collected on a filter, and after the solution had run off, the precipitate was suspended in one-quarter per cent. sodium chloride solution, filtered off and washed with the same solution. The clear filtrate and washings were then dialyzed into alcohol until a considerable precipitate had formed which was filtered off and washed successively with fifty per cent. alcohol, stronger alcohol, absolute alcohol, and ether, and dried over sulphuric acid. It was then almost wholly soluble in water, but after drying at 110° it became insoluble, and was washed with water, alcohol, and ether, and again dried, 35.

PHASELIN, PREPARATION 35.

	I.	II.	Average.	Ash-free.
Carbon	49.01	....	49.01	51.37
Hydrogen	6.77	....	6.77	7.10
Nitrogen	14.26	13.82	14.04	14.71
Sulphur } Oxygen }	....	....	....	26.82
Ash	4.58	....	4.58	....
				100.00

[TO BE CONTINUED.]

THE DETERMINATION OF ALBUMEN IN COW'S MILK.

BY L. L. VAN SLYKE.

Received August 22, 1894.

IN Vol. **15**, No. 11 of the JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, the writer presented a paper on the determination of casein in cow's milk. It is now desired to present another paper supplementary to that and relating to the determination of albumen in cow's milk.

Ordinarily, when we speak of milk albumen, we mean the portion of nitrogen compounds not coagulated by rennet, acid, etc. In other words, we apply the term albumen to the nitrogen compounds left after removing the casein proper. This use of the term albumen is inaccurate, because, after removing from normal milk its casein, there remain, at least, two nitrogen compounds or classes of nitrogen compounds. One of these is coagulated by heat, especially in the presence of dilute acids, while the other is not coagulated under these conditions. To the former only of these two, the term albumen is properly applicable.

DETAILS OF METHOD.

The filtrate obtained, after separating the casein by the method described in the article above referred to, is placed in a water-bath heated to the boiling temperature of water, the beaker containing the filtrate being covered with a watch-glass crystal. The solution is kept at this temperature until the albumen coagulates and settles to the bottom, leaving the supernatant liquid clear. Ten or fifteen minutes usually suffices to accomplish this. The precipitate is filtered, washed and then treated according to the Kjeldahl method for determining nitrogen. The amount of nitrogen multiplied by the factor 6.25 gives the amount of albumen.

It was thought that too long boiling of the albumen precipitate might cause some of it to redissolve; and, in order to ascertain what effect the length of time of heating influenced the results, the digestion was varied from five minutes to ten hours. The tabulated results are as follows:

	Length of time solution containing albumen was heated.									
	5 Minutes.	10 Minutes.	15 Minutes.	20 Minutes.	30 Minutes.	45 Minutes.	1 Hr.	2 Hrs.	4 Hrs.	10 Hrs.
No. of sample of milk.	Per cent. of nitrogen in albumen contained in milk.									
1..... *a*	....	0.060	....	0.057	0.054	0.056	0.057	0.061	0.046	0.060
"..... *b*	....	0.062	0.058	0.048	0.051	0.063	0.062	0.059	0.055	0.054
"..... Average	....	0.061	0.058	0.053	0.053	0.059	0.059	0.060	0.051	0.057
2 ..... *a*	0.014	0.054	0.054	0.052	0.052	0.051	0.052	0.047	0.045	....
" ..... *b*	0.044	0.053	....	0.054	0.051	....	0.051	0.051	0.049	....
" ..... Average..	0.029	0.053	0.054	0.053	0.052	0.051	0.051	0.049	0.047	....
3 ..... *a*	0.054	0.053	0.049	0.052	0.051	0.053	0.057	0.057	0.056	0.058
" ..... *b*	0.054	0.047	0.053	0.056	....	0.057	0.057	0.060	0.053	0.055
" ..... Average..	0.054	0.050	0.051	0.054	0.051	0.055	0.057	0.058	0.055	0.056
4 ..... *a*	0.057	0.064	0.061	0.061	0.065	0.065	0.062	0.062	0.069	0.065
" ..... *b*	0.062	0.055	0.065	0.063	0.064	0.062	0.065	0.066	....	0.065
" ..... Average..	0.059	0.060	0.063	0.062	0.064	0.063	0.063	0.064	0.069	0.065
Average of all results..	0.047	0.056	0.056	0.055	0.055	0.057	0.057	0.058	0.056	0.059

An examination of the foregoing table shows:

(1) In one case, heating for five minutes gave low results; in two other cases, good results.

(2) In general, the results varied little with increased length of time of heating.

(3) There was a slight tendency to higher results with

increased length of heating, but such increase was more or less irregular and, at most, amounted to only 0.002 or 0.003 per cent. of nitrogen.

(4) It would, therefore, appear that entirely satisfactory results can be obtained by heating the solution containing albumen under the given conditions for ten or fifteen minutes, while an increased length of time of heating does not practically change the results.

It may be stated that the precipitate formed always filters readily and washes easily.

SEPARATION AND DETERMINATION OF THE NITROGEN COMPOUNDS OF COW'S MILK.

Below we give a brief summary of our method as we employ it in effecting the determination and separation of the three classes of nitrogen compounds present in the normal milk of cows.

1. Total Nitrogen Compounds.—Determine the amount of total nitrogen by the Kjeldahl method and multiply by the factor 6.25.

2. Casein.—Weigh out about ten grams of milk, dilute in a beaker with about ninety cc. of water at 40°–42° C., and add at once 1.5 cc. of a solution containing ten per cent. of acetic acid, by weight. Stir with a glass rod and let stand three to five minutes longer. Then decant on a filter, wash two or three times with cold water by decantation and then transfer precipitate completely to filter. Wash once or twice on filter. The washed precipitate and filter paper are then digested as in the regular Kjeldahl method for the determination of nitrogen, and the determination completed in the usual manner. To calculate the nitrogen into an equivalent amount of casein, multiply the amount of nitrogen by the factor 6.25.

3. Albumen.—The filtrate obtained above in separating casein is placed in a water-bath and heated to the boiling temperature of water for ten or fifteen minutes. The filtered and washed precipitate is then treated by the Kjeldahl method for determining nitrogen. The amount of nitrogen multiplied by 6.25 gives the amount of albumen.

4. Remaining Nitrogen Compounds.—The remaining compound or compounds of nitrogen are determined by difference,

subtracting from the amount of total nitrogen compounds the sum of the casein and albumen.

In conclusion, I wish to call attention to the crude nomenclature in common use in stating the results of milk analysis for nitrogen compounds. It is an almost universal custom to call the total nitrogen compounds of milk casein. It would be quite as correct to call the fat of milk palmitin or some similar name. This wrong use of the term casein leads to much confusion, and it is highly desirable that we should use a more discriminating nomenclature. It is also desirable that, in making analysis of milk, pains should be taken to separate and determine the different kinds of nitrogen compounds, since our knowledge of these compounds is far from complete.

I am much indebted to Mr. A. L. Knisely for assistance rendered by him in carrying out the analytical details of the work.

AN APPARATUS ("LYSIMETER") FOR DETERMINING SOLUBILITIES.

BY CHARLES RICE.

Received July 11, 1894.

IN determining the solubility of a substance in some liquid at a given temperature, there is usually but little difficulty encountered when the solvent is not very volatile and the temperature at which the determination is to be made is not high. With a highly volatile solvent, and a high temperature, however, certain difficulties present themselves which are liable to lead to error. The main difficulty is encountered in the endeavor to separate from the original solution, which usually contains an excess of the substance in suspension, a *filtered* portion at the same temperature as that of the solution. The higher this temperature is, the more difficult becomes the removal of a portion without the introduction of errors by the ordinary methods of filtration. It appears, therefore, that it is only necessary to modify the method of filtration in such a way as to maintain the temperature of the original solution unchanged in order to eliminate these errors. This may be easily accomplished by upward filtration into a tube placed in the original solution, and so constructed that it will enable the operator to control the act of filtration, as well as accurately to determine the amount of solvent