ART. XXVII.—*Chemical Papers from the Massachusetts Institute of Technology.*—No. II. *The determination of Lead as Peroxide*; by W. C. MAY.

IN the account of Luckow's scheme of analysis of copper ores by means of the galvanic battery, which is given by the officers of the Mansfield Mines,* the behavior of many metals toward the electric current is noticed, and the statement is made that lead is completely precipitated as peroxide on the positive electrode. These authors appear to have considered chiefly the case of a solution previously treated with sulphuric acid, which, consequently, could contain only traces of lead, and I have been unable to find any published account of determinations of lead by this process. The experience in this laboratory confirms the statement of the German authorities; and it has been the custom here, for two years past, in the separation of lead from copper, to precipitate by the battery the small amount of lead which remains in solution after the main portion has been precipitated by sulphuric acid. In order to discover whether this method is serviceable for the estimation of larger quantities of lead, the following experiments were made.

The substance operated upon was brass, the per cent of copper and lead in which were accurately known from a large number of analyses made in this laboratory. Various amounts of proof lead were added in order to increase the quantity of that metal. These were dissolved in nitric acid and diluted with water, so that for one gram of copper about 80 to 100 c.c. of water and 3 c.c. of strong nitric acid were present, in addition to the acid combined with the metals. The metals were precipitated by the galvanic current, the copper upon the negative and the lead upon the positive electrode, using for the former a piece of platinum foil about $2\frac{1}{2}$ to 2 inches; and for the latter a narrow strip of foil, about $\frac{1}{8}$ inch wide and long enough to reach to the bottom of the beaker. After the precipitation was complete, the copper was thoroughly washed and was then weighed in the usual manner. The oxide of lead precipitate, I satisfied myself, was virtually insoluble in nitric acid of the strength here used, and therefore deemed it unnecessary to continue the current after the copper had been removed from the solution. All chance of error in this respect might be avoided by connecting a platinum wire with the battery, in place of the negative electrode, and immersing it in the solution. After drying and weighing the copper, the lead

* *Fresenius Zeitschrift*, 1869, p. 1.

which remained upon the positive electrode was gently chafed off, with a rubber-coated glass rod, into a small beaker containing water, and the entire precipitate was collected upon a filter, washed and dried, and then transferred to an accurately weighed porcelain crucible and ignited gently, apart from the filter. This treatment brought the lead to the state of protoxide, in which condition it was weighed. From this weight of protoxide the per cent of lead was calculated. I generally found no trouble in completely removing the peroxide of lead from the foil; should any difficulty be experienced, however, the last traces may be converted to the peroxide upon the platinum itself, by cautious heating; and without, in the least, injuring the foil.

Below are the results of several analyses.

I.

Wt. of copper taken=2.3723	Wt. grms. of lead taken=1.7804 grms.	Total 4.1527
“ “ found=2.379	“ “ found=1.7791	“
Per cent “ “ =57.28	Per cent “ “ =42.84	
Theory “ “ =57.13	Theory “ “ =42.87	

II.

Wt. of copper taken=0.3988 grms.	Wt. of lead taken=.3857 grms.	Total .7845
“ “ found=.4001	“ “ found=----	“
Per cent “ “ =51.00	Per cent “ “ =----	
Theory “ “ =50.84	Theory “ “ =49.16	

III.

Wt. of copper taken=.4740 grms.	Wt. of lead taken=.0907 grms.	Total .5647
“ “ found=.4737	“ “ found=.0895	“
Per cent “ “ =83.88	Per cent “ “ =15.84	
Theory “ “ =83.94	Theory “ “ =16.06	

IV.

Wt. of copper taken=.5461 grms.	Wt. of lead taken=.0246 grms.	Total .5707
“ “ found=.5458	“ “ found=.0240	“
Per cent “ “ =95.63	Per cent “ “ =4.20	
Theory “ “ =95.69	Theory “ “ =4.31	

V.

Wt. of copper taken=.2201 grms.	Wt. of lead taken=.0260 grms.	Total .2461
“ “ found=.2205	“ “ found=.0248	“
Per cent “ “ =89.59	Per cent “ “ =10.07	
Theory “ “ =89.44	Theory “ “ =10.56	

VI.

Wt. of copper taken=.4666 grms.	Wt. of lead taken=.4109 grms.	Total .8775
“ “ found=.4695	“ “ found=.4070	“
Per cent “ “ =53.50	Per cent “ “ =46.38	
Theory “ “ =53.17	Theory “ “ =46.82	

These results were obtained by the process previously described and under the conditions there detailed, and seem quite satisfactory, especially the first three. The plus error of the copper was probably due to slight oxidation of the metal upon the edges.

In a subsequent analysis I added to the copper and lead solution a solution of iron and potash, which, so far as can be judged by a single determination, exerted an injurious effect upon the precipitation. Further investigation must be made to ascertain this more fully. Following is the result of the analysis in this case.

VII.

Wt. of copper taken=	·6153	grms.	Wt. of lead taken=	·3252	grms.	Total	·9405
“ “ found=	·6126	“	“ “ found=	·3027	“		
Per cent “ “	=65·13		Per cent “ “	=32·18			
Theory	=65·42		Theory	=34·58			