NOTES.

Notes on the Separation of Silica and Alumina in Iron Ores.—A reading of G. W. Dean's "Notes on the Determination of Silica and Alumina in Iron Ores,"[1] and "The Determination of Silica in Iron Ores Containing Alumina,"[2] led to a comparison of the three methods outlined in the above-mentioned articles with the sodium carbonate fusion method.

A brief statement of the four methods may not be out of place; they are as follows:

(1) Sodium carbonate fusion. One gram of the sample was treated with concentrated hydrochloric acid and evaporated to dryness twice, then dissolved in hydrochloric acid, the solution filtered and the residue fused with sodium carbonate. The fusion was treated with hydrochloric acid and evaporated twice to dryness and the silica determined as usual.

(2) Double dehydration of ore in hydrochloric acid, solution in same, ignition of the insoluble residue in platinum and re-solution in hydrochloric acid, and silica determined.

(3) Ignition of ore in porcelain with sulphur, solution in hydrochloric acid, and silica determined.

(4) Ignition of ore in porcelain without sulphur, solution in hydrochloric acid containing 1 gram of stannous chloride in 225 cc., and silica determined.

Alumina was precipitated as phosphate.

The ores used were those encountered in routine work and were as follows: (*a*) Brown hematite-limonite mixture, (*b*) brown hematite, (*c*) red-brown hematite mixture.

The following figures are averages of numerous determinations:

	Ores.					
	(*a*).		(*b*).		(*c*).	
Methods.	SiO_2.	Al_2O_3.	SiO_2.	Al_2O_3.	SiO_2.	Al_2O_3.
(1)	7.70	3.11	5.52	1.44	13.31	4.00
(2)	8.90	2.49	6.01	1.15	13.76	3.70
(3)	8.92	2.37	6.00	1.07	14.07	3.44
(4)	8.71	....	6.17	....	14.17	....

The determination of alumina subsequent to (4) was, of course, impossible.

The following figures show the amounts of alumina soluble in hydrochloric acid before the ignition in method (2), and the amounts liberated by the ignition:

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[1] THIS JOURNAL, 29, 1208.

[2] *Ibid.*, 28, 882.

Ore.	Al_2O_3. No. 1.	Al_2O_3. No. 2.
(*a*)	0.97	1.53
(*b*)	0.62	0.59
(*c*)	1.48	2.21

Three different ignition temperatures for method (2) were tried on ore (*a*). A low red heat, barely sufficient to redden the crucible bottom, was applied till the filter was carbonized and about half consumed; this gave results as follows: Silica 8.92, alumina 2.48. A moderate red heat, sufficient to redden the crucible (15 g.) clear to the top, and applied till the filter was entirely consumed, gave: Silica 8.88 and alumina 2.51. Igniting to bright redness gave figures much higher on silica and lower on alumina and so discordant as to be totally worthless.

The sodium carbonate fusion being considered a standard method for the determination of silica, it is evident from the above comparisons that ignition methods (2), (3) and (4) are not universally applicable to the accurate determination of silica and alumina in iron ores.

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An Apparatus for the Quantitative Electrolysis of Hydrochloric Acid.—A desirable piece of apparatus for a lecture experiment is one that is easily put together for operation, certain to give correct results without any time-consuming preparation or preliminary adjusting. In the opinion of the writer, the following piece of apparatus for demonstrating the volume relation of the hydrogen and chlorine obtained in the electrolysis of hydrochloric acid fulfils the above requirements of "desirable apparatus."

The special points of difficulty to be overcome in an apparatus for this purpose are (1) the mixing of the catholyte with the anolyte; (2) the solubility of the chlorine in the water over which it is to be collected. In the apparatus here described, the mixing of the catholyte with the anolyte is practically entirely prevented by surrounding the anode with a porous cup. The second difficulty is eliminated by discharging the chlorine into the bottom of a tall, large cylinder, and collecting the equal volume of air forced out of the top of the cylinder. These ideas are embodied in the following design.

The electrolysis is carried on in a cylindrical glass jar, *1*; *2* is a cylindrical porous cup; *3*, the carbon anode; and *4* the cathode of sheet platinum. The glass jar and the porous cup are both closed with rubber stoppers, through which are inserted the carbon anode, the platinum wire connection for the cathode, and the delivery tubes. The chlorine delivery tube is fitted with a rubber stopper to the lower opening of