

close to the diagonal. If these observations are correct, then alcohol would have nearly normal molecular weights at the concentrations corresponding to these observations, but these observations are so different from the other ones that I thought it best to draw the plot as I did.

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### A NEW FILTERING MEDIUM.<sup>1</sup>

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FOR the removal of manganese dioxide from the nitric acid in which solution it has been precipitated by potassium chlorate, a glass tube similar to that used for carbon determinations, is recommended. The bottom of this tube is covered first with a small piece of glass wool, then with asbestos. This we used for some time, but were frequently troubled by the precipitate running through, unless a very thick bed of asbestos was made. In this case, the time consumed in filtering was very considerable, due to clogging of the filter by potassium chloride from the large amount of potassium chlorate necessary to oxidize the chromium which was present in considerable quantities in the steels dealt with.

After some experimenting, we adopted the following as giving the most satisfactory results: A carbon filtering tube with a stem five inches long and a body three and one-half inches long and one and one-fourth inches in diameter, is filled one-fourth inch with pewter sand, a small piece of glass wool being used to retain the sand; over this a thin layer of asbestos is formed by pouring in the asbestos shaken up with water and sucking the bed dry. A little hot dilute nitric acid is poured back and forth through the tube several times, when it is ready for use.

When a heavy precipitate is encountered, the bulb from a syringe is used to force air into the tube and drive the liquid through, care being taken to keep the bulb compressed until removed from the tube.

We have found that the quickest and best way to wash the manganese dioxide consists in allowing the nitric acid to run

<sup>1</sup> Read at the New York meeting of the American Chemical Society, December 28, 1898.



entirely through the filter, then washing all the residue in the beaker into the tube with cold water, and as soon as the filter has drained, washing out the potassium chloride with hot water. The filter and manganese dioxide are blown out into the beaker and the dioxide reduced with ferrous sulphate, etc. The sand and asbestos are recovered and used time and again. The washings and nitric acid filtrate were examined and found free from manganese. In this filtrate the chromium was determined by adding ice and reducing the chromate with ferrous sulphate, etc.<sup>1</sup>

This sand filter was used for the removal of ammonium phosphomolybdate from the solution in which it was precipitated. It was found best to place a few pieces of glass rod upon the asbestos to hold it in position when the solution was first being poured upon the filter. With this device, we have found the freeing of the precipitate and filter of molybdic acid to be more easily and more quickly accomplished than when paper filters were used. The phosphomolybdate has a tendency, as all know, to 'creep,' and, unless the filter is fitted properly to the funnel, to get into the filtrate. This trouble is avoided by the sand filter. To dissolve the precipitate, the ammonia solution is poured through the filter two or three times and finally washed out with hot water. A number of determinations, using the sand and paper filters side by side, have been made on the same sample and the results obtained agreed to a thousandth. It was found best to wash the sand filters, used to catch the ammonium phosphomolybdate, with ammonia as well as with nitric acid, since in the ammonia washings silica and alumina were found, and these would tend to clog the reductor.

Once made up, they stand ready for repeated use, and besides saving time they save considerable money, especially where many determinations are made. By these filters, one man was able to turn out in one day forty-two phosphorus determinations, and every precipitate was washed until the droppings from the tube gave no reaction for molybdenum when tested with ammonium sulphide.

The cut shows clearly the manner of making up these filters.

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<sup>1</sup> "Methods for the Analysis of Ores, Pig Iron, and Steel," compiled from the Transactions of the Chemical Section of the Engineers' Society of Western Pennsylvania.