

This form of funnel is known as the Hirsch funnel.<sup>1</sup>

As in all cases the results were nearly identical; it is evident that the different methods of washing the precipitate had no influence upon the result. Exactly twenty-three molecules of  $\text{Na}_2\text{O}$  are required for one molecule of  $\text{P}_2\text{O}_5$ . The standard acid is prepared by diluting 323.7 cubic centimeters of normal sulphuric acid to one liter, and not 326.5 cubic centimeters as previously stated. The alkali solution, after removing carbon dioxide by barium hydroxide, is brought to the same strength as the acid, volume for volume.

One cubic centimeter of either solution is then equal to one milligram of  $\text{P}_2\text{O}_5$ .

PHILADELPHIA, PA., February 20, 1894.

### NOTE ON PEMBERTON'S METHOD OF PHOSPHORIC ACID DETERMINATION AS COMPARED WITH THE OFFICIAL METHODS.<sup>2</sup>

BY WM. C. DAY AND A. P. BRYANT.

HAVING occasion to make a series of determinations of phosphoric acid in Florida phosphate rock, we have used the method recently described by Mr. H. Pemberton, Jr., and incidentally have made a number of comparisons between it and the official method. The following are the results:

#### GRAVIMETRIC DETERMINATIONS.

No. 1. From 0.7867 gram  $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$ , obtained 0.2426 gram  $\text{Mg}_2\text{P}_2\text{O}_7$

No. 1. From 1.1100 grams  $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$ , obtained 0.3433 gram  $\text{Mg}_2\text{P}_2\text{O}_7$

No. 2. From 1.0000 gram Florida rock, obtained 0.5828 gram  $\text{Mg}_2\text{P}_2\text{O}_7$

No. 3. From 0.3807 gram Florida rock, obtained 0.0262 gram  $\text{Mg}_2\text{P}_2\text{O}_7$

No. 3. From 0.4831 gram Florida rock, obtained 0.0333 gram  $\text{Mg}_2\text{P}_2\text{O}_7$

No. 4. From 1.0036 grams Florida rock, obtained 0.0227 gram  $\text{Mg}_2\text{P}_2\text{O}_7$

<sup>1</sup> To be had from Bullock and Crenshaw, Philadelphia. A disk of filter paper of the diameter of an American silver quarter dollar (fifteen-sixteenths inch) is used, when employing the smallest size funnel. I can highly recommend this funnel in all cases in which the precipitate is to be titrated. The precipitate presents a perfectly flat surface, is easily and quickly washed, and is readily transferred with the aid of the wash bottle to the beaker. The funnel can be employed only when using the suction pump, but it has the advantage of not requiring a platinum cone, and the size of the filter is reduced to a minimum.

<sup>2</sup> Read at the stated meeting of the Chemical Section, of the Franklin Institute held February 20, 1894.

## DETERMINATIONS BY PEMBERTON'S METHOD.

No. 1 used 1.0737 grams  $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$  and 22.88 cubic centimeters KOH solution and 1.85 cubic centimeters acid.

No. 1 used 1.0370 grams  $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$  and 21.30 cubic centimeters KOH solution and 0.80 cubic centimeter acid.

No. 2 used 1.0000 gram Florida rock and 41.85 cubic centimeters KOH and 5.05 cubic centimeters acid.

No. 3 used 1.0000 gram Florida rock and 7.55 cubic centimeters KOH and 3.10 cubic centimeters acid.

No. 4 used 1.0000 Florida rock and 6.75 cubic centimeters KOH and 5.50 cubic centimeters acid.

Strength of  $\text{H}_2\text{SO}_4$  used 1 cubic centimeter = 0.015998 gram  $\text{H}_2\text{SO}_4$ .

Strength of potassium hydroxide solution 1 cubic centimeter = 0.01847 KOH.

The percentages of  $\text{P}_2\text{O}_5$ , calculated from the foregoing determinations, are :

Substance.	Gravimetric.	Pemberton.
No. 1, sodium hydrogen phosphate.....	19.72	19.73
No. 1, sodium hydrogen phosphate.....	19.78	19.99
No. 2, Florida rock.....	37.28	37.22
No. 3, Florida rock.....	4.40	4.53
No. 3, Florida rock.....	4.41	...
No. 4, Florida rock.....	1.45	1.32

It is evident from the above figures that the agreement between the results of the two methods is as close as could be desired. Inasmuch as the Pemberton method is of extreme accuracy, is very easily carried out and effects a great saving of time and labor over the official method, it is well worthy of extended use. We have found that the author's statement of the time required for a single determination, namely, thirty to forty minutes from the time the solution is measured out for titration, is entirely reasonable. Omitting filtration of silica makes no difference in the accuracy of the results.

SWARTHMORE COLLEGE, PA., February 20, 1894.

## THE CHEMICAL AND PHYSICAL EXAMINATION OF PORTLAND CEMENT.

(Continued from Page 273.)

BY THOMAS B. STILLMAN, PH.D.

REFERENCES (1870 to 1892).

1870.

*American Chemist*.—Chemical examination of a piece of cement metamorphosed while immersed in the water of Bayen de Luchon, 148.