coal Company in 1896 purchased the entire property of the General Mining Association of London, which operated the well-known "Old Sydney" main seam in Sydney Mines, Cape Breton. The intention then was to utilize part of the coal mined for the manufacture of coke to be used in iron blast furnaces, and in 1899 the plant described in this paper was laid down at the colliery, the general scheme being similar to that of the plant previously erected at Ferrona. As originally designed, by Stein & Boericke, metallurgical engineers of Philadelphia, and erected, the plant was expected to handle 300 tons of coal per day of ten hours. It has, however, been much altered in details, chiefly of elevators and waste disposal, so as to have a uniform washing capacity throughout, and, as a consequence, the output is now over 500 tons per day.

The plant is situated in the immediate vicinity of the