The maximum and minimum figures vary in some cases considerably from the true composition. We have made no attempt, however, to cut out the poor ones, but have taken them just as they come. In many cases the highest and lowest figures are accounted for by new and inexperienced estimators. In making reports on unknown papers this is, of course, taken into consideration. Notwithstanding the individual variations, the averages are satisfactory.

In Table II we have arranged the estimates of two individual chemists, A and B, on the rag-sulfite series. Each estimate was made on a different slide and on different days. They extend over a period of about five years.

These figures would indicate that only about one estimate out of 6 or 8 made by an individual on rag-sulfite mixtures is more than 10 per cent from the true composition and where from 5 to 10 people estimate on a single slide it may be expected that the average will be within 5 per cent of the actual composition. In rare cases there may be a variation of 10 per cent, but this should not be exceeded if five or more individuals make independent estimations which are within reasonable accord and if their estimates are frequently checked up by standard slides. Ground wood-sulfite and soda-sulfite mixtures are more difficult and in rare cases there may be 15 per cent variation but ordinarily the results may be expected to be within 5 or 10 per cent of the actual composition.

Table III shows that the above statements are borne out by results in this laboratory on standard slides. In this table are given the actual results, taken just as they come, on various standards where five or more individuals have estimated on them at one time.

It is to be remembered that the above figures are all on single slides. On unknown papers where duplicate slides are employed probably still greater accuracy may be expected.

SUMMARY

The estimation method of fiber analysis as applied to papers has been thoroughly tested out and has given satisfactory results in this laboratory for considerably more than 15 years. When carried out as above described it may be expected to give results accurate to within 5 per cent or better on rag-sulfite mixtures and within about 10 per cent or better on ground wood-sulfite and soda-sulfite mixtures.

LABORATORY OF ARTHUR D. LITTLE, INC.
CAMBRIDGE, MASSACHUSETTS

DATA OF INTEREST IN THE BARIUM INDUSTRY

By LOUIS S. POTSDAMER

Received February 19, 1919

Since September 1914, when the barium industry in the United States sprang into being, there has been a tremendous growth. Starting with one firm at that time, at least two dozen are active now and rapidly growing. Of course, some have fallen by the wayside, but they represent a very small minority.

Very little data of use in this industry have been published and we therefore offer the tables attached, for what they may be worth.

Table I was compiled by the writer in collaboration with Alexander Strobl, and it has recently been corrected. It gives at a glance equivalents of chemicals frequently used in this industry.

TABLE I

BaSO ₄	1.18	1.12	0.96	3.19	0.81	1.00
BaS.....	0.86	0.82	0.70	2.32	0.59	0.73
BaCO ₃	1.00	0.95	0.81	2.70	0.69	0.85
BaO.....	0.86	0.82	0.70	2.32	0.59	0.73
BaO.....	0.78	0.74	0.63	2.10	0.54	0.66
BaCl ₂	1.06	1.00	0.86	2.86	0.73	0.90
BaCl ₂ ·2H ₂ O.....	1.24	1.17	1.00	3.35	0.86	1.05
Ba(NO ₃) ₂	1.41	1.33	1.14	3.81	0.97	1.19
HCl, 100 per cent.....	0.37	0.35	0.30	1.00	0.25	0.31
HCl, 18°.....	1.33	1.26	1.07	3.59	0.92	1.13
HCl, 20°.....	1.18	1.12	0.96	3.19	0.81	1.00
HCl, 22°.....	1.05	0.99	0.85	2.83	0.73	0.89
H ₂ SO ₄ , 100 per cent.....	0.50	0.47	0.41	1.35	0.34	0.42
HNO ₃ , 100 per cent.....	0.62	0.58	0.50	1.67	0.43	0.53
ZnSO ₄ ·7H ₂ O.....	1.46	1.36	1.18	3.95	1.00	1.24
ZnS·BaSO ₄	1.68	1.57	1.36	4.53	1.16	1.43

Example—One pound of BaSO₄ is equivalent to 0.73 lb. BaS or can be produced from 0.42 lb. 100 per cent H₂SO₄ and 0.90 lb. BaCl₂.

Table II contains data from the 1918 Van Nostrand Annual and is of value to the lithopone manufacturers.

TABLE II

—ZnSO ₄ ·7H ₂ O at 15° C.—		—ZnCl ₂ at 19.5° C.—	
Deg. Bé.	ZnSO ₄ ·7H ₂ O Per cent	Deg. Bé.	ZnCl ₂ Per cent
4.1	5	6.3	5
8.1	10	12.1	10
12.1	15	17.5	15
16.0	20	22.7	20
20.7	25	27.9	25
23.5	30	32.7	30
27.2	35	37.7	35
29.9	40	42.9	40
34.3	45	47.5	45
37.8	50	52.4	50
41.3	55	57.1	55
44.6	60	61.7	60

Table III is of use to the manufacturers using barium sulfide, black ash, and was compiled by the writer in collaboration with A. Lusskin.

TABLE III

Deg. Bé. at 60° F.	BaS Lbs. per Gal.	BaS Per cent
2	8.486	2.67
4	8.571	4.10
6	8.700	6.21
8	8.827	8.31
10	8.945	10.29
11	9.013	11.40
12	9.082	12.46
13	9.151	13.58
22	9.810	24.42
23	9.890	25.72
24	9.970	27.28
25	10.046	28.58
26	10.135	29.91
27	10.171	31.26
28	10.256	32.64

CHEMICAL PIGMENTS CORPORATION
PHILADELPHIA, PENNSYLVANIA

SOME CHEMICAL NEEDS OF THE VEGETABLE OIL INDUSTRY¹

By DAVID WESSON

A large corporation engaged in crushing cottonseed and refining vegetable oils was recently asked by the War Department what were the effects of the war on its manufacturing methods. A request was made at the same time for photographs showing improved plant and machinery as illustrating improvements brought about by the war conditions. The answer that was sent back conveyed the information that in handling the seed the amount of lint cut off was about doubled, and to do this the linting capacity of the mills had to be increased. This called for more power, which,

¹ Read before the Division of Industrial Chemists and Chemical Engineers, 57th Meeting, American Chemical Society, Buffalo, April 7 to 11, 1919.

with the difficulty in increasing power plants and the scarcity and poor quality of coal furnished, had a tendency to cut down the normal capacity of the mills.

In the refineries, owing to the drafting of many of the chemists and skilled labor, the work was in many instances done at low efficiency, while in the lard-substitute plants the same methods were carried on through the war as before, though attempts were made to induce the Government to use, in both the Army and the Navy, a form of lard substitute which would have saved them from 12 to 14 per cent of cost on packages, with a corresponding saving in freight space.

In the handling of by-products the manufacture of glycerin was stimulated by high prices, which have now faded away, leaving the product uninteresting to manufacture.

On account of the shortage of chemists, research work in many cases had to be dropped, so peace finds the industry very much where it was before the war started.

With the increased cost of living and high prices of the necessities of life there seems to be a wide field for chemical development of the cheaper materials of the industry. When the armistice came the country had on hand half a million bales of cotton linters, which, during the war, were worth $4\frac{1}{2}$ cents per pound, but in normal times are not worth over 2 cents. This material can be made at the rate of 150 lbs. per ton of seed, as in the past, and it is up to the chemist to work this very valuable raw material into useful products.

The cottonseed cake carries 35 to 40 per cent of protein. Some method should be worked out to put this in a digestible form suitable for human food.

In the manufacture of the oil through its various processes there is still room for improvement. This country is far behind in the use of solvents for extraction, and now with benzol cheap and plentiful it would seem that extraction processes are going to play a big part in the future of the industry. There is a need at the present time for their development.

As is well known, the chief chemical used in the vegetable oil industry is caustic soda. Before the war this was almost universally sold on the basis of 60 per cent Na_2O by the New York and Liverpool test. During the war caustic soda was sold all kinds of ways, mostly, however, flat. Most of the large producers adhered to the old-fashioned way of quoting as above

stated, while the speculators and others who did not care to go into the intricacies of alkali mathematics sold caustic for so much a pound for certain brands of certain strengths. This, of course, led to a great deal of confusion.

When the writer first left school he was given some caustic soda to analyze and made a report but found it was very different from the bill. It was then that he ran up against the time-honored New York and Liverpool test for testing alkali. Apparently very few young chemists know much about this test, and I venture to say there are a good many old ones, not in the habit of handling caustic soda in large quantities who are no better posted. This test has been in use for the last seventy years and is based on the incorrect chemical equivalent of sodium oxide in which it is assumed the atomic weight of sodium is 24 instead of 23. By this method pure carbonate of soda would show 60.377 per cent, whereas actual Na_2O would be 58.491 per cent. In other words, the New York and Liverpool test shows 3.226 per cent more Na_2O based on the total actual Na_2O present. When this test is applied to caustic soda the buyer has to pay for Na_2O present whether it is there as sodium hydroxide or sodium carbonate.

The only defense brought forward for the New York and Liverpool test is "trade custom," and this is because some conservative firms still like to make the ignorant buyer think he is getting more for his money than he receives.

When a chemist buys caustic soda he wants sodium hydroxide because that is what he uses in his work. It would be a considerable saving in time and trouble to those engaged in the industry if all using caustic soda would specify a definite percentage of sodium hydroxide in their contracts and settle on that basis, allowing nothing for Na_2O as carbonate which, in oil refining, is of no use when mixed with the hydroxide.

With the large capacity of alkali plants brought about by the war and the natural competition for business which is bound to result, it would seem that the time is ripe for relegating an obsolete and worse than useless trade custom to the scrap heap, and it is hoped that the members of the AMERICAN CHEMICAL SOCIETY will do what they can to bring about this result.

SOUTHERN COTTON OIL COMPANY
120 BROADWAY, NEW YORK CITY

FOREIGN INDUSTRIAL NEWS

By A. McMILLAN, 24 Westend Park St., Glasgow, Scotland

MANUFACTURE OF COKE

According to an English patent, carbonaceous material, for example, anthracite, peat, lignite, etc., is mixed with the calculated quantity of tar, pitch, petroleum residues or other hydrocarbon required to produce a mixture analytically similar to natural coking coal. The mass is crushed, mixed into a slightly pasty mass and pressed into briquettes in a cold state. The blocks are exposed to the air for about 24 hrs. and are subsequently coked, the volatile constituents being collected as tar, which may be employed for mixing with other material to be coked. The coke obtained has the special properties of metallurgical coke.

STEEL WORKS IN NORWAY

The *Anglo-Norwegian Trade Journal* states that the Minister of Norwegian Industrial Supplies has announced that the government purposes to subsidize new steel works and rolling mills planned in Norway. Loans will be granted and premiums given on production. The latest project is a steel works to be established at Eidjford, Hardanger. A company with a capital of several million kroners has secured water power and sites for the works and will use a new electric process which is said to be much cheaper than methods used hitherto. The water power amounts to 50,000 h. p., of which 10,000 h. p. will be utilized as a beginning.