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The Analyst,

INCLUDING THE PROCEEDINGS OF

THE "SOCIETY OF PUBLIC ANALYSTS."

A MONTHLY JOURNAL FOR THE INFORMATION OF THOSE INTERESTED IN THE PURITY OF FOOD AND DRUGS, AND IN GENERAL ANALYTICAL AND MICROSCOPICAL RESEARCH.

EDITED BY

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ONE OF THE

Hon. Secretaries of the Society of Public Analysts;

AND

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Vice-President of the Society of Public Analysts.

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THE ANALYST.

JANUARY, 1882.

SOCIETY OF PUBLIC ANALYSTS.

A SPECIAL GENERAL MEETING was held on the 14th December last at Burlington House; the President, Mr. Heisch, in the chair.

The minutes of the previous meeting were read and confirmed.

The ballot papers having been opened, it was reported that the following gentlemen had been duly elected:—as a Member, Mr. C. N. Hake, F.I.C., Analytical Chemist, London; as Associates, Mr. J. P. Laws, Assistant to Mr. Bernard Dyer, and Mr. F. T. Strutt, Assistant to Dr. Hodgson Ellis, of Toronto. Mr. Hugh McCallum, Government Analyst, Hong Kong, was proposed as a member.

The following paper was read and discussed:—"Some Observations on the Permanganate Test," by A. Dupré, Ph.D., F.R.S., &c.

The paper, "On a New Method of Testing for Alum," announced to be read by Mr. Wynter Blyth, was postponed, owing to the author's unavoidable absence.

The Annual Meeting will be held at Burlington House on Wednesday, the 18th inst., at 5 o'clock, when the ballot for the Officers and Council for this year will take place and the usual address by the President will be given. The paper postponed from the last meeting, "On a New Method of Testing for Alum," by A. Wynter Blyth, M.R.C.S., &c., will be read, and the author will give some experimental illustrations; and a paper "On the Manufacture of Chloride of Sulphur," by J. Carter Bell, F.C.S., will also be read.

After the meeting, the Annual Dinner will be held, of which due notice will be sent to members.

SOME OBSERVATIONS ON THE PERMANGANATE TEST.

BY A. DUPRE, PH.D., F.R.S., &c.

Communicated to the Society of Public Analysts on 14th December, 1881.

THE Committee of the Society having put forward a certain method for estimating the amount of oxygen absorbed, it may perhaps be advisable to give some reasons for that method to show that it is really an advantage compared with the older one.

The first point for consideration is, Does permanganate suffer decomposition spontaneously at 80 degrees Fahr. in the presence of so much sulphuric acid? I have made a great many experiments, and find that, in really pure water, there is, practically, no decomposition at 80 degrees Fahr. after four hours; or at any rate the amount decomposed is always well within the limits of experimental error. It may, therefore, be taken as established that if the experiment is carried out in a closed vessel there is no spontaneous decomposition, and consequently all the oxygen that is found to be absorbed at that temperature must have been absorbed by some substance present in the water. In an open vessel this could not be assumed, as I do not think it would be possible to heat water in

an open vessel to 80 degrees with permanganate without some decomposition. The point is of importance, because it does away with the second, blank experiment so strongly recommended by Tidy. He makes two experiments; he adds the same amount of permanganate to the water being examined and to distilled water. He takes the distilled water as his standard, and at the end of three hours calculates from that the oxygen absorbed in the other. If the vessel is closed this is entirely unnecessary, and one great source of error, the possibility of traces of impurity present in the distilled water or absorbed from the air, is removed.

This closed vessel makes, however, another precaution necessary. I do not know whether all our analysts do so, but it is neccssary to standardize the permanganate in a closed vessel, for if you standardize in a beaker less hyposulphite is required, unless you do the titration very rapidly. If you do it slowly you always get a lower result in the beaker than in the bottle. I should not be astonished if some of the results of no oxygen absorbed are really due to the loss occasioned in that way.

In some of my experiments the amount of oxygen absorbed, determined as rapidly as possible in a bottle, or in a beaker, was found to be 11·2 to 11·25 c.c. of hypo. Taking ten minutes for the titration, the hypo. comes down to 10·9, or sometimes even lower in the beaker, but remains the same in the bottle.

I must say I was rather astonished at that. I expected to find more iodine liberated by giving a little time, but instead of that there is less, and there is no doubt that a small amount of iodine volatilizes during the titration. If it is done in a bottle, and left even for half an hour, identical results are obtained. A result I did not expect. I expected a considerable increase in iodine liberation by the action of the sulphuric acid on the iodine.

The next point is with regard to the variation of the oxygen absorbed by the variation of temperature.

Here I found that if the water is very pure the amount of oxygen absorbed does not vary much with the temperature. The variation remains within the limits of experimental error, wherever it is done at 32 degrees or 80 degrees. If we take a somewhat less pure water there is, however, a very perceptible difference, and the more impure the water the greater is the difference in the amount of oxygen absorbed according to temperature. In the Trafalgar Square water the variation is only between ·017 and ·03. It seems proportionally large, but it is quite within the limits of error. It represents less than half a tenth of permanganate, which I may fairly take to be within experimental error. The same result comes out even if you increase the temperature up to 100 degrees.

Taking the water supplied to the Westminster Hospital, that absorbed ·0526 at 54 degrees, and ·065 at 80 degrees, which is of course a very measurable increase. If we take a still more impure water the difference becomes greater. A water I had from Farnborough gave 0·0395 at 32 degrees, 0·0554 at 60 degrees, and 0·0613 at 80 degrees, this being a very measurable increase.

It follows that if we have a water of great purity it really matters very little how we keep the temperature; but if our water is only of moderate purity, it is a matter of very great importance indeed to keep the temperature fairly uniform.

If the water is still more impure the difference increases, and 1 degree or 2 degrees Fahr. might then make a sensible difference.

It would be desirable to have some experiments made at lower temperatures, and I should not be surprised if a comparison between the action at a low and high temperature

would enable us to make distinctions between waters which the higher temperature alone does not enable us to do. We might distinguish between two kinds of organic matter, which, at a higher temperature, give the same result, but a different result at a lower temperature.

Variation in Time.—In a pure water the variation in time is not great—the oxidation comes to an end sooner than in an impure water; so that no great difference is found, whether the water is treated for three or four hours. Dr. Tidy told me that he never had a water that absorbed after three hours. That is so with pure waters, but not with impure ones, as in these there is a very decided increase from the three to four hours.

The Farnborough water, for example, in three hours absorbed ·055, and at four hours ·061 grains of oxygen, a very noticeable increase; and I have found the same in other waters. I have no doubt that with a really impure water four hours is not enough to give to the limit of what the permanganate process will do.

The next point to which I directed my attention is the variation of oxidation by varying the amount of permanganate; and here, also, the result corresponds very much with the preceding. With a fairly pure water it matters nothing whether you add 10 or 20 c.c. If you work well you come to the same result.

In the Trafalgar Square water, with 10 c.c. of permanganate I got 0·009, and with 20 c.c. 0·010, which is practically identical. Taking the Chelsea water, to which a little blood had been added, with 10 c.c. of permanganate, the oxygen absorbed was 0·115; but with 20 c.c. it had increased to 0·124.

I next tried phosphoric acid in place of sulphuric acid, bearing in mind that the latter decomposes the hydro-iodic acid, and renders the titration thereby somewhat inaccurate, and more particularly that it interferes with the sharpness of the final reaction.

Taking phosphoric acid (in equivalent proportions) the water remains generally more clear, and the final reaction is beautifully sharp. It has also a slight effect in making the oxygen absorbed, with varying amounts of permanganate, somewhat more uniform.

It diminishes, however, very appreciably the amount of oxygen absorbed. It has thus the advantage of rendering the end reaction sharper, and, perhaps, of making the amount of oxygen absorbed somewhat more independent of the amount of permanganate taken; but it diminishes the oxygen absorbed very considerably, and I have, therefore, returned to the use of sulphuric acid.

I next made a great many experiments with the permanganate test, with a view to throw some light on the organic matter present.

The first thing I did was to boil the water, and I found, to my great astonishment, that it increased the oxygen absorbed. That is to say, taking our Chelsea Company's water and estimating the oxygen absorbed direct, then boiling it for an hour, and again estimating the oxygen absorbed, an increase is observable.

As we always heat our water for some time with sulphuric acid, I thought I would try boiling the water with sulphuric acid. I found, on the whole, a noticeable increase in the amount of oxygen absorbed. Only occasionally did I find the reverse, and that was always when there was a considerable amount of nitrates present. With that exception I always found an increase, which seemed to be the greater the impurer the water, or perhaps the more recent the contamination. Or to put it broadly, if the organic matter is

already altered by natural action in the water, it does not get altered by boiling with sulphuric acid, a point which, if it should be confirmed by other observers, is of considerable importance.

I will now give you a few waters that have been purposely polluted. By far the most striking results were obtained by pure crystal sugar, a remarkably pure sample of which I obtained from Mr. Wigner. Adding sugar to the Trafalgar Square water increased the oxygen absorbed in four hours but slightly; but if the water is boiled with sulphuric acid it goes up to tenfold that amount.

OXYGEN ABSORBED IN FOUR HOURS AT 80 DEG. F.

By Trafalgar Square Water	0·010 grains.
„ „ „ „ + 1 grain of sugar	0·017 „
„ „ „ „ + 1 „ „ boiled 1h with 10 c.c. acid	0·160 „
„ „ „ „ + 0·1 „ „ ————————	0·009 „
„ „ „ „ + 0·1 „ „ boiled 1h with 10 c.c. acid	0·016 „

This result led me to expect that the acid might be the means of distinguishing between vegetable and animal matters, but so far I have not been able to do so. I also tried alkali, and I had some hopes by its means of being able to distinguish between the two kinds of matter; but, though I took the utmost care to get the alkali pure, yet I found the purest soda, after acidifying with sulphuric acid, absorbed a considerable amount of permanganate. I suppose that the pure sulphate of soda has a sensible effect on permanganate. At any rate, however pure the water was, I never could get it to give no oxygen absorbed whenever I boiled with alkali; while boiling with sulphuric acid did not affect pure water.

GELATINE.—Taking 2·27 grains of gelatine per gall., I found that the water absorbed in four hours ·036 without boiling, and after boiling ·039—a very slight increase indeed. In half-an-hour it absorbed 017 without boiling, and ·036 after boiling. The effect is thus very slight in four hours, but very perceptible in half-an-hour.

URINE.—30 grains added per gall., and treated it in the same way.

OXYGEN ABSORBED PER GALL. IN—

	½-hour	1 hour.
By the Pure Water		0·010
„ „ „ + Urine	0·056	0·064
„ „ „ + „ boiled with 10 c.c. acid	0·065	0·092

The difference is much larger than any experimental error would be.

EGG ALBUMEN.—The amount I added was 1 grain to the 2 litre, which comes to 0·035 of dried albumen per gall. I have only the four-hour result, which is ·014 without boiling, 0·016 after boiling. The pure water, as before, absorbed 0·01.

The last substance tried was starch, which was rather disappointing. I expected to get a very noticeable increase. I added 2·27 grains per gall., and the oxygen absorbed without boiling was ·008 (in fact, exactly the same as the pure Trafalgar water), after boiling 0·020. The starch was taken, boiled up into a thin mucilage and then added to the water.

No doubt the proportional increase is considerable, yet the actual increase, compared to the quantity taken, is nothing like what one would expect. Evidently this boiling for an hour with 10 c.c. acid per ½-litre does not convert the starch into sugar.

In reply to questions, Dr. Dupré said: I have made it a point to test all waters for nitrous acid with starch and iodide, but I use sometimes Gries' test, which is more

delicate. With these tests you may get the most intense colouration, and yet not the slightest discolouration of permanganate. All the experiments were made with soda made from sodium. I dissolved that to the corresponding strength of our sulphuric acid, and added permanganate and put it overnight in my warm chamber. I added permanganate till it was distinctly green, and yet when 10″ of this soda solution were added to Trafalgar Square water, together with 20 c.c. sulphuric acid, there was always a noticeable decomposition of permanganate.

One of my reasons for bringing this subject forward in an incomplete form is that I may induce some of our younger members to devote some of their time to such experiments as these, my engagements not allowing me to carry the experiments further at the present time.

SOMERSET HOUSE ANALYSES.

By O. Hehner, F.C.S., F.I.C.

Read before the Society of Public Analysts on the 16th November, 1881.

On September 12th a sample of milk, taken on the same day by the Inspector of the Town Council of Derby, was submitted to and analysed by me with the following results:—

Specific Gravity	1027·4
Solids not fat	8·37 per cent. by weight.
Fat	3·49
Total solids	11·86
Ash	0·65

The duplicate analysis gave total solids 11·97, and ash 0·66 per cent.

On the ground of these figures—the specific gravity, solids not fat, and ash—all being low, I certified the milk to be adulterated with 10 per cent. of water.

The results of the analysis were indirectly corroborated by the inspector, who informed me afterwards that his attention had been directed to the fact that the person who sold the milk to the vendor had, on a previous day, been seen to add water to the milk, and that in consequence he purchased the sample.

The vendor asserting, as was doubtless correct, that not a drop of water had been added by her to the milk, the sample was sent to Somerset House, 26 days after my analysis was made.

Before giving their certificate, the Excise chemists requested the magistrate's clerk to give them information as to a number of points, "as the case presented some peculiarities." They specially wished to know whether the milk was the produce of a single cow or of a number of animals, and upon what kind of food they were fed, and were informed that the milk was from a well-fed herd of 30 cows, grass with a few grains forming the food.

On October 19th the following certificate was received:—

"The sample of milk referred to in the annexed letters, and marked No. 7, was received here on the 8th inst. The sample was securely sealed.

"We hereby certify that we have analysed the milk and declare the results of our analysis to be as follows:—

Solids not fat	7·89 per cent.
Fat	3·38 „
Water	88·43 „
	100·00
Ash	0·74 „

"After making the addition for natural loss arising from the decomposition of the milk through keeping, the amount of solids not fat is not lower than is found in genuine milk.

"The percentages of fat and ash are each equal to that found in genuine milk of good quality.

"From a consideration of these results, and of the particulars supplied, we are not prepared to affirm that water has been added to the milk.

"As witness our hands, this eighteenth day of October, 1881.

"(Signed) J. BELL.
G. LEWIN."

It will be seen that the fat is slightly higher than in my analysis, whilst the total solids have diminished but little. Fermentative damages cannot have taken place to any great extent, doubtless owing to the cold weather prevailing during the period the sample was kept.

The certificate is remarkable in several respects. "After making *the* addition for natural loss." Does any chemist believe that there can be made a fixed addition for loss by decomposition? Fermentation is influenced by many circumstances, and it is not only impossible to make any real correction sufficiently accurate to corroborate or contradict the analysis made upon a sample when fresh, but it is much less possible to make a *fixed* addition or correction. Surely chemists who venture to speak of such corrections in such a manner must have considerable confidence in themselves or their powers.

"From the particulars supplied!" The particulars supplied, if they gave any help in coming to a conclusion at all, testified against the genuineness of the sample, and not in its favour.

The solids not fat being very low the percentages of fat and ash can have furnished the only guidance. Now, the amount of fat goes absolutely for nothing, milk much richer in fat having been found watered. Besides, it is well known that the fat rises as milk becomes old, nitrogenous matter furnishing fatty substances. The ash alone remains as safe measure of the quality of the milk.

Having made my analysis very carefully, and obtained results agreeing well, I felt confident that the amount of ash found by the Somerset House Chemists could not be correct. I did not allow the heat requisite for incineration to rise to redness, and notable loss by volatilisation was out of the question. I, however, repeated the ash determinations, and found in two very carefully performed experiments—Ash, 0·67 (1) and 0·67 (2). The fat had further risen to 3·89 per cent., the solids not fat fallen to 4·22, when the sample was analysed a few days ago (October 4th). The loss of substance by fermentation explains the very slight and insignificant rise in ash.

I am, therefore, in a position strongly to affirm the accuracy of my ash determination, four successive results agreeing as well as they can be expected to agree; and I do not hesitate to declare the only figure, upon which our Court of Appeal could scientifically have relied, to be erroneous and misleading.

Every indication in my analysis pointed in the same direction: the specific gravity, solids not fat, and the ash. On the other hand, we have only the ash, apparently contradicting any results. Public Analysts can form their own inferences from these facts.

MR. J. FALCONER KING, F.C.S., Analyst to the City of Edinburgh, has been appointed Public Analyst to the Burgh of Galashiels.

ON TEA ASH.

By J. Carter Bell, F.C.S., &c.

The following fifty-eight samples of Tea were bought from grocers in the Borough of Salford and neighbourhood:—

Name of Tea.	Ash.	Ash soluble in water.	Ash insoluble in water.	Alkalinity of Ash calculated as Potash.
1 Congo	6·00	48·20	51·80	23·50
2 ,,	6·94	42·10	57·90	18·90
3 ,,	6·10	58·40	41·60	26·00
4 ,,	6·06	50·60	49·40	26·36
5 ,,	6·06	56·44	43·56	26·36
6 ,,	5·84	56·86	43·14	30·57
7 ,,	6·00	54·34	45·66	26·53
8 ,,	5·68	47·89	52·11	29·78
9 ,,	5·86	57·34	42·66	28·87
10 ,,	5·94	54·89	45·11	26·90
11 ,,	6·36	46·86	53·14	22·16
12 ,,	6·06	56·77	43·23	26·36
13 ,,	6·64	45·79	54·21	22·65
14 ,,	6·74	45·11	54·89	20·91
15 ,,	6·28	61·15	38·85	25·44
16 ,,	6·08	55·94	44·06	29·37
17 ,,	6·30	53·66	46·34	20·88
18 ,,	6·56	43·00	57·00	20·05
19 ,,	6·24	54·17	45·83	20·71
20 ,,	6·32	52·54	47·46	26·75
21 ,,	5·94	59·95	40·05	26·90
22 Green	6·48	58·58	42·42	21·76
23 ,,	7·00	43·72	56·28	16·00
24 ,,	6·14	61·25	38·75	27·55
25 ,,	6·64	45·43	54·57	27·06
26 ,,	8·46	37·36	62·64	15·43
27 ,,	6·36	57·24	42·76	28·39
28 ,,	7·50	47·47	52·53	23·81
29 ,,	6·16	48·06	51·94	25·94
30 ,,	6·36	57·55	42·45	26·60
31 ,,	6·32	67·41	32·59	28·25
32 ,,	5·82	58·08	41·92	25·84
33 ,,	6·14	50·49	49·51	26·02
34 ,,	7·06	54·68	45·32	21·30
35 ,,	6·00	61·34	38·66	26·63
36 ,,	6·08	56·58	43·42	27·79
37 ,,	7·24	45·03	54·97	20·77
38 Mixed	5·82	54·99	45·01	25·83
39 ,,	6·24	48·08	51·92	27·11
40 ,,	6·00	59·00	41·00	28·20
41 Caper	5·64	57·38	42·62	26·87
42 ,,	7·74	36·00	64·00	14·50
43 ,,	8·58	32·70	67·30	14·24
44 ,,	6·14	58·70	41·30	24·49
45 ,,	7·50	37·87	62·13	18·18
46 ,,	7·32	43·45	56·55	17·99
47 ,,	7·02	40·46	59·54	20·03
48 ,,	6·32	50·00	50·00	25·28
49 ,,	7·00	43·15	56·85	25·51
50 ,,	5·80	56·56	43·44	25·93
51 ,,	6·82	41·94	58·06	20·69
52 ,,	6·54	44·35	55·65	20·12
53 ,,	7·40	38·38	61·62	22·83
54 ,,	7·70	41·56	58·44	17·09
55 ,,	6·38	53·30	46·70	23·95
56 ,,	5·74	49·13	50·87	24·56
57 ,,	6·86	43·45	56·55	21·92
58 Tea Dust	6·10	49·19	50·81	27·70

The Note on "The Adulteration of Balsam of Peru," by Dr. Senier, in our November number, was printed by mistake without acknowlegment. It was really an abstract contributed by Dr. Senier to, and copied by us from the *Sanitary Engineer*, of New York.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in December, 1881. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Dec. 16	c. p. blue	none	1·98	trace	·490	·0074	·0030	·0080	·0120	20·8°	5·5°	29·00	vegetable debris	Wigner & Harland.
New River	,, 15	c. s. yellow	none	1·12	trace	·269	·0028	·0028	·0400	·0800	16·0°	3·5°	22·68		B. Dyer.
East London	,, 8	c. yellow green	none	1·14	trace	·203	·0014	·0078	·0160	·0480	15·0°	4·0°	22·80	vegetable debris	Wigner & Harland.
Southwark & Vauxhall	,, 15	yellow and clear	none	1·24	trace	·170	·0010	·0070	·0600	·1088	14·5°	4·0°	19·90	satisfactory	J. Muter.
West Middlesex	,, 19	yellow	none	1·06	trace	·181	·0012	·0060	·0672	·1096	13·7°	3·8°	21·80		O. Hehner.
Grand Junction	,,	p. yellow	none	1·24	trace	·151	·0008	·0076	·0334	·0926	14·7°	4·6°	21·20		A. Wynter-Blyth.
Lambeth	,, 15	yellow and clear	none	1·24	trace	·150	·0010	·0080	·0644	·1064	14·5°	4·0°	19·70	satisfactory	J. Muter.
Chelsea	,, 14	c. grnsh. yell.	none	1·26	trace	·170	·0010	·0115	·0590	·0980	17·0°	4·5°	22·26		A. Dupré.
Birmingham	Dec. 6	clear blue	none	1·12	none	·154	·0007		·0013	·0044	12·2°	6·0°	22·90		A. Hill.
Bolton	,, 6	s. turbid yellow	none	·48	none	·038	·0015	·0063	·0188	·0370	3·2°	3·0°	6·42	mineral mtr. veg. debris	W. H. Watson.
Bradford	,, 15	v. s. op., s. pt. yl.	none	·70	none	none	none	·0049	·0260	·1560	4·5°	4·3°	8·30	none	F. M. Rimmington.
Brighton	,, 11	c. blsh. green	none	2·05	none	·392	·0084	·0041	·0040	·0040	12·6°	3·6°	21·20	vegetable debris	Wigner & Harland.
Bristol	Nov. 28	brownish green	none	·90	none	·044	none	·0042	·0179	·0358	16·8°	1·6°	19·20	sand, diatoms	F. W. Stoddart.
Bury (Lan.)	Dec. 6	s. turb yellow	none	·88	trace	·046	·0050	·0072	·0170	·0370	4·5°	4·4°	7·55	min. mtr. veg. deb.	W. H. Watson.
Cambridge	,, 14	p. ble. v. s. turb.	none	1·30	trace	·560	·0014	·0028	·0056	·0084	16·0°	5·0°	26·00	satisfactory	J. West Knights.
Canterbury	,, 21	c. pale blue	none	1·47	none	·411	·0005	·0006	·0020	·0060	5·0°	3·4°	9·80	s. mineral	S. Harvey.
Croydon	,, 20	f. grnsh. blue	f. earthy	1·05	trace	·179	·0060	·0010	·0084	·0084	15·5°	6·5°	24·00	none	C. Heisch.
Darlington	,, 19	s. yellow	none	1·05	trace	·032	trace	·0035	·0541	·1174	9·5°	4·5°	11·20	min. matter veg. debris	W. F. K. Stock.
Dublin	Nov. 28	s. yellow	none	·99	trace	traces	·0020	·0060	·0050	·0300	1·3°	·6°	4·35	satisfactory	C. A. Cameron.
Edinburgh	Dec. 13	s. brown	none	·80	none	trace	trace	·0024	·0160	·0400	4·9°	4·7°	8·32	none	J. Falconer King.
Exeter	,, 3	f. brnsh. yellow	none	·84	trace	·109	·0007	·0038		·0721	2·9°	2·9°	7·00	earthy and veg. debris	F. P. Perkins.
Grantham	,, 17	s. blue s. turb	none	1·12	trace	·780	·0009	·0015	·0045	·0155	14·8°	5·0°	23·18	diat. confer. & mov. orgs.	A. Ashby.
Greenock	,, 8	c. brnsh. yellow	none	·80	none	·001	·0009	·0115	·1700	·2000	1·8°	1·6°	5·52		J. W. Biggart.
Hastings	,, 12	grnsh. s. cloudy	none	4·90	trace	·105	·0035	·0052	·0020	·0050	9·5°	6·0°	28·40	vegetable debris	H. H. Cheshire
Ipswich	,, 16	colourless	none	2·24	trace	·420	·0030	·0038	none	·0054	23·5°	4·5°	33·45	satisfactory	J. Napier.
King's Lynn	,, 10	drty. grsh. yell.	v. faint	1·69	trace	·142	·0028	·0056	·0200	·3587	18·0°	6·5°	28·70	moving organisms	W. Johnstone.
Leamington	,, 1	greenish	none	1·54	none	none	·0028	·0021	none	·0045	26·1°	13·6°	30·10	none	A. Bostock Hill.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in December, 1881. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Leicester.....	Dec. 19	s. yellow	none	1·73	trace	·096	·0017	·0039	·0225	·0840	8·4°	5·0°	14·60	vegetable debris	W. L. Emmerson.
Liverpool	,, 9	grnsh. yellow	s. peaty	1·08	trace	·062	·0007	·0021	·0392	·1055	5·2°	4·2°	9·52	s. vegetable debris	A. Smetham.
Maidstone—															
*Wtr. Company	Nov. 28	brn. v. muddy		2·20	h. trace	·470	·0060	·0231	·1495	·2996	10·4°	6·3°	33·20	veg. debris earthy matter	M. A. Adams.
Wtr. Company	Dec. 12	grsnh. brn. opq.		2·90	trace	·570	·0014	·0049	·0501	·0548	19·7°	9·1°	43·80	mineral matter	M. A. Adams.
Public Conduit	,, 9	grn. blue		2·10	trace	·380	none	·0028	·0031	·0039	19·5°	7·7°	36·70	none	M. A. Adams.
Manchester....	,, 21	v. s. turb. f. yell.	none	·62	none	none	·0038	·0055	·0111	·1112	2·1°	2·0°	4·91	s. mineral	W. Thomson.
Newark	,, 17	c. grnsh. blue	none	1·30	trace	·052	·0024	·0043	·0154	·0406	17·2°	14·0°	37·15	diatoms	A. Ashby.
Newcastle-on-Tyne.....	,, 8	f. yellow	none	·85	trace	·036	·0010	·0080	·0570	·1020	16·0°	5·7°	21·00	satisfactory	J. Pattinson.
Norwich	,, 10	p. grnsh. yellow	none	2·00	trace	·058	traces	·0044	·0340	·0620	15·0°	4·0°	20·00	satisfactory	W. G. Crook.
Nottingham ..	,, 14	c. grnsh. blue	decided	1·91	none	1·400	·0012	·0066	·0040	·0040	11·5°	5·5°	27·80	mycelium, veg. debris	Wigner & Harland
Portsmouth ..	,, 12	v. s. turbid	none	1·12	trace	·240	trace	·0021	none	none	17·0°	2·0°	18·20	vegetable debris	W. J. Sykes.
Reading	,, 1	f. grnsh. yellow	none	1·10	trace	·145	·0014	·0081	·020	·056	15·1°	4·0°	19·85	amorphous	J. Shea.
Rochdale	,, 18	pale blue	none	·68	none	·010	·0030	·0028	·0002	·0070	2·8°	2·5°	3·80	satisfactory	T. A. Collinge.
Rugby	,, 13	f. turbid		1·26	h. trace	·130	·006	·0196	·0280	·0532	11·0°	8·5°	16·80	wms.,hrs.,vg.db.,snd.,&c.	A. P. Smith.
Salford	,, 1	v. cloudy yellow	none	·70	none		·0028	·0070	·0440	·1340	3·0°	2·5°	10·00	oxide of iron	J. Carter Bell.
Shrewsbury ..	,, 10	c. colourless	none	1·45	trace	·260	none	·0040	·0080	·0080	21·5°	7·5°	24·60	none	T. P. Blunt.
Southampton..	,, 21	c. p. yellow	none	1·26	h. trace	·493	·0030	·0056			15·0°	5·0°	23·00	vegetable debris	A. Angell.
Swansea.....	,, 16	s. turbid	none	·90	trace	none	·0010	·0063	·0030	·0040	1·6°	1·6°	4·40	none	W. Morgan.
Whitehaven ..	,, 8	c. f. green	none	·39	none	·004	none	·0008	·0083	·0173	·4°	·4°	1·90	satisfactory	A. Kitchin.
Wolverhampton	,, 15	brownish	none	1·33	trace	·126	·0007	·0063	·0224	·0560	13·1°	6·7°	22·40	earthy and few diatoms	E. W. T. Jones.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

* When River was flooded.

THE PUBLIC WATER SUPPLIES OF ENGLAND.

VALUATION, ACCORDING TO "WIGNER'S VALUATION SCALE," OF THE ANALYSES PUBLISHED THIS MONTH.

In the following table we give the *average* valuation of those public water supplies reported on this month from January to June, and the valuation of the July, August, September, October, November, and December waters.

	Average to June.	July.	August.	Sept.	October.	Nov.	Dec.
King's Lynn	94	110	48	110	84	128	111
Leamington	26	..	26	..	24	..	24
Leeds	35	28	22	..	..	27	..
Leicester	42	24	26	23	25	31	31
Liverpool	36	29	41	47	37	31	36
Maidstone—							
Water Company	39	34	30	31	38	35	55
" Public Conduit	36	28	25	27	31	27	26
Manchester	22	17	29	28	49	27	27
Newark	39	46	41	..	33	34	37
Newcastle-on-Tyne	37	40	43	68	57	55	39
Norwich	36	49	36	33	34	38	34
Nottingham	39	46	38	42	62	55	58
Plymouth	29	..	..	28	..	..	..
Portsmouth	30	22	26	27	24	29	25
Reading	25	20	34	23	25	18	38
Rochdale	9	7	9	..	5	12	7
Rugby	41	..	..	46	69	55	48
Salford	18	14	21	21	15	14	44
Sevenoaks	20	..	..	..	..	20	..
Shrewsbury	23	..	17	19	21	25	25
Southampton	43	..	40	40	40	37	45
Sunderland	25	27	..	..	..	..	..
Swansea	16	14	19	15	12	12	15
Tunbridge Wells	..	..	..	35	..	..	..
Warwick	34	34	..	40	..	40	25
Whitehaven	9	17	14	10	10	7	7
Wolverhampton	46	39	32	15	33	41	38
LONDON—							
Kent	30	27	20	27	29	26	29
New River	26	17	17	21	24	25	34
East London	32	39	20	28	35	46	37
Southwark and Vauxhall	34	28	31	27	30	43	53
West Middlesex	30	24	29	39	33	43	50
Grand Junction	30	23	25	30	31	36	39
Lambeth	37	29	31	26	33	37	50
Chelsea	30	26	32	36	37	43	51
Bath	12	19	20	..	13	16	..
Birmingham	33	37	26	29	36	47	29
Bolton	..	17	19	17	28	29	26
Bradford	53	53	59	44	36	31	39
Brighton	24	23	25	21	22	25	28
Bristol	22	27	..	30	29	24	23
Bury	..	35	24	24	30	33	31
Cambridge	28	26	22	21	22	22	25
Canterbury	17	22	16	12	15	13	14
Croydon	27	30	..	..	22	21	21
Darlington	33	39	96	50	74	62	46
Derby	18	13	..	..	..	..	..
Dublin	23	..	13	..	..	..	15
Edinburgh	28	21	20	24	31	28	19
Exeter	20	16	23	23	18	23	22
Grantham	27	..	32	..	70	30	30
Hastings	..	20	25	..	27	25	34
Huddersfield	23	26	28	..	..	..	..
Ipswich	27	30	30	..	28	25	28

Owing to considerations of space we have omitted from this table those places as to which we have published no analyses during the past five months.

In the case of the Metropolitan waters, the average valuation of the supplies for December show an increase of nearly 6 over the valuation for November, but the increase is mainly in the supplies of the companies drawing from the rivers Thames and Lea. The Kent water shows an increase of 8 in value, the New River water an increase

in the valuation of only one, while the other companies have increases ranging from 3 in Grand Junction to 1 in Lambeth.

Among the provincial supplies reported on this month the most pure are Rochdale and Whitehaven with a valuation of 7 each, Canterbury 14, Dublin and Swansea 15 each, and Edinburgh 19. In these there is scarcely any notable change from last month, with the exception of Edinburgh which shows a marked improvement.

Following these best waters we have Croydon with a valuation of 21 Exeter 22, Bristol 23, Leamington 24, Cambridge, Portsmouth, and Shrewsbury 25 each, Bolton and Maidstone Public Conduit 26 each, Manchester 27, Brighton and Ipswich 28 each, Birmingham 29, and Grantham 30. In these figures the only change of note is the remarkable improvement in the Birmingham supply.

The valuations of Bury, Darlington, King's Lynn, Newcastle, Norwich, Rugby, and Wolverhampton show an improvement over the valuations of last month, while, on the other hand, the waters of Bradford, Hastings, Leicester, Liverpool, Maidstone Company, Newark, Nottingham, Reading, Salford, and Southampton give less satisfactory indications, the Maidstone and Salford waters showing much higher valuations than previously owing to the turbidity of the samples.

ANALYSTS' REPORTS.

Dr. Cameron, Public Analyst for Dublin, in his report for November last, states that he examined during the month 34 samples, comprising 28 milks, five of which were adulterated with from 12 to 100 per cent. of added water, one coffee, one mustard, and four pepper.

Dr. J. F. Hodges, Analyst for Belfast, in his last quarterly return, states that he has submitted to analysis 41 articles of food and drink, viz:—nine samples of buttermilk, 18 of sweetmilk, one of coffee and chicory, one of spirits, eight of black pepper, and four of mustard. Of these seven samples of buttermilk were found adulterated by large additions of water; two samples of sweetmilk were diluted with water. The mixture of coffee and chicory contained only about ten per cent. of coffee. The spirits had been diluted below the legal strength; and seven of the samples of pepper were rendered impure by the presence of earthy matters.

LAW REPORT.

Magistrate not to decide as to the fact of Adulteration.—Decision on Appeal:—

With reference to the important case briefly noticed at page 155 of our last vol., in which a magistrate had decided that it was for him and not for the analyst to decide as to the fact of adulteration, it may be of interest to our readers if we give the judgments of Justices Lindley and Mathew reversing the magistrate's decision, for which we are indebted to Mr. Farnfield.

Shortly stated the case was this—Henry Richards had been summoned by W. T. Harrison, an Inspector for the Poplar Board of Works, for selling adulterated milk. The certificate of the analyst, Mr. W. C. Young, gave the usual figures, and stated, "I am of opinion the same is a sample of milk adulterated with 20 per cent. of water." The magistrate (Mr. Lushington) considered that he and not the Public Analyst was the ultimate judge of the matter in issue, whether the defendant had sold to the inspector milk adulterated with water. He took it to be matter of notoriety and common observance that the milk of different cows, and of the same cows under different circumstances, varied considerably in richness and in the proportion of its several constituents; he compared the results certified by Mr. Young with some obtained by Dr. Voelcker, and came to the conclusion that it was fully possible that the defendant's milk was in fact a sample of very poor but genuine milk, from which some of its original richness had been abstracted in the process of gradually ladling out for sale, without any fraudulent adulteration with water, and the magistrate declined to convict the defendant. He was of opinion that he had satisfied the statute (Sale of Food Act, ss. 21, 22) by receiving the analyst's certificate as sufficient evidence of the constituents of the milk, and that he was left free by the statute to question and examine for himself the correctness of the certificate, so far as regarded the analyst's conclusion that the milk had been adulterated.

The magistrate gave a special case, which was argued by counsel for the Poplar Board of Works, before the Queen's Bench Division, and the following are the judgments delivered:—

Mr. Justice Lindley: Nobody appearing on the other side I think we have seen enough to say that the magistrate has put too narrow a construction upon s. 21, which runs thus, "At the hearing of the information in such proceeding the production of the certificate of the analyst shall be sufficient evidence of the facts therein stated, unless the defendant shall require that the analyst shall be called as a witness, and the part of the article retained by the person who purchased the article shall be produced, and the defendant may, if he thinks fit, tender himself and his wife to be examined on his behalf." The form of the certificate throws some light upon the proper construction of the expression "evidence of the facts therein stated." The facts to be stated in the certificate are to be the result of an analysis, and the form is, "I have analysed the same and declare the result of my analysis to be as follows":—that is one set of facts; then comes an expression which is another fact, and it runs thus: "I am of opinion that

the said sample contained the parts as under, or the percentages of foreign ingredients as under." What the analyst here has done is this—he has analyzed this milk, and he sets out the result of the analysis in the certificate, and then he gives in the note his opinion, and his opinion is that the sample of milk is adulterated with 20 per cent. of water. That is *prima facie* evidence; of course, it is not conclusive, but it is *prima facie* evidence, which, in this case, the person charged did not attempt to dispute. It is to be taken for what it is worth, and the Act of Parliament presumes what it is worth. It says that it is to be *prima facie* evidence. Therefore, I think it was not right on the part of the magistrate here to take the course he did, because what he did was to disregard the only evidence there was in the case. There was no other evidence at all, but he has not given effect to it.

Mr. Justice Mathew: I am entirely of the same opinion.

Mr. R. Brown: Then the case is remitted to the magistrate for conviction?

Mr. Justice Lindley: Not for conviction. The case is remitted back, then that will give the magistrate an opportunity of explaining it. I think the question is whether he was right. We will answer the question by saying that in our opinion his determination was erroneous in point of law, and then the case is remitted to him for his determination.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No. 1881	Name of Patentee.	Title of Patent.	Price.
1639	J. Deucker	Production of Nitro Benzole	2d.
1653	J. H. Johnson	Electric Lamps	8d.
1658	H. E. Newton	Manufacturing Sugar	6d.
1685	A. M. Clark	Electric Lamps or Regulators	8d.
1704	G. Atkinson	Refining Camphor	6d.
1720	A. M. Clark	Treating Dolomite and Magnesian Limestones	4d.
1721	Ditto	Manufacture of Carbonates of Soda and Potash	2d.
1731	A. A. Ceoll	Manufacture of Sulphate of Alumina	4d.
1767	F. A. Zimmermann	Manufacture of Dyes	6d.
1768	Ditto	Production of Magnesia and Sulphate of Calcium	2d.
1786	F. Wirth	Production of Solid Fat Acids from Oils or Oleic Acid	4d.
1802	P. Jensen	Electric Lights	10d.
1820	S. Pitt	Preparation of Magnesia for separation of Ammonia from Excrementitious Matter	4d.
1844	H. E. Newton	Apparatus for Filtering Chemical Solutions and Drying the Precipitates	6d.
1893	C. D. Abel	Rendering available for Manufactures Sulphuric and Sulphurous Acid contained in Furnace Gases	4d.
1896	S. Cliff	Separating the Lime and Magnesia in Dolomite	2d.
1909	H. Wedekind	Production of Magnesia	2d.
1922	J. B. Rogers	Electric Lamp	6d.
1942	J. Brockie	Electric Arc Lamps	6d.
1943	E. G. Brewer	Electric Lighting	4d.
1957	W. Weldon	Manufacture of Sulphuric Acid	4d.
1974	H. N. Lay and H. Bulford	Condensing Fumes from Roasting Arsenical and Sulphurous Pyrites	6d.
2004	H. Collet	Treatment of Sewage for producing solid matter therefrom	6d.
2017	E. Solvay	Manufacture of Soda	2d.
2113	Ditto	Ditto	4d.
2019	W. R. Lake	Manufacture of Sugar	2d.
2035	W. P. Thompson	Treating Iridium	4d.
2079	C. H. Gimingham	Electric Lamps	2d.
2080	A. M. Clark	Apparatus for Making Oxygen and Hydrogen	1s. 2d.
2091	J. Keith	Manufacture of Gas	6d.
2136	J. A. Dixon	Manufacture of Artificial Alizarine	4d.
2198	C. D. Abel	Electric Lamps	6d.
2213	E. S. Samuel	Production of Hydrogen Gas and Manufacture of Ammonia	2d.
2314	G. M. Allender	Preservation of Butter	2d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Oil and Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record; Oil and Drug Journal; The Canada Lancet; **A Manual of Sugar Analysis, by J. H. Tucker, Ph.D., D. Van Nostrand, New York.**

THE ANALYST.

FEBRUARY, 1882.

SOCIETY OF PUBLIC ANALYSTS.

THE ANNUAL MEETING of this Society was held on the 18th January, the President, Mr. Heisch, in the chair.

The minutes of the previous meeting were read and confirmed.

The President delivered his Annual Address as follows :—

GENTLEMEN,—It is now my duty in conformity with annual custom to make a few remarks to you in resigning into your hands the office of President, to which you did me the honour of calling me last year.

Firstly, as regards the state of our Society, I am glad to be able to congratulate you on our growing prosperity, both numerical and financial.

During the past year we have lost but one member by death, and, though the circumstances attending his decease are more than usually painful, still, considering our numbers, it is a matter of congratulation that it is the only death we have to record.

Four members have been removed from the roll of the Society for non-payment of fees, making a total of five lost to the Society.

On the other side 22 new members, if we include the one ballotted for to-night, have been added, our total number of Members being 116, and of Associates, 18—134 in all.

Our balance at the bank is £22 14s. 3d., being £6 7s. 8d. more than this day last year, though the expenses for printing, stationery, &c., have (owing to the carrying out of the scheme for water analyses) been exceptionally heavy, and two more meetings have been held than in any previous year, viz., eight in London and one in the country.

Much good work has been done by members of the society, as is evidenced by the fact that, at the meetings referred to 25 papers have been read, while six—which want of time prevented our reading, have been published in THE ANALYST.

We have also this year in our capacity as a Society laid before the public what I think may be called the first set of strictly comparable analyses of the public water supplies of the country. This has only been effected by all the members who took part in the analyses to some extent sinking their individual opinions and working loyally on the lines laid down by the majority to secure that which all must consider of the utmost importance—uniformity of results. The first and second editions of the instructions for these water analyses were quickly exhausted, and an enlarged edition has, after revision by the Water Committee, been published in THE ANALYST.

In addition to the monthly tables of the analyses of the Public Water Supplies, a description of all the sources of supply has also been published, all which has entailed on

our secretaries an amount of extra work which few would have been found to undertake. We are also indebted to one of the secretaries, Mr. Wigner, for the admirable digest of the work done by Public Analysts in 1880, which is a very valuable piece of statistics.

Before concluding, I should like to say a few words on the relations of Public Analysts to another body—which some have called the Court of Appeal, as I think there is a wide-spread misunderstanding, not only in the minds of Public Analysts but in those of vestry clerks and magistrates, on this subject. Most magistrates act as if the certificates of the Somerset House officials were not only evidence, but final evidence. Now those of us who followed the stages of the Sale of Food and Drugs Act, will all remember that when Sir H. Peek proposed to insert after Somerset House the words, "whose decision shall be final," Mr. Sclater-Booth, who had charge of the bill, refused to insert them, and when the matter was pressed to a division they were rejected by a large majority. Not only this, but Mr. Booth declared in his place in Parliament, that he did not intend the Somerset House decision to be final, bnt that the analysts should both be subject to examination on oath in case they differed, and should each have the opportunity of justifying their decisions if they could. It has been regretted that red tape has prevented our knowing the limits, &c., adopted by the Somerset House chemists. If Public Analysts whose certificates have been called in question had been properly represented by the legal officers of their boards, and the Somerset House chemists had been put into the box and examined on oath, no number of yards of red tape would have prevented our knowing by this time both their limits and their processes. Mr. Hehner brought a case before you recently, in which, by taking it for granted that some certain specific loss occurred in milk solids by keeping, the Somerset House chemists reversed his decision. As far as appears on the face of his case, they did not doubt his conclusions, but his analysis. Now I take it that, if these gentlemen had been asked on oath "Are you prepared on the faith of an analysis made when the milk is sour to say that the analysis made when it is fresh is wrong?" it would have required more ignorance than I give the Somerset House chemists credit for to answer, Yes. All Public Analysts are obliged by the form of their certificates to state if any change has taken place in a sample to interfere with the analysis. Why are the Somerset House chemists to be free from this obligation? and why are they alone permitted to make "the addition for natural loss arising from the decomposition of the milk through keeping." If a Public Analyst gave such a certificate we know pretty well what would be the result.

Another case, which is reported in the *Daily Telegraph* of Dec. 3rd, brings out a different point. The Analyst certified that a sample of milk contained 12 per cent. of added water. On appeal, the Somerset House chemists certified "that the solids not fat were not lower than they had found in pure milk of low quality, and they therefore could not say that water had been added." Unfortunately, no figures are given in the report. Mr. Paget, before whom the case was tried, and who has before expressed the opinion that "it is all guess work," dismissed the summons with costs, and we have the affair put in the paper with the heading "Conflicting Analyses." Had the Somerset House chemist been examined we should have known the meaning (if any) of "pure milk of low quality," and whether the gentleman in question saw the cows, from which it was derived, milked, or knew anything of their condition or feeding? Gentlemen, I have thought it right to make

these remarks, because I think it time that we, as a Society, should take means to call the attention of Public Analysts, vestry clerks, and even magistrates, to the fact that Somerset House certificates, even if evidence at all, are not final, and that we have a right to call the givers of these certificates to justify them on oath. In conclusion, let me thank you all for the kindness with which during my year of office you have one and all treated me, and the forbearance you have shown to my numerous shortcomings.

The ballot for the Officers and Council for the current year was then taken.

Mr. Angell and Mr. Hobbs were appointed Scrutineers to examine the ballot papers, and reported that the following had been elected:—

President.

C. Heisch, F.C.S., F.I.C.

Vice-Presidents.

J. Muter, Ph.D., M.A., F.C.S., F.I.C.
M. A. Adams, F.R.C.S., F.C.S.
C. A. Cameron, M.D., F.R.C.S., F.I.C.

Treasurer.

C. W. Heaton, F.C.S., F.I.C.

Hon. Secretaries.

G. W. Wigner, F.C.S., F.I.C.
F. Maxwell Lyte, F.C.S., F.I.C.

Other Members of Council.

A. Wynter Blyth, M.R.C.S., F.C.S.
Bernard Dyer, F.C.S., F.I.C.
Otto Hehner, F.C.S., F.I.C.
A. Bostock Hill, M.D., F.C.S., F.I.C.
T. Jamieson, F.C.S., F.I.C.
G. Jarmain, F.C.S., F.I.C.

The names of those Members of Council whose term of office has not yet expired, and who, consequently, do not retire this year, are—

A. H. Allen, F.C.S., F.I.C.
H. C. Bartlett, Ph.D., F.C.S.
A. Dupré, Ph.D., F.R.S., F.C.S., F.I.C.
J. West Knights, F.C.S., F.I.C.
J. W. Tripe, M.D.

The Scrutineers also reported that the following gentleman had been duly elected a member, viz., Mr. Hugh McCullum, Government Analyst, Hong Kong.

Mr. Adams proposed, and Mr. Wynter Blyth seconded, a vote of thanks to Mr. Heisch, for his conduct in the chair during the past year.

Mr. Heisch proposed, and Mr. Heaton seconded, a vote of thanks to the Chemical Society for the use of their rooms during the past year.

Mr. Angell moved, and Mr. Hobbs seconded, a vote of thanks to the Members of the Council for their services during the past year.

Mr. West Knights moved, and Dr. Stevenson seconded, a vote of thanks to the Water Committee.

Dr. Muter moved, and Mr. Hehner seconded, a vote of thanks to the Secretaries.

Dr. Dupré moved, and Mr. Dyer seconded, a vote of thanks to the Treasurer, which Mr. Heaton suitably acknowledged.

The Treasurer presented his accounts, audited for the past year.

Mr. W. G. Crook, Public Analyst for Norwich, was proposed as a member.

The following papers were read:—"A New Method of Testing for Alum, with Experimental Illustrations," by A. Wynter Blyth, M.R.C.S., &c.

"The Manufacture of Chloride of Sulphur," by J. Carter Bell, F.C.S., F.I.C.

After the meeting the Annual Dinner was held at the Criterion, Piccadilly, where a pleasant evening was spent by the members and their friends.

The next meeting will be held at Burlington House, on Wednesday, Feb. 15th, at 8 o'clock, when the discussion on the Water Valuation Scale, which was adjourned at the June meeting, will be resumed, and the following paper will be read: "Some Analyses of Milk which have fallen below the Society's Limit," by W. Johnstone, F.C.S.

IMPROVED PROCESSES FOR THE DETECTION OF ALUM IN FLOUR AND BREAD.

By A. Wynter Blyth, M.R.C.S., &c.

Read before the Society of Public Analysts on the 18th January, 1882.

Detection of Alum.—Neither the mere detection of alum in flour, nor as for that its estimation, presents any difficulty, for we have by the chloroform process a method of separating nearly all the alum added as alum; therefore the remarks I am about to make apply chiefly to bread, although flour was used in many of the experiments as more convenient. The logwood test, as usually applied to bread or flour, I have found wanting both in delicacy and sharpness, and this is especially the case when only small quantities of alum are present. Whether the coloured bread is dried or undried, it often happens that of two equally good observers the one calls a sample, thus coloured, dirtyish pink, the other bluish pink. Knowing the power that gelatine undoubtedly possesses of uniting with alum, I have attempted to utilise this property. A preliminary experiment was made with gelatine and pure solutions of alum. A few slips of gelatine were digested in a solution of alum of 1·10 per cent. strength for 12 hours, and the strength of the solution then ascertained. Alum withdrawn by the gelatine amounted to 15·8 per cent. A second experiment was made with a stronger solution 2·0 per cent. In 15 hours the amount of alum which had been withdrawn by the gelatine amounted to 16·9 per cent. It therefore may be anticipated that gelatine will withdraw, and as it were concentrate a considerable percentage of alum from a solution.

The next experiments were made in the staining of gelatine slips by means of ammoniacal solution of logwood, that is fresh tincture of logwood, to which an equal bulk of 10 per cent. solution of carbonate of ammonia had been added. Gelatine soaked in distilled water, in pure cold aqueous extract of flour, or aqueous extract of pure bread, becomes of a reddish brown colour without a trace of blue (see lithograph No. 1).* Such a slip put into glycerine decolourizes in a few hours, and then has a dirty yellow hue. Gelatine soaked in alum solutions, in watery extracts of alumed bread or flour, becomes of a blue tint, the shades varying from lavender blue up to cobalt (see lithograph No. 2, gelatine dyed with logwood, alum, 1:10,000; No. 3, 1:7,000; No. 4, 1:1,000). More than this, the slips put into glycerine can be kept without changing colour; how long the colour thus remains I do not know, but I have some gelatine slips which

* The plate comprising coloured lithograph is omitted from this reprint.

are more than a month old, and they still retain their primitive freshness. The blue tint is very distinctly seen in solutions containing one part of alum in 10,000 parts of solution, and is still demonstrable in one part in 50,000, especially if the slip is placed in glycerine and its behaviour noted. It therefore will detect one part of alum in one million parts of a solution, for such a dilute solution may be concentrated down to a smaller bulk. The application of the test is so simple that it scarcely needs description. Any convenient quantity of the bread is crumbled, put into a suitable glass vessel, and one or two little slips of dry commercial gelatine, proved to be pure by a blank experiment with distilled water, are placed with the bread, sufficient distilled water is added to well cover the mixture, and the whole is left over night. In the morning the bits of swollen gelatine are taken out and dyed with the alkaline logwood in the usual way. From some experiments it would appear that four minutes immersion is the best time, for where the proportion of alum is very minute the alumed layer appears to be only on the surface, and the dye with longer periods sinking towards the unalumed core, colours the centre reddish pink, and this pink centre, shining through the blue cortex, confuses the colour. But this statement must not be considered final, for there may possibly be some difference as to the kind of alum, whether ammonia, or potash, and also as to the strength of the logwood tincture, which future experiments will determine. Having thus obtained a method of concentrating the alum on a little strip of an almost colourless jelly, a jelly that could be coloured with the greatest ease by almost every dye, it was only natural to go farther, and to see if the alumed jellies behaved differently to the unalumed jellies. Accordingly trials were made, very generally with the aniline colours; this quite in an empirical way, for there was no theoretical likelihood of success, and as a fact, but little difference was observed.

Attention was next turned to such tinctorial agents as madder, turmeric, litmus, brazil wood, chrysophanic acid, gamboge, garancine, and many others. Of these, madder, Brazil wood, garancine, and chrysophanic acid, when the solution was made ammoniacal, all tinted the gelatine a most decidedly different hue when pure than when alumed; but the logwood was chief, both in delicacy of reaction and depth of colour, so that so far as we have gone there is nothing to equal logwood as an alum test. As for magnesia giving the same colour, it is only the soluble salts of magnesia which do this. The magnesian phosphate in bread certainly does not colour logwood, and the process to be given farther on effectually distinguishes magnesia from alum.

Excessively small quantities of alum may be detected by obtaining the phosphate of alumina in the manner to be shortly described; fusing it with sulphate of soda on a platinum dish by the blowpipe, lixivating the phosphate of soda produced, dissolving the residue with a very little dilute sulphuric acid, neutralising with ammonia. Then in this liquid, which need not be more than a cubic centimetre, steep a small bit of gelatine, and when the gelatine is sufficiently swollen and softened, it is coloured with logwood as before, and will show the reaction.

Can Alum be Extracted Out of Bread or Flour by Water?—It has been generally asserted that when alum is added in powder or solution to flour, and that flour is kneaded up with water or made into bread, the alum ceases to exist as alum, but forms phosphate

of alumina. That phosphate of alumina is the form in which alum appears in the ash, I freely admit; that phosphate of alumina is formed save in minute quantity in the bread itself I by no means admit, and consider it quite an open question. Take an aqueous extract of flour, filter it by the aid of a pressure pump, and add a little solution of alum, there is no precipitate; add a little phosphate of soda or potash, and a cloud is immediately perceived. Although phosphate of potash is found in the ash obtained by evaporating down to dryness, and incinerating the aqueous extract, the behaviour with solution of alum would render one doubtful of the existence of an alkaline phosphate in the watery extract were there not a simple explanation. The simple explanation is this, that phosphate of alumina is not fully thrown down from its solutions by an alkaline phosphate, except by an excess of that phosphate, so that it all depends as to the quantity of alum added, whether it is likely all to be in the state of phosphate or not. Again, if the alum is all converted into phosphate of alumina, it could hardly be washed out of bread or flour by water; but I have made some experiments which show that, by using relatively enormous masses of water, no inconsiderable quantity of alum is thus separated. But were such experiments needful?—the whole gelatine process is an ample proof of the possibility of extracting the alum from flour or bread by water, it cannot be considered possible for the gelatine to have attracted and united with such an insoluble substance as phosphate of alumina—it must be united to a soluble salt of alumina, in short, to alum itself.

EXPERIMENT.—20 parts of alum, 3,500 parts of flour, and 28,000 parts of water were mixed together, and the whole set aside for 72 hours. The flour as usual settled to the bottom, leaving a clear supernatant fluid. A fractional portion of this clear fluid was decanted, a little sodic phosphate added, and the liquid boiled slowly down to dryness in a platinum dish incinerated and the phosphate of alumina separated and determined in the way familiar to all chemists. The amount of alumina phosphate calculated on the whole as alum was 2·55 parts or 12·7 per cent. of the alum originally added. Hence in this experiment in which the proportion of water to alum was as 1,400 is to 1, over 12 per cent. of the original alum was recovered.

EXPERIMENT.—Three loaves, A, B and C, were made with a flour which was proved to be pure. Definite quantities of alum were added to two of the loaves, the third was made of the pure flour. A, 5 parts alum, 8,438 parts of flour; B, 5 parts alum, 3,503 parts of flour; C, flour 7,545 parts. In the A loaf the alum was added to the flour in powder and mixed dry with the flour. In B loaf the alum was added in solution. The loaves were fermented and baked in the usual way. Then the three loaves were cut into small pieces and soaked in three separate jars, each jar containing 49,000 parts of distilled water. After three and a half days' soaking the liquid was separated by filtration, and the residue on the filter weighed, and the necessary calculations made, so that the amount of water still adhering to the bread was known, and could be allowed for. The three filtrates were respectively evaporated to dryness after the addition of a little sodic phosphate, and the three extracts dried and incinerated, and the three ashes treated in the usual manner so as to obtain as a final result, any alumina phosphate, if present. The alumina phosphate calculated on the whole as alum separated was as follows: A yielded 1·493 parts of alum, B yielded 1·454 parts of alum, C yielded no trace. In this case then in which the water was 9,800 times the alum, the amount recovered by simple extraction with cold water was about 29 per cent.

Quantitative Estimation of Alum.—If then by using large bulks of water it was possible to extract a portion of the alum, it was thought highly probable that by using a more powerful solvent and especially one in which any aluminic phosphate would be dissolved, most, if not all of the alum would be dissolved. It was also a question whether by this means there could not be devised a method to distinguish between alumina added as alum and alumina present as silicate of alumina. Kaolins, composed of silicates of alumina with other silicates, were taken and digested in 5 per cent. hydrochloric acid in the cold, but no alumina was found in the solution. Even a 35 per cent. hydrochloric acid, acting for 24 hours in the cold, failed to decompose the silicate of alumina. On the other hand, London clay was acted on by 5 per cent. hydrochloric acid, and parted with much iron and a minute quantity of phosphate of alumina. This is possibly derived not from a decomposition of a silicate but a mere solution of a pre-existing phosphate of alumina.

Experiments with Bread.—Five commercial loaves of bread from various sources, none of which gave any reaction with the logwood test, whether applied in the old or in the new way, were severally crumbled and digested with a large quantity of 5 per cent. hydrochloric acid. The acid liquid was poured off the bread, a little sodic phosphate added, and then the acid was neutralised with ammonia, and the liquids boiled down to dryness in a platinum dish, the extract incinerated, &c., &c., but none of the five yielded to the ordinary analytical methods the least trace of phosphate of alumina.

Experiment.—A sample of pure flour was taken and divided into three parts. The three flours were then mixed as follows: No. 1, alum 10, flour 1,750 parts; No. 2, alum 10, kaolin 10, flour 1,750 parts; No. 3, kaolin 10, magnesia 10, flour 1,750 parts. The flour thus prepared was made up into three loaves. The three loaves were finally each treated in the cold with 12,250 parts of 5 per cent. hydrochloric acid acting for 24 hours. Two thirds of the whole quantity was decanted off, one third remained with the bread. From No. 1, 95·8 per cent. of the alum added was recovered as phosphate of alumina. From No. 2, 99·0 per cent., that is of course calculated on the whole. The difference between the two determinations was considered to be due to loss, considerable spluttering occurring towards the end of the operation. No. 3, though containing silicate of alumina added in the form of kaolin yielded no alumina phosphate. Other experiments have been made and are still proceeding, and so far they tend to substantiate the hydrochloric process as superior to the old burning up methods in which a correction has to be made for the silica. Although, thanks to the researches of Dr. Dupré, followed by those of Mr. Carter Bell, the proportion of silica to alumina must be considered as well established as the nature of the thing permits, yet this correction no one can call perfectly satisfactory.

It may be expected that I should mention a recent case in which a difference of opinion between myself and the Somerset House laboratory appears to have arisen. A sample of bread which gave both by the old fashioned method of applying logwood a pronounced blue, and also by the gelatine method an almost cobalt blue, and finally from which sufficient alum was extracted by water, out of 250 grains, to colour blue the gelatine slip No. 5, and in which I found after allowing 12 grains of alum for 12 grains of silica (for I had not worked at that time sufficiently the hydrochloric acid process), I returned as containing nearly 19 grains of alum to the 4 lb. loaf. Now

19 grains is not much, but it is most decidedly a quantity that, having done so much work in the subject, I was not likely to make a mistake as to *the presence* of alum. However, the Somerset House chemists could find no alum in their sample, and gave a laconic certificate, "free from alum." Although I may have my own ideas on the subject I cannot swear that their sample contained alum, for there is always the possibility of unequal admixture. But what I can legitimately criticise is, the form of their certificate. There are similar referees in both France and Germany, yet in all cases the referees draw up a report stating in full all operations and experiments they have performed, and the reasons for their conclusions. It would be considered most discourteous and unprofessional in those countries, to give simply an opinion without details. If the Somerset House chemists are to take advantage of the accident of official position as referees, and to act in this way, it will be absolutely essential for the Public Analysts to take united action in a representation to the Government and press for some very decided modification of the present Sale of Food and Drugs Act.

Returning from this digression, which is scarcely germane, I must in conclusion point out clearly that I by no means pretend to have settled the hydrochloric acid process. This paper is only a preliminary note. I do not advise any one to rely upon the process until many more determinations have been made; and one of the main objects of publishing the process so early is in the hope that some of my *confrères* will take it up and for the next few months analyse all breads both by the old and the new methods and publish the results. I have to thank my assistant, Mr. Grinwood, for his very valuable and active co-operation in performing the experiments on which this paper is based.

ON THE MANUFACTURE OF CHLORIDE OF SULPHUR.

By J. Carter Bell.

Read before the Society of Public Analysts on 18th January, 1882.

This substance is now largely used in manufacturing what is called "indiarubber substitute," and though there is a considerable demand for this article and it is sold by the hundredweight, yet any one consulting the chief works upon chemistry, or the price list of some of our largest dealers in chemicals, would come to the conclusion that chloride of sulphur could only be made in small quantities, and was thus a very expensive chemical to be used on the large scale, for in one list I see the price is nine shillings a pound, and in another list it is six shillings; with large orders at the prices named, a manufacturer would soon become a millionaire, for the cost of the manufactured article is about threepence a pound.

A friend of mine requiring about half a ton of chloride of sulphur, applied to me for assistance. I consulted all the best works, and they one and all gave the same process, that of passing chlorine over melted sulphur in a retort; this is very well if only a small quantity of chloride of sulphur is required; if it has to be made by the hundredweight this process is impracticable. I therefore had to devise some method which would not require so much care and attention as the above.

For simplicity, I will divide the "modus operandi" into three parts:—the generation of the chlorine; drying the gas; passing the chlorine into flowers of sulphur.

Generation of the chlorine: I used a fifteen gallon clay vessel, which was made by the

potter specially for this purpose; it had only one aperture, which was two inches in diameter. In having another vessel made, I should prefer to have two holes three inches in diameter, exactly like a two-necked Woulff's bottle; the vessels which are kept in stock have holes four and five inches in diameter, and also have an outlet at the bottom, these holes are inconveniently large, and as the generator is in a water bath, there is a risk of the contents of the jar finding its way into the water. The generator was put into an ordinary iron kitchen boiler, water was put in, and heated by a small fire. Into the generator was put twenty-eight pounds of manganese ore in pieces of the size of a small nut, containing from 70 to 80 per cent. of binoxide of manganese. A carboy of commercial hydrochloric acid was poured in, and the two-inch aperture closed with an indiarubber bung containing a piece of glass combustion tube bent at about an angle of 120°.

Drying the chlorine gas: A Woulff's three-necked bottle, gallon size, may be used. The tubes, if possible, should be ground into the apertures; in default of this, glass combustion tubing and indiarubber tubing slipped over the necks may be used. The sulphuric acid bottle is not absolutely necessary; when it is used, the chloride of calcium will last a much longer period without renewing. The bottle must have a safety tube. The sulphuric acid bottle is connected with a stone aspirator about five gallons in size. An indiarubber cork carrying a piece of tubing is put into the inlet at the bottom of the aspirator; the piece of tubing should be pushed through the cork into the vessel a distance of two or three inches. The aspirator must now be carefully filled with chloride of calcium in pieces about the size of small nuts, no powder must be put in; an indiarubber cork carrying a tube must now be put in at the top aperture, which tube is connected with the vessel containing the sulphur.

Passing chlorine into sulphur: The vessels I used were wide-mouthed, blue glass gallon bottles, these were fitted with good ordinary corks; indiarubber must not be used, for the chloride of sulphur acts rapidly upon such corks, making them in a short time unfit for use. It would be better to use Woulff's bottles with ground glass tubes. The bottles are now filled with dry flowers of sulphur, taking care in the filling that room is left for the gas delivery tube. When the bottle is full a hole should be made to the bottom of the bottle by means of a wooden rod about $\frac{3}{4}$ of an inch diameter; if this is neglected and the delivery tube is pushed down through the sulphur, the tube becomes so filled with hardened sulphur that the gas has not a free passage. Two of these gallon bottles are connected together, the outlet tube of number two may be connected with an absorbing apparatus for waste gases.

The apparatus being all connected and gas tight, the water in the boiler may be raised to boiling heat, chlorine is abundantly given off, and after passing through the acid and chloride of calcium, soon begins to act upon the sulphur, which becomes very hot, and abundance of chloride of sulphur is formed, which will be seen in the bottle as a dark coloured liquid with undissolved sulphur at the bottom. When the liquor has reached a strength of 136° Twaddle, a new bottle of sulphur may be put in the place of number one; when chlorine ceases to be evolved, the spent acid may be siphoned off, and a new charge of manganese and acid introduced.

Such an apparatus, like the one described, could be fitted up for less than five pounds, and will make at the very least one hundred pounds weight of chloride of sulphur weekly.

BEER ANALYSIS.

By J. N. Hurte.

The following analyses of our beers may be interesting to English analysts. These beers are sold here in immense quantities, with loud declarations as to their purity and general excellence.

	Milwaukee.	Lieber's.	Maus's.	Schmidt's.
Specific Gravity	1·0174	1·0229	1·018	1·0172
Extractive Matter	7·312%	5·988%	6·33%	5·816
Sugar	1·895	3·126	4·060	3·440
Dextrin	3·880	2·644	2·060	2·283
Albumen	·037	·016	·006	·014
Bitter matter	1·530	·202	·118	·074
Acidity as $HC_2H_3O_2$ ..	·159	·281	·309	·080
Alcohol	5·35	9·99	5·384	4·640

Indianapolis, Indiana, U.S.A., Dec. 5th, 1881.

THE ADULTERATION OF DRUGS IN AMERICA.*

By Frederick Stearns.

The Committee on Adulteration of Drugs offer the following as their report:—

Prior to writing the report the chairman sought, from members of the Association, by circular, whatever information upon the subject each member might have to offer. The order followed in arranging this report is, first, to give the new forms of adulteration noticed in those journals to which the writer has had access during the past year, together with the means, when given, for determining the same; second, recent legislation against adulterating food and medicines; third, suggestions, criticisms and comments bearing upon the subject.

Adulterations.

Glucose.—Eleven millions of bushels of corn will be used this year in the twenty glucose factories of the United States in producing this product, most of which is employed for adulterating cane sugar and cane syrup. This amount of grain is equivalent to over one thousand car-loads per day, and when it is to be considered that the principal temptation to its production is, so far, its fraudulent use as an adulterant for true cane sugar, not easily detected, enabling the producers to reap fabulous profits therefrom, the writer thinks that it is high time that State or National legislation should compel manufacturers and mixers of this left-handed, often impure, insipid sugar to brand it, whether pure, or mixed with cane sugar, by its right name and percentage, that buyers may get what they pay for. At the last meeting of the American Pharmaceutical Association, Mr. Allaire, of this committee, very properly reported against the use of glucose, in making medicinal syrups, as a substitute for cane sugar.

Japanese Star-Anise.—Mr. Kelly, of this committee, through the kindness of Stallman & Fulton, New York, reports (with accompanying specimen) upon this article, stating that there was an arrival in New York of about fifty cases, which were, it is believed, afterwards

*Read at the Seventh Annual Convention of the Western Wholesale Drug Association, New York.

exported to London. It was offered as low as ten cents per pound. An exhaustive article on this drug appears in *New Remedies*, July, 1881, pages 199 to 202 inclusive, which is appended to this report. A synopsis of the same may be stated as follows: The genuine star-anise is a product of Cochin-China, and Siam, while the false star-anise comes from Japan, both belonging to the genus *Illiscinni*, of the N. O. Magnoliaceæ. The botanical difference in the fruit of the two is so slight as to easily deceive upon superficial examination. In taste the genuine is sweet and anise-like, the odour faintly like anise. The taste of the false is disagreeable, and not sweet or anise-like, its odour different from anise, faintly resembling laurel, camphor and nutmeg. The genuine is somewhat larger than the false, its surface more cork-like, points short, horizontal, or slightly curved upwards, further separated carpels, less woody, shrunken and wrinkled; seeds mostly dark-brown, with rounded point. Surface of the false fruit more shining and red brown; points thin, often strongly curved upwards; carpels more woody, greatly shrunken and wrinkled; seeds mostly yellowish-brown, with strong raphe and elevated point. This false star-anise is considered highly poisonous in its native habitat, and analyses by the sanitary authorities of Japan have isolated a crystalline principal as powerfully poisonous. Whether the genuine star-anise contains an identical poison in smaller proportion remains yet to be determined. Your reporter thinks it not at all improbable, for reason of the profound physiological effects of the proximate principal of the Japan star-anise, that it may in the near future become a valuable addition to the materia medica far exceeding in therapeutic value the variety which this specimen is vainly wandering around the world to substitute.

Cubebs.—The present high cost of this drug, owing to its increased use for smoking in catarrhal cigarettes, has led to fraudulent practices. The writer has recently had offered to him crushed cubebs from which the essential oil had been mostly removed by distillation.

Antimony Sulphuret.—Your reporter has seen this article offered, consisting entirely of ground, broken crockery, and anthracite coal dust.

Cascara Bark.—This new drug, the product of *Rhamnus Purschiana*, has come largely into use since its introduction to the medical profession by Parke, Davis & Co. Through the ignorance of collectors it often occurs, and has occurred repeatedly to your reporter, that large parcels of inert and worthless bark and barks of allied species are offered in place of genuine.

Mixtures.—Mr. Allaire, of this committee, reports that twice during the past year mixtures prepared for adulterating powdered drugs were offered him. He failed to obtain samples for reasons that he could not get them in less than five barrel lots. They were of three colours, red, yellow, and brown. They were offered him at 2½ to 4 cents. per pound.

Jalap.—Mr. Allaire has made several examinations of commercial powdered jalap, showing that not over 10 per cent. of the samples were up to standard. In regard to jalap, your reporter sees no reason why it should not have its market value and price established by the proper assay of each lot, as in the case of opium and cinchona.

Spruce Gum.—Your reporter detected an ingenious substitution in a lot of this article; his suspicions were excited by the fine appearance of the lot. It proved to consist of artfully prepared lumps of common resin, mixed with a small per cent. of the genuine gum, the whole being roughened by attrition.

Oil of Bay Rum.—Your reporter is informed that the so-called "smuggled" oil of bay rum is nothing but the genuine oil mixed with the oil of clove and oil of pimento, and in this condition artfully foisted upon unsuspecting parties at a price less than the imported and duty-paid oil can be sold, under the pretext that it is "probably smuggled."

Oil of Bitter Almond. (*Ess.*)—In order to introduce into market the oil now made by synthesis, and which, while it has the chemical formula of its natural analogue, is unlike it somewhat in odour, and, showing strong signs as it does of its derivative, is branded "German Oil."

Oil Ylang Ylang.—The recent great reduction in the price of this fine perfume leads to the suspicion that the reason for it lies in some ingenious sophistication not yet determined.

Ginseng.—Lilienthal Bros., of New York, report being imposed upon by ginseng fraudulently mixed with a root so closely resembling ginseng as to defy detection, unless every root was carefully broken for examination. They also found leaden plugs inserted in genuine root to add weight to it.

Rose Leaves.—Mr. Greenish (London Pharm. Soc.), calls attention to artificially-coloured rose leaves, common in the London market early this year. They prove to be petals of the pale cabbage rose, *Rosa Centifolia*, artfully dyed with coraline, or rosanaline, and dipped in perfume. They prove to be of German origin, and shipped from Hamburg to the amount of from one to three thousand pounds.

Oil of Peppermint.—J. J. Quetting & Co., New York, report finding much of this oil adulterated with oil of pennyroyal, and give as a reliable test a solution of two parts of chloral in one part of sulphuric acid, to which is added 5 per cent. of alcohol. The test mixed with the suspected oil in equal proportion gives a fine cherry colour to pure oil, and a dark, olive-green if mixed with pennyroyal.

Olive Oil and Cotton Seed Oil.—Our Consul at Naples, the Hon. B. O. Duncan, reports to the State Department that immense quantities of refined cotton seed oils are imported into Italy for the special purpose of sophisticating the native oil, for reason that it can be laid down in Naples at less than half the cost of producing pure olive oil. Hence the temptation is great to use it for mixing with pure oil for export from Italy to other countries. Its use is not easily detected except by chemical means. G. A. Buckheister (*Droguisten Zeitung*) finds that while the ordinary tests, sulphuric and nitric acids, potash, lye, ammonia, &c., produced no definite reactions, he could, by a mixture of equal parts of sulphuric and nitric acids, render visible as small an addition of cotton seed oil as ten per cent. Three parts of this test to ten parts of the suspected oil is shaken together. Pure oil gives a white colour with a greenish cast, that mixed with sesame a grass-green, and that mixed with cotton oil a paler colour. After a few minutes the liquids separate, and pure olive oil appears almost unchanged; cotton seed oil, a light brown.

Wines.—(*N. Y. Times* Paris correspondence). Out of 123 samples of wines examined at the new laboratory at the Prefecture of Police, Paris, only three were found genuine grape juice; the remainder were falsified.

Logwood.—*Le Tincturier Pratique* notes complaints about the adulteration of this dye wood with inert substances, such as molasses, sawdust, clay, &c., reinforced by sumac and chestnut extracts.

Oil Wintergreen.—Is adulterated with alcohol and chloroform, and also with oil sassafras. The first two may be detected by fractional distillation. Chloroform will make itself evident on warming a sample of suspected oil. Strong nitric acid will detect oil of sassafras, turning the sample red and throwing down a dark resinous mass. In pure oil this test leaves the oil unchanged for some time, and finally deposits white crystals of methyl nitro salicylic acid. A second method is to distil from the sample the chloroform —generally added with the sassafras to give the correct specific gravity; add to the residue one-fourth its weight of potassium hydrate solved in four parts of hot water, when the odour of the sassafras will be apparent.

Potassium Iodide.—Kasper (*Schweiz. Woch. Pharm.*) has investigated commercial iodide of potassium as to its purity, and determines it by its reaction with corrosive sublimate, a simple and easy test. His conclusions are that in the commercial state the pure salt varies from 88 to 99½ per cent.; that it should contain from 96 to 97 per cent. pure salt.

Red Cinchonas.—R. V. Mattison (*New Remedies*, October, 1881) gives the analysis of 20 specimens of commercial red barks, and states that four-fifths of the so-called red barks are nearly or quite devoid of crystallizable alkaloids; that the commercial red barks rejected by the quinine makers are absolutely worthless—that it is never a *true red* bark. No rich barks can be had at a low price. This explains why Huxham's tincture is so often found worthless, and why it is so much better when made from the popular fluid extract, for the reason that the manufacturer has to use care in making his choice of material. Out of twenty analyses, the commercial barks yielded from nil to traces, and in one instance only nearly a half per cent. quinina; of cinchonidia, etc., from nil to one and six-tenths of one per cent.; of cinchonia, etc., from nil to three per cent.

Silicate of Soda.—This has long been used as a dilutant of laundry soaps. Now the French journals announce that the silicate itself is adulterated with soap, added for the purpose of giving it a deceitful gelatinous appearance.

Salicylic Acid.—Adulterants of this salt are mentioned (*Drug Circular*, September, 1881,) as sugar, acid sulphate of potassa and cryst. sulphate of lime, starch and silica, and as accidental impurities due to imperfect washing—carbolic acid, muriatic acid, and soda salts.

False Chian Turpentine.—This drug, in its purity, has probably not existed in market to any extent at all for many years.

Linseed Oil.—Mason (Report to Liverpool Chemists' Association) says 250 tons of this oil, adulterated with neutral petroleum oil, has been sent from that port to foreign ports; that it contained about 30 per cent.; that the test is its specific gravity, and the separation of the adulterant made by converting the sample into soap, and washing this with petroleum spirit, which readily removes the mineral oil, which does not saponify.

Benzoic Acids.—Gehe states that hippuric-benzoic acid is now made from urine of cows as well as that from horses, and when so made has less characteristic odour; and further states that toluol benzoic acid is now in market at various grades and prices. Bedford (Proc. N. Y., State Pharmaceutical Associatien) states the latter has a strong odour of its derivative—nitro-benzole; and that of the imports of the past year—8,500 pounds—over 5,000 pounds of this was the urine-benzoic acid. Permanganate of potassium, added to a solution of benzoic acid neutralized with carbonate of sodium, is discharged if the benzoic acid is that from urine, but if from gum it becomes green.

To be continued in our next.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in January, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Jan. 25	grsh. blue, brght.	none	1·91	trace	·34	·0031	·0096	·012	·015	19·6°	6·8°	32·6	satisfactory	Wigner & Harland.
New River	,, 15	c. f. yellow	none	1·05	trace	·29	·0014	·0028	·042	·075	15·0°	4·5°	22·7		B. Dyer.
East London	,, 11	p. yellow green	slight	1·27	slight	·29	·0005	·0043	·032	·086	15·0°	5·4°	24·0	satisfactory	Wigner & Harland.
Southwark & Vauxhall	,, 10	c. v. p. yellow	none	1·24	slight	·20	·0020	·0060	·059	·084	14·0°	4·0°	20·3	satisfactory	J. Muter.
West Middlesex	,, 14	yellowish	none	1·11	h. trace	·17	·0012	·0061	·052	·089	13·5°	3·5°	21·5	none	O. Hehner.
Grand Junction	,,	p. brown	none	1·22	trace	·16	·0020	·0078	·028	·108	15·4°	4·2°	21·8		A. Wynter-Blyth.
Lambeth	,, 10	c. v. p. yellow	none	1·24	slight	·20	·0020	·0050	·059	·075	14·0°	4·0°	21·7	satisfactory	J. Muter.
Chelsea	,, 16	p. grnsh. yell.	none	1·19	trace	·33	·0056	·0087	·050	·097	18·0°	5·5°	23·2		A. Dupré.
Birmingham	Jan. 12	s. turb. grensh.	none	·98	trace	·04	·0007		·011	·090	15·2°	8·0°	21·2	none	A. Hill.
Bolton	,, 13	s. turbid yellow	none	·40	none	·03	·0019	·0052	·020	·042	3·2°	3·2°	7·0	mineral and veg. debris	W. H. Watson.
Brighton	,, 9	c. blue green	slight	2·05	slight	·39	·0006	·0039	none	none	13·0°	5·2°	23·0	vegetable debris	Wigner & Harland.
Bristol	,, 16	brownish green	none	·90	none	·05	·0003	·0026	·020	·056	16·9°	1·9°	22·4	mineral and veg. debris	F. W. Stoddart.
Bury (Lan.)	,, 14	s. turb yellow	s. mossy	·95	none	·03	·0043	·0098	·023	·044	4·5°	4·4°	7·7	mineral and veg. debris	W. H. Watson.
Cambridge	,, 13	c. pale blue	none	1·40	slight	·56	·0005	·0015	·001	·009	16·0°	5·0°	24·3	satisfactory	J. West Knights.
Canterbury	,, 12	c. pale blue	none	1·47	none	·41	·0005	·0006	·001	·006	5·4°	3·6°	10·6	s. carb. lime	S. Harvey.
Croydon	,, 20	f. greenish	none	1·19	slight	·31	·0020	·0060	none	none	15·5°	4·5°	23·8	none	C. Heisch.
Darlington	,, 12	c. yellow	s. peaty	·84	slight	·02	·0020	·0040	·0116	·189	5·0°	4·5°	8·4	satisfactory	W. F. K. Stock.
Dublin	Dec. 30	s. yellow	none	·97	slight	traces	·0020	·0050	·004	·035	1·3°	·6°	4·5	satisfactory	C. A. Cameron.
Edinburgh	Jan. 16	s. brown	none	·64	none	trace	·0016	·0032	·016	·076	6·2°	4·9°	8·2	none	J. Falconer King.
Exeter	,, 14	f. brnsh. yellow	none	·84	slight	·15	none	·0033	·023	·040	2·8°	2·8°	7·0	none	F. P. Perkins.
Grantham	,, 18	c. p. blue	none	·98	slight	·62	·0013	·0021	·004	·006	15·7°	4·8°	22·5	diat. des. min. movg. org.	A. Ashby.
Ipswich	,, 14	c. colourless	none	2·25	trace	·24	·0044	·0052	·009	·006	19·5°	8·4°	30·7	satisfactory	J. Napier.
King's Lynn	,, 9	drty. mlky. wht.	earthy, offs	1·65	trace	·19	·0028	·0063	·070	·322	17·6°	5·6°	23·3	dc. vg. db., min. mtr., diat.	W. Johnstone.
Liverpool	,, 17	brownish	s. peaty	1·08	slight	·02	·0056	·0070	·052	·131	3·8°	3·4°	8·1	vegetable debris	A. Smetham.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in January, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Maidstone—															
Wtr. Company	Jan. 14	p. grnsh. blue	none	2·45	trace	·25	none	·0042	·0112	·015	21·8°	7·2°	35·8	satisfactory	M. A. Adams.
Public Conduit	,, 11	pale blue	none	2·15	trace	·40	none	·0007	·0100	·014	19·9°	7·2°	31·8	satisfactory	M. A. Adams.
Manchester....	,, 16	s. turb. f. yell.	none	·74	none	none	·0039	·0047	·021	·088	1·8°	1·8°	4·7	s. mineral	W. Thomson.
Newark	,, 14	c. grnsh. blue	none	1·12	trace	·06	·0008	·0048	·013	·031	16·7°	12·7°	35·0	satisfactory	A. Ashby.
Newcastle-on-Tyne.....	,, 9	f. yellow	none	·88	trace	·04	·0010	·0070	·051	·088	16·4°	5·4°	21·7	satisfactory	J. Pattinson.
Nottingham ..	,, 13	c. grnsh. blue	none	1·42	trace	1·12	·0012	·0014	·008	·014	11·0°	7·0°	17·4	vegetable debris	Wigner & Harland
Norwich	,, 11	p. grnsh. yellow	none	1·87	trace	·02	traces	·0029	·042	·052	17·5°	4·5°	24·0	satisfactory	W. G. Crook.
Portsmouth ..	,, 19	v. s. turbid	none	1·12	trace	·25	traces	·0023	none	none	17·2°	2·0°	18·4	vegetable debris	W. J. Sykes.
Reading	,, 14	f. yellow	none	1·00	none	·14	·0009	·0056	·003	·074	14·8°	4·1°	19·2	amorphous matter	J. Shea.
Rochdale	,, 22	pale blue	none	·65	none	·01	·0020	·0030	none	·001	3·5°	3·0°	4·5	satisfactory	T. A. Collinge.
Rugby	,, 10	f. turbid	none	1·27	h. trace	·14	·0070	·0200	·030	·055	11·2°	8·6°	17·0	veg. deb., sand, infusoriæ	A. P. Smith.
Salford	,, 16	clear yellow	none	·6	none	none	·0014	·0028	·010	·039	3·5°	3·0°	5·1	none	J. Carter Bell.
Southampton ..	,, 21	c. f. grsh. yell.	none	·98	h. trace	·51	trace	·0056	·034	·097	14·8°	5·5°	21·6	satisfactory	A. Angell.
Swansea	,, 19	clear	none	·90	trace	none	·0010	·0063	·004	·004	1·4°	1·4°	3·7	none	W. Morgan.
Warwick	,, 21	greenish	none	1·12	none	·19	·0014	·0021	·005	·039	21·0°	13·4°	21·0	none	A. Bostock Hill.
Whitehaven ..	,, 16	c. f. green	none	·39	none	·005	none	·0007	·007	·015	·4°	·4°	2·1	satisfactory	A. Kitchin.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very sligh

THE PUBLIC WATER SUPPLIES OF ENGLAND.

VALUATION, ACCORDING TO "WIGNER'S VALUATION SCALE," OF THE VARIOUS WATER SUPPLIES.

In the following table we give the *average* valuation of the public water supplies reported during the twelve months of last year, and the valuation of the waters examined last month.

	Average for 1881.	January 1882.		Average for 1881.	January 1882.
LONDON— Kent	29·5	36·5	Leicester	33·1	
New River	24·7	35·0	Liverpool	36·3	48·0
East London	33·2	40·0	Llandrindod	13·0	
Southwark and Vauxhall	34·3	44·0	Maidstone— Water Company	30·5	31·0
West Middlesex	33·0	40·0	„ Public Conduit	26·3	27·0
Grand Junction	30·3	41·0	Manchester	25·7	30·0
Lambeth	35·7	40·0	Newark	38·4	30·0
Chelsea	34·0	48·0	Newcastle-on-Tyne	43·6	41·0
Bath	12·0		Northampton	39·5	
Birmingham	34·6	36·0	Norwich	36·6	32·0
Bolton	22·7	27 0	Nottingham	45·6	35·0
Bradford	48·3		Oldham	23·6	
Brighton	23·9	27·0	Plymouth	28·7	
Bristol	25·1	25·0	Pontefract	171·0	
Bury	29·5	36·0	Portsmouth	27·4	25·0
Cambridge	25·3	23·0	Reading	25·8	31·0
Canterbury	16·0	15·0	Rochdale	8·4	8·0
Coventry	32 5		Rotherham	18·9	
Croydon	23·1	24·0	Rugby	47·0	45·0
Darlington	54·2	57·0	Salford	19 9	15·0
Derby	17·6		Sevenoaks	19·9	
Doncaster	35·0		Sheffield	21·4	
Droitwich	39·0		Shrewsbury	22·6	
Dublin	18·5	16·0	Southampton	42·6	44·0
Dudley	45·0		Stockport	17·4	
Edinburgh	25·9	21·0	Stourbridge	37·3	
Exeter	20·2	20·0	Stourport	27·0	
Grantham	32·9	31·0	Sunderland	25·0	
Hastings	26·2		Swansea	15·1	16·0
Huddersfield	24·3		Tunbridge Wells	35·0	
Hull	22·7		Warwick	36·1	27·0
Ipswich	27·7	29·0	Whitehaven	10·0	7·0
King's Lynn	96·6	103·0	Wolverhampton	38·7	
Leamington	25·5		Worcester	54·9	
Leeds	32·8				

We give above a list of all the towns whose water supplies have been examined and reported upon during the last year, together with the average valuation of the impurities in each supply for the year. We had intended making some remarks on the various points to which these average valuations give rise, but the pressure on our space compels us to defer our observations until next month. We also give the usual valuation of the month's supplies.

Mr. Beringer has been appointed Public Analyst for the County of Cornwall.

Mr. W. B. Harrington, F.C.S., has been appointed Public Analyst for the city of Cork, vice O'Keeffe resigned.

ANALYSTS' REPORTS.

At the Somersetshire Quarter Sessions, Dr. Alford, of Taunton, the County Analyst, reported that during the past quarter he had analysed no less than 331 samples. Among them were 57 samples of butter, 50 of tea, 25 of coffee, 47 of mustard, 18 of pepper, 11 of sugar, 2 of arrowroot, 1 of currants, 2 of confectionery, 2 of jam, 8 of spirits of nitre, 5 of glycerine, 3 of spirit of magnesia, 2 of senna, 3 of tartaric acid, 1 of carbonate of soda, and 1 of milk of sulphur. Among the samples which he had found to be adulterated were 4 samples of coffee and 11 of mustard. None of these adulterations were prejudicial to health. During the past year he had made no less than 886 analyses of food and drugs, and 54 of them he had found adulterated.

At the Monmouthshire Quarter Sessions, Major Herbert, the chief constable, stated:—"It having been reported to me that a whole family at Risca, after partaking of American tinned brawn, became seriously affected, two being in a very critical state, I instructed the sergeant at Risca to submit a portion of the meat, and also the vinegar used with it, to the County Analyst for examination. I attach his report. It clearly shows that although no adulteration was practised by the vendor, the meat was not in a healthy condition. The result of this analysis may possibly serve as a caution to both purchasers and vendors of American tinned meats."

At the City Commission of Sewers, on Tuesday, Dr. Saunders reported, as Public Analyst, that 162 samples had been analysed during the year—namely, of milk, butter, water, pepper, and sugar—but only 2 required the institution of a prosecution, both being in respect of milk. The public seemed to take very little interest in the working of the Adulteration Act, for, with a few exceptions, all the articles analysed had been obtained at his own (Dr. Saunders's) instruction by the officers of the Commission.

During the quarter ended December 31st, the Leeds Borough Analyst received the following samples for analysis:—5 of milk, 1 of butter, 2 of blackberry jam, 1 of ginger-beer, and 1 of soda-water; total 10 samples. Four of the samples of milk, the ginger-beer, and the soda-water were genuine, and of fair quality. The sample of so-called butter was found to be butterine. One of the samples of blackberry jam had a somewhat offensive smell—whether due to use of bad fruit, or to an ineffectional mode of preserving, the analysis did not show. The other sample of jam was sound, and of good quality.

LAW REPORTS.

Alum in Bread.—Dispute with Somerset House:—

Philip Keber, a baker, carrying on business at 23, Brown Street, Edgware Road, was summoned by the Vestry of Marylebone, on 30th November, for selling, to the prejudice of the purchaser, an inspector of nuisances, a 2lb. loaf of bread which was found to have been adulterated by the addition of alum. Mr. Greenwell, solicitor and vestry clerk, prosecuted; Mr. Russell, solicitor, defended. Mr. Greenwell said that the case was before the Court some time since, but was adjourned without any evidence being taken in order that the bread might be analyzed by the analyst at Somerset House. The certificate of Dr. Alexander Wynter Blyth, the Public Analyst for Marylebone, was to the effect that the sample of bread was adulterated with alum to the extent of 4·7 grains to the pound, or 18·8 grains to the 4lb. loaf. The certificate from Somerset House had been received and would be read. The chief clerk read the certificate from the Laboratory, Somerset House, signed by James Bell, Richard Bannister, and Henry James Helm, and it showed that they had analyzed the sample and declared it to be "free from alum." Mr. Greenwell urged that Dr. Blyth should be heard in support of his certificate; but Mr. Russell opposed this, as the official analyst had proved that there was no alum in the bread. Mr. Mansfield said that it was not certain the same bread was sent to Somerset House as Dr. Blyth had analysed. Mr. Russell said there could be no question as to that. Mr. Greenwell remarked that what he wished was to prevent any imputation against Dr. Blyth. Mr. Mansfield consented to hear the witnesses, and evidence was given to prove the purchase of the sample of bread. Dr. Blyth then gave the result of his analysis of the bread as shown in the certificate and explained his method of analysis. He said that of late he had made many researches as to the adulteration of bread and flour, and had made some analytical discoveries, which he had not yet published. This bread certainly was alumed, and if other people could not find the alum he could not help it. If this sample did not contain alum, it was no use his analyzing it or certifying any more samples. He had the greatest confidence that his opinion in this case was correct. In cross-examination, he said that the gentlemen at Somerset House signing the certificate were persons of ability. They might not have made a special study of

this question, as he had. He had had several prosecutions for the adulteration of bread, and had been wrong all his life if their certificate was correct. Re-examined: Alum was sometimes unequally distributed, but he could not imagine that, with that quantity of alum in the bread, it could be so unequally distributed as that other analysts would not obtain some evidence of its presence. The defendant was called, and he said that he had never had any alum in his house. He used the best flour. Mr. Mansfield said that the Legislature had placed the matter in his hands, but it was absurd to call upon a magistrate to decide a matter like this. It was a question whether this gentleman, who had made the subject a study for some time, or the gentlemen at Somerset House, who might have adopted some old-fashioned methods, were right. It was impossible for him to give a decision, and he should adjourn the summons *sine die*, and either party could bring it on again if desirous. There was a similar summons against William Parsons, baker, of 30, Lisson Street, and Mr. Russell produced a certificate from Dr. Hill Hassall to the effect that the bread contained no alum. Mr. Greenwell suggested that this summons should also be adjourned *sine die*, and said that Dr. Blyth was going to publish his researches, and the matter would undergo some public discussion. Mr. Mansfield accordingly adjourned this case also, and observed that the question was of interest to hundreds of the cleverest people in the country.—*Times*.

Selling Impoverished Milk:—

At Huddersfield, on Monday January 21st, James Dearnley, milk dealer, Dalton, was charged with selling impoverished milk, which had been impoverished by the removal of butter fat. The defendant did not appear. Mr. Kirk the sanitary inspector, stated that on the 27th ult., at his own request, Mrs. Swan, who lived in Greenhead, purchased from the defendant a quart of milk, for which he charged 3½d. She handed him four penny pieces in payment. He said he had not a half-penny, and asked her to have that extra value of milk. She took the extra milk, and then told the defendant that she had bought the milk for Mr. Kirk, the sanitary inspector. Mr. Kirk thereupon took the milk, and told the defendant what he had purchased it for. He asked the defendant if he would have a part, and at the same time offered to give him a part. The defendant made no reply, but put himself in a threatening attitude, and Mrs. Swan took the jug out of his hand and ran on to the first step of the staircase. He called Mr. John Firth, who was in the street, and he stepped between him and the defendant. He was about to get the bottles in order to divide the milk when the defendant made another attempt to get at him, and he told the defendant that he had better keep back, as he evidently seemed determined to upset the milk as he did on the last occasion. While he was engaged in the house dividing the milk the defendant came to the door and called out that he had sold it as old milk; and then said he would have a part. He told the defendant that he would have to wait until he completed the analysis, and he heard no more about him. On the 29th November he submitted a sample of the milk to Mr. Jarmain, the Borough Analyst, who gave a certificate to the effect that the milk contained of butter fat 0·78 per cent., solids not fat 8·05, and 91·17 and he was of opinion that the milk had been impoverished by the removal of 69 per cent. of butter fat, and that it contained 10 per cent. of added water. The defendant had been fined £5, £10, and £15 respectively, for similar offences, and he was now fined the full penalty of £20 and the expenses.

Jonathan Eastwood, farmer, Farnley Tyas, was summoned for having sold to the sanitary inspector a sample of milk, which was not of the nature and quality demanded by the purchaser. Mr. John Firth, assistant inspector, stated that on the 11th November he bought from the defendant a pint of milk, for which he paid 1½d. The defendant took a part which was offered to him, and said that he sold milk from his own cans at 3½d., and that he sold it at 3d., because he got it elsewhere. Mr. Kirk said he handed the sample which Mr. Firth bought to Mr. Jarmain, who had given a certificate showing that the butter fat was 2·21 per cent., solids not fat 8·73, and water 89·06; and that he was of opinion that the milk had been impoverished by the removal of 8·0 per cent. of butter fat, and 4 per cent. of added water. Defendant endeavoured to show that his son was selling new milk and he was selling old milk, which he had specially bought, and that he told purchaser at the time of purchase that it was not new milk. In reply to the Court, Mr. Ward said the defendant had been before the Bench on two occasions in reference to three similar cases, all of which were dismissed. The Bench fined the defendant £3 and the expenses.

Adulterated Milk in New York.—Thirty-four Dispensers of the Lacteal Fluid Fined for a Too Liberal Use of Croton Water:—

In the Court of Special Sessions recently Frederick Stieger was charged with adulterating milk. Sanitary Inspector Martin produced the usual evidence, and after a whispering consultation by the three presiding justices the prisoner was sentenced to pay a fine of 150 dols. This was the first of a list of

thirty-four similar offenders against the sanitary laws, whose aggregated fines netted the city treasury nearly a thousand dols. [which will more than pay the analyst his year's salary—Ed. Analyst.] The next unhappy milkman was Claus Umlandt, of No. 1,229 Third avenue. He was fined 150 dols. Charles Dusterbehen, of No. 766, Eleventh avenue, was discovered by Inspector White in his aqueous practices, and the Court fined him 50 dols, But the most original adulterator on the list was Julius Dolgner, who not only mixed with water but also sought to add a rich and pungent flavor by putting in salt with the water. Dolgner received a fine of 150 dols. and one month in the Penitentiary for his enterprise. Diedrich H. Doscher, of No. 820, Tenth avenue, escaped with a fine of 15 dols., but James McCall, whose turn came next, was assessed 25 dols.

The other cases were as follows :—

Adolph J. H. Meyer, No. 750, Tenth avenue, fined 35 dols.; Michael Rice, Fifty-fourth street, near Third avenue, fined 25 dols.; William Schmiedekamp, bond forfeited; James Alwell, No. 53, West Twenty-sixth street, fined 10 dols.; John Bryson, No. 436, West Twenty-eighth street, fined 100 dols.; Thomas Clarkin, No. 469, West Twenty-sixth street, fined 50 dols.; Rose Coffee, No. 454, West Twenty-seventh street, fined 20 dols.; Margaret Cahill, No. 448, West Twenty-seventh street, fined 25 dols.; Sarah French, fined 35 dols.; Marie Guerie, No. 427, West Twenty-sixth street, fined 15 dols.; Anton Genan, No. 338, West Twenty-sixth street, fined 25 dols.; Frederick Hegler, No. 326, West Twenty-seventh street, fined 50 dols.; Elizabeth Hill, fined 15 dols.; Henry Klee, No. 258, Tenth avenue, fined 50 dols.; Philip Lyons, No. 438, West Thirty-fourth street, fined 35 dols.; Charles W. Moys, No. 248, West Thirty-second street, fined 50 dols.; Michael McGuire, No. 235, West Twenty-seventh street, fined 15 dols.; Edward Murphy, No. 439, West Thirty-second street, fined 25 dols.; Nathaniel Owens, No. 342, West Thirty-sixth street, 25 dols.; John H. Ranges, case sent to General Sessions Court; Andrew Scherer, No. 314, West Thirty-first street, fined 150 dols.; Henry Schafer, No. 370, Seventh avenue, fined 50 dols.; Michael Swalline, No. 137, West Thirty-third street, fined 25 dols.; Patrick W. Wahren, No. 321, West Twenty-fifth street, fined 25 dols.; John F. Withers, No. 403, West Thirty-third street, fined 25 dols.—*New York Herald.*

Referring to the above report, Dr. J. Blake White writes: "The milk found on the premises of Dolgner was analyzed because it presented a very watery appearance and tasted brackish. I append the analysis, as it may prove interesting to yourself and other Public Analysts.

"Taste brackish and insipid. Appearance watery. Sp. gr. 1·029 at temp. 60° Fahr.

	Water.		Butter. Dis.	Butter. Ind.		Solids not fat.
	89·07	..	2·91	3·08	..	
Duplicate ..	89·06	..	2·95	3·16	..	
Average ..	89·065	..	3·02		..	7·915
Ash ..	= 1·22					

"My assistant, Mr. Munsell, determined the large amount of ash to be due to the addition of chloride of sodium. The following analysis is that of milk found in the possession of a dealer named Morlock last May, which was not only skimmed but salted also and watered:—

	Water.		Butter. Dis.	Butter. Ind.		Solids not fat.
	89·54	..	1·61	1·63	..	
Duplicate ..	89·57	..	1·59	1·61	..	
Average ..	89·555	..	1·61			8·835
Ash ..	= 1·01					

"The chief frauds practised here among milk dealers are skimming and watering, as well as both some times in same sample. Rarely we find additional salt. The fines hitherto imposed have not seemed to inspire dread of detection, but the recent disposition on the part of the Courts to imprison in addition to fining those arrested for dealing in adulterated milk, I believe will have a decided effect in checking the wholesale adulteration of milk which has long prevailed." [But we presume the State is under the necessity of paying for the support of the delinquents while they are in prison.—Ed, Analyst].

Dublin Milk—Heavy Fines:—

Thomas Kavanagh, 33, Cook Street, dairy-keeper, was summoned at the instance of Mr. David Toler, Corporation Inspector, for having sold to him a sample of new milk which Dr. Cameron certified was adulterated with 100 per cent. of added water. The defendant pleaded that the milk which was sold to Mr. Toler had been purchased from another dairy previous to the visit of the inspector. Mr. Toler informed the magistrate that this was an old excuse, and Mr. Woodlock fined the defendant £19. Mr. Fagan defended.

Sarah Molloy. "College Dairy," 12, Duke Street, was summoned by the same inspector for having sold to him a sample of new milk which Dr. Cameron certified was adulterated with 21 per cent. of added water. It transpired in evidence that the defendant was fined £6 on October 4th, for selling adulterated milk, and on the last visit of Mr. Toler she informed him that "he was very hard on the public, and that he had come very soon again." Mr. Woodlock imposed a fine of £4.

John Leonard, 23, Cook Street, was summoned by Mr. Toler for a similar offence, the milk in this instance being adulterated with 38 per cent. of added water. Mr. Toler deposed that on the 26th November he instructed a lad named Mulhall to ask for one half-penny worth of new milk at defendant's dairy. Mulhall did as he was directed, and handed the milk to him at Leonard's door. The defendant informed the inspector that it was "wholesale robbery" to send a lad like Mulhall to purchase milk on his (Mr. Toler's) behalf. In reply to Mr. Woodlock, the defendant stated that the lad Mr. Toler sent to buy the milk was a little bare-legged chap, and, judging from his appearance, he thought it was quantity and *not* quality he required, he therefore gave him skim milk. Mr. Woodlock, who remarked that that was the queerest defence he ever heard, fined the defendant £7.

Thomas Clitheroe, dairyman, 116, Lower Gardiner Street, was also summoned by Mr. Toler for having sold a quantity of new milk, in pursuance of a contract, to the Governors of the Westmoreland Lock Hospital, Townsend Street. Mr. Toler deposed that on the 11th of November he attended at the above institution, and obtained a sample of new milk from the supply which the servant of Thomas Clitheroe was delivering to the Hospital for the use of the patients, in pursuance of a contract. This milk Dr. Cameron certified was adulterated with 16 per cent. of added water. Mr. Toler also deposed that on the same day he purchased a sample of milk from a separate can supplied by Clitheroe for the Hospital matron; this milk, however, was found to be of a *pure* quality. Mr. Woodlock imposed a fine of £5, remarking that it was a perfectly scandalous system of trading, and added that Clitheroe should consider himself safe that he was not fined £20. Mr. McSheeley, Law Agent to the Corporation, prosecuted in each case.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No. 1881	Name of Patentee.	Title of Patent.	Price.
2097	R. Hall	Substitute for Coffee	2d.
2306	W. R. Lake	Manufacture of Manure	2d.
2369	S. Colné	Electric Lamp	4d.
2391	E. Solvay	Treatment of Phosphate of Lime	4d.
2402	G. Hawkes and E. Bowman	Electric Lamps	8d.
2423	W. L. Wise	Treatment of Organic Substances for Production of Ammonia	6d.
2492	P. Jensen	Electric Lamps	8d.
2495	E. G. Brewer	Electric Arc Lights	6d.
2524	J. H. Johnson	Manufacture and Purification of Gas	6d.
2563	G. G. André	Electric Lamps	6d.
2572	H. E. Newton	Electric Lamps	6d.
2575	W. E. Gedge	Manufacture of Baryta	4d.
2580	J. Webster	Producing Alumina	4d.
2589	F. Lux	Desulphuration of Liquids and Gases	4d.
2612	W. Crookes	Electric Lamps	4d.
3864	S. Pitt	Preparing Compounds of Nitrocellulose or Pyroxyline	6d.
4617	A. M. Clark	Electric Lamps	6d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Oil and Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record; Oil and Drug Journal; The Canada Lancet; Gas and Water Engineering.

THE ANALYST.

MARCH, 1882.

SOCIETY OF PUBLIC ANALYSTS.

An Ordinary General Meeting of this Society was held on the 15th February at Burlington House, Piccadilly; the President, Mr. Heisch, in the chair.

The minutes of the previous meeting were read and confirmed.

On the ballot papers being opened, it was reported that Mr. W. G. Crook, Public Analyst for Norwich, had been duly elected a member.

The following papers were read and discussed:—

"Some Analyses of Milk which have Fallen Below the Society's Limit," by W. Johnstone, F.C.S.

"Notes of Some Experiments on the Action of Organic Matter on Silver Salts," by H. Leffmann, M.D.

The discussion "On the Water Valuation Scale" which was adjourned at the meeting in June last, was to have been resumed at this meeting, but owing to the lateness of the hour, it was again postponed until the March meeting; and on the proposition of Dr. Muter, the President was requested to send a circular to every member of the Society resident in the United Kingdom, setting forth all that had taken place on the subject, and asking each member to express his opinion for or against the adoption of a Water Scale by the Society, with his reasons therefor, and stating that the replies received should be held to represent the presence and votes of the members so replying at the London meeting.

The next meeting of the Society will be held at Burlington House, on Wednesday, the 15th March, when the following papers will be read:—

"On Milk Analysis," by P. Vieth, F.C.S., &c.

"Some Points in Milk Analysis," by Otto Hehner, F.C.S., &c.

"The Action of Sulphuretted Hydrogen upon Compounds containing Oxide of Iron," by J. Carter Bell, F.C.S., &c.

The letters received by the President in reply to the circular relating to the "Water Valuation Scale" will be opened and read.

NOTES OF SOME EXPERIMENTS ON THE ACTION OF ORGANIC MATTER ON SILVER SALTS.

By Henry Leffmann, M.D., Microscopist to the Pennsylvania State Board of Agriculture.

Read before the Society of Public Analysts, on 15th February, 1882.

The action of organic matter upon silver salts is well known, but I am not aware of any attempts to utilize this method for the examination of water. The following experiments

were undertaken as a sort of preliminary investigation. The subject of water analysis is so important, and so much remains to be done, that every observation of the kind must have some value.

If we add a salt of silver to ordinary water, the precipitated chloride interferes with the test, and to prevent this, I used a solution containing marked excess of ammonia. In the following experiments, the proportion used was 2 c.c. of ammonio-nitrate of silver to 100 c.c. of the water. The silver solution contained only a few grains to the ounce. When not otherwise mentioned, the water was exposed to the sunlight for two hours.

1.	Distilled water	No colour.
2.	Schuylkill ,, ...	,,
3.	Ditto ,, with 0·1 c.c. urine	Brown colour.
4.	Ditto ,, with 0·5 c.c. urine	Deep brown.
5.	Ditto ,, with 0.02 c.c. urine	Red brown.
6.	Ditto ,, with 4 grs. raw sugar	No colour.
7.	Ditto ,, with 2 grs. stale mash	Yellowish.
8.	Well water, not perfectly pure, but not unfit to drink ..	Faint black.
9.	Ditto ,, markedly contaminated	Black precipitate almost immediately.
10.	Water from a small stream, quite pure	No colour.

Waters containing small amounts of milk, glucose and albumin gave no distinct effects. Solution of glue produced a faint brown. All the experiments tended to show that the test was very sensitive to the presence of urine. Some experiments were made with highly dilute solutions of the common active principles.

Quinidia, strychnia and cinchonidia gave no result. Picrotoxin gave light yellow. Caffeine gave light yellow. Quinidine sulphate gave faint brown. Morphia gave immediate precipitate.

I hope to present before long the results of some further study of the matter.

SAMPLES OF MILK WHICH HAVE FALLEN BELOW THE SOCIETY'S LIMIT.

By William Johnstone, F.I.C., F.C.S., Public Analyst for the Borough of King's Lynn.

Read before the Society of Public Analysts on 15th February, 1882.

There has been much written upon milk analysis, and the results obtained vary so much that I think I am warranted in making a few observations upon the result I have personally obtained as a Public Analyst, as they differ materially from the limit adopted by the Society of Public Analysts; therefore, I think it will not be out of place to lay a few of the results so obtained before the Society. The process I adopt for the extraction of the fat is described in the *Chemical News*, Vol. XLIII. No. 1,121, and differs in no essential point, except that I have discontinued the use of the stoppered extraction tube, and adopted that invented by Professor Soxhlet. The total solids I determine in a separate 10 grm. of the milk evaporated to dryness in the water-bath, and then heated to a temperature of 110° C. in the air-bath until the weight is constant. The following analyses are the results obtained from four samples of milk which were taken by the inspector on 29th July, 1881. The figures represent the average of duplicate analyses:—

Total solids	12·850	13·169	12·325	13·035
Fat	3·182	4·716	3·995	4·258
Solids not fat	8·668	8·453	8·330	8·777
Ash	0·734	0·633	0·670	0·770
Sp. gr.	1030·0	1029·0	1029·4	1032·8

I was unable at the time to make arrangements to see the cows milked, but from careful enquiries made, I have every reason to believe the above milks were genuine, and the milk of several cows. However, to give the benefit of the doubt to the limit adopted by the Society, I shall now quote the actual figures of duplicate analyses of two samples taken by the inspector on the 8th December, 1881 :—

	1		Average.	2		Average.
Total solids ..	12·30	12·29	12·29	12·42	12·48	12·45
Fat	4·02	3·93	3·97	3·94	4·12	4·03
Solids not fat ..	8·28	8·36	8·32	8·49	8·36	8·42
Ash	0·770	0·73	0·75	0·686	0·713	0·74
Sp. gr.	1030·6	1030·6		1029·7	1029·7	

After considerable hesitation I determined to report the above samples adulterated, so as to be able to ask the magistrate to grant an order to see the cows milked if the defendants pleaded not guilty. Happily the summonses were not issued as the vendors both consented to allow the cows to be milked in the presence of an officer, and also gave the following details as regards the feeding of the cows and the number that supplied the milk.

No. 1 was the milk of four cows : they received ordinary feeding along with a considerable quantity of mangolds. No. 2 was the milk of 10 cows fed on grains, malt combs, turnips, mangolds, cake, and long hay.

On the 31st December, 1881, an officer was sent to No. 1 dairy, saw the cows milked, and the milk emptied into a large vessel ; he then took a sample, and the following are the results of duplicate analyses :—

			Average.
Total solids	13·865	13·920	13·89
Fat	5·529	5·511	5·52
Solids not fat	8·336	8·409	8·37
	*8·320	8·410	8·36
Ash	0·780	0·786	0·78
Sp. gr.	1029·2	1029·2	

* Solids not fat found upon drying residue in platinum boat.

The above sample of milk was taken after the milk of five cows had been mixed.

On the 30th January I personally called at the dairy and asked the proprietor if he would allow me to witness his cows milked, and also to allow me to take a sample of each cow's milk ; he readily consented, and the following are the average results of duplicate analyses of each milk :—

	1	2	3	4	5	6	7	8 Mixed milk.
Total solids	13·547	11·960	11·851	12·856	12·884	11·891	14·268	12·526
Fat ..	5·495	3·728	3·653	4·265	4·565	2·745	4·541	4·299
Solids not fat	8·052	8·232	8·198	8·591	8.319	9·146	9·727	8·227
Ash ..	0·647	0·726	0·708	0·799	0·731	0·765	0·746	0·752
Sp. gr. ..	1027·8	1029·1	1029·	1029·9	1029·9	1031·4	1033·8	1030·7

I was also furnished with the following details :—

Cow No. 1.—Calved in last week of November, or first week of December. Pedigree breed.

Cow No. 2.—Calved a week after No. 1, about 5th Decemher.

Cow No. 3.—Calved a week after Christmas ; its first calf ; and itself a calf of No. 1.

Cow No. 4.—Calved last August.

Cow No. 5.—Ditto.

Cow No. 6.—Calved the week before Christmas.

Cow No. 7.—Calved 23rd January, 1882.

For a fortnight previous to the 30th January the cows have all been fed on turnips, grains, and long hay. Cows Nos. 1, 2, 4, and 5 compose milk taken on 8th December, 1881; then fed on mangolds, grains and hay.

Cows No. 1, 2, 3, 4 and 5 compose milk taken on 31st December, 1881.

Cows Nos. 1 to 7 compose milk taken on 30th January, 1882.

On the 31st December, 1881, an officer was also sent to dairy No. 2, saw the cows milked, the milk emptied into one large vessel, took a sample, and the following are the results obtained :—

			Average.
Total solids	12·505	12·453	12·479
Fat	3·955	3·974	3·964
Solids not fat	8·550	8·479	8·514
	*8·570	8·476	8·520
Ash	0·706	0·710	0·708
Sp. gr.	1029·5	1029·5	

* Solids not fat obtained upon drying residue in platinum boat.

On the 2nd February I personally called at dairy No. 2, explained my object, made the same request as to samples, saw the cows milked, the milk emptied into a large wooden vessel, took a sample, and the following are the averages of duplicate analyses :—

	1	2	3	4	5	6
Total solids	11·398	11·408	14·122	12·472	13·764	12·288
Fat	2·773	2·973	4·784	2·966	5·174	3·699
Solids not fat	8·625	8·435	9·348	9·506	8·590	8·589
Ash	·792	·769	·826	·774	·761	·792
Sp. gr.	1028·6	1029·2	1030·9	1029·4	1030·4	1033 4

	7	8	9	10	11	12 Mixed milk.
Total solids	14·059	12·288	13·646	12·910	12·330	12·789
Fat	4·457	3·083	4·607	3·866	3·515	3·574
Solids not fat	9·632	9·205	9·039	9·044	8·815	9.215
Ash	·803	·742	·852	·716	·720	·766
Sp. gr.	1032·9	1033·1	1032·0	1030·8	1030·8	1031·5

The results of analysis of the milks of these 18 cows, which are genuine beyond doubt, the solids not fat in 10 instances fell considerably below the standard adopted by the Society. They are certainly the milk of individual cows, but that cannot be said in regard to the mixed sample from dairy No. 1, where out of seven cows only two came up to the standard. Also as regards the mixed sample from dairy No. 2, containing the milk of eleven cows, five of which fell below the Society's standard of solids not fat, and two below 11·5 per cent. of total solids.

The foregoing analyses illustrate what has frequently been pointed out before by several members of the Society—namely, the variability of the composition of milk. That individual cows are occasionally met with (and I have met with them in this case) whose milk give startling results I admit, but it should be borne in mind that the samples collected on the 31st December are not the milk of two individual cows poorly fed, but that of five and ten respectively, and that the poorness in solids not fat cannot be attributed to bad feeding.

In judging a milk upon the analytical results as to whether it has been tampered with or not, the proportion of fat in conjunction with the other constituents should be carefully considered before giving a definite opinion as to the genuineness of the sample. In cases such as the above, I think the analyst is justified in reporting the sample adulterated; as the alternative is always left, that, if the vendor refuses to allow the cows to be milked before trial, or pleads not guilty, the analyst can apply to the magistrate to grant an order to see the cows milked. If such a plan were more generally adopted in suspicious cases, the truth would soon be arrived at. However, until the legislature fix a standard of fat, and solids not fat, milk prosecutions in doubtful cases will be far from satisfactory.

The President said that so far from being surprised at Mr. Johnstone's finding *some* milks which fell below the Society's standard, he wondered that Mr. Johnstone ever found any which came up to it. If he kept his samples at 110° C. till they ceased to lose weight, the greater part of the milk sugar must be decomposed. The Society's standard is for milks dried at 212° F. From the amount of fat the sp. gr. and the ash, Mr. Johnstone's samples appeared to be good milks, and had they been dried, as is usual, at 212° F., he believed very different results would have been obtained. He, the President, should strongly object to the paper being published with its present heading of "Samples of Milk which have Fallen Below the Society's Limit," because they had not been examined according to the Society's method.

Mr. Hehner said he wished to echo what had fallen from the President. At 100°C. milk sugar loses part of its water, the loss amounting to about 5 per cent. if one molecule of water was driven off. He would certainly expect to find the solids not fat from three to four-tenths of a percentage too low if the milk was dried to constant weight. Milk sugar changed in several physical respects, such as specific rotatory power, on being heated for some length of time, as had recently been shown by Mr. Schmoeger (*Berl. Ber.* 1881). A very striking point in Mr. Johnstone's analyses was the non-agreement between the specific gravity and the total solids or solids not fat; in every case the specific gravity was that of genuine milk, and he held that it was quite impossible to find low solids not fat and normal specific gravity. This discrepancy ran through the whole of the analyses. In addition to this the amount of ash was normal in all cases but one, whilst one would have expected with the fall of the solids not fat a corresponding fall of the ash. The specific gravity and the ash utterly contradicted the results of the solids not fat.

Dr. Muter strongly confirmed the President's remarks as regarded milk sugar. Sometime ago, when he was elaborating his process for the estimation of cane sugar in milk, he had occasion to make many experiments on milk sugar, and he knew very well that even at 100° C. it began to lose appreciably. That was what always caused the slight difference and rendered it impossible to get an accurate estimation of both sugars in milk within one per cent. or so. If the milk sugar were dried above 100° C., then the decomposition was still more pronounced. Another point was as to the time which had elapsed between the taking of the samples and the analysis. In perfectly fresh milk from the cow one might perhaps venture to dry more boldly; but, if it had stood a little and developed the slightest acidity, then high temperature drying would be still more dangerous. Referring to the title of the paper, Dr. Muter said it was not what it should be, because they could not consider the Society's standard applicable to any milk analysis unless it had been made exactly in the way the Society intended, namely, by drying a small quantity as rapidly as possible at 212° F., extracting the dry residue with ether or light petroleum, and then rapidly drying the "solids not fat" remaining also at 212° F. Referring to the possible loss of solids not fat by keeping, Dr. Muter said that, now many years ago, he had made a large number of experiments to find if any rule could be laid down as to the rate of decomposition, but it was impossible to ever come near the truth, as no two milks behaved alike even when kept under similar conditions; and although he then laid down a sort of fair average, which had since been practically adopted at Somerset House as the result of their trials which agree apparently with his, yet it was really a most illusory matter, frequently leading to great

injustice to the analyst who worked on the fresh sample. A curious fact, however, was that in some milks the first step of loss was more sudden than what occurred afterwards; so that, in any experiments tending to either establish or invalidate a standard, the milk should be taken as fresh as possible to get reliable results. In conclusion Dr. Muter said that no experienced analyst ever adopted a hard and fast standard of condemnation, but took every point into consideration, and many milks passed through his hands where the solids not fat fell a trifle under 9 per cent., but were not yet condemned because the fat was exceptionally high, as in the cases quoted to-night, or for some other reason which might occur to his mind, on studying the constitution of the article as shown by the figures obtained. Given, however, everything else concordant, then 9 per cent. was a fair and just standard of calculation, and ought not to be lowered on account of exceptional cases like the present.

Dr. Bartlett said it appeared to him that Mr. Johnstone had not been operating in the same way to which they had been accustomed. The results given were no doubt those which had been obtained, but from a certain amount of experience gained from some years in analysing large quantities of samples, he (Dr. Bartlett) had not found any such results accompanying the process by which they had been accustomed to derive their results. He had also noticed the discrepancy between the sp. gr. and the other results referred to by previous speakers. In one case the fat is supposed to represent 4·54, and the solids not fat 9·73. Taking the column to the left of that, the fat was represented by 2·75, which was very considerably lower, and the solids not fat 9·15, and also the ash had a little increased, but the sp. gr. of the one was 1031·9, and of the other 1033·8. If they took the 2·75 and 9·15 and added them to the water, they would get at the theoretical sp. gr. which was as easily worked out as the original gravity of beers. If Mr. Johnstone did that and compared it with the other he would find it actually impossible to get these discrepancies in the sp. gr. He would like to ask Mr. Johnstone if he had determined the total solids by themselves at 110° C.? Having extracted the fat, had he determined the solids not fat at that temperature, and then had he determined the total solids at the temperature which is 100° C. or 212° F., and if so, were those results in accordance with the previous ones, particularly when the total results were compared? A most important feature in his (the speaker's) experience was that there might be a double error—one correcting the other. He had found the oxidation of the fat had increased the weight when such a temperature as that mentioned was used, and the same high temperature would have decreased the solids not fat by the loss of the constituent water of the milk sugar. The opinions he had expressed were based upon analyses made on a large number of samples of milk, which were so nearly constituted in their results—not of each cow, but of large and small dairies supplying a condensed milk company—that they were able to put their fingers upon any dairy where any admixture of water had taken place, and were frequently told that the difficulty arose from the peculiar breed of the cow, or the time of breeding, or the time of day when the milking took place; and whenever they did find anything that could be depended on, it was that the cows were diseased, or were unfit for milking, if the results of the analyses did not come well within the standards since adopted by the Society of Public Analysts.

Mr. Wigner pointed out that the fat was in every case too high, and the solids not fat too low; had these samples been put in his hands he should have asserted that the fat had

been extracted by ether containing alcohol, and some of the milk sugar taken away. He also concurred in what had been said about drying at 110°C. as such a deviation from the Society's method that he did not think the analyses could be at all compared.

Mr. Johnstone, in reply, said that the analyses were all commenced within two hours after the cows had been milked. The total residues were all dried at 100° C. and weighed. He invariably found throughout the whole analysis that if dried at 100° C. and then at 110° C. the decrease never exceeded 0·2 per cent., and in proof of that he gave the results obtained in the different weighings in the duplicate analyses made of the two samples of milk taken on 31st December, 1881 :—

Dried at 100° C. for 3½ hours	14·135	14·248	12·903	12·900
Do. 4 „	14·045	14·238	12·785	12·750
Do. 5 „	13·974	14·050	12·716	12·666
Do. 6 „	13·905	14·000	12·650	12·630
Dried at 110° C. for 2 „	13·900	13·983	12·610	12·546
Do. 3 „	13·885	13·950	12·530	12·490
Do. 4 „	13·865	13·920	12·505	12·453

It took from four to six hours to dry the total solids, and the following are the results so obtained from the samples collected on 30th January when dried at 100° C. for six hours :—

1	2	3	4	5	6	7	8
13·647	12·086	11·972	13·030	12·992	12·070	14·518	12·620

He used the best methylated ether he could obtain for the extraction, having been previously rectified before use. The platinum boats or elongated basins were bodily inserted into a large test tube, with perforated bottom previously plugged with cotton (so as to act the part of a filter), the whole inserted into Soxhlet's fat extraction apparatus also containing cotton, and the extraction completed in this way ; the ether was twice filtered through cotton before returning to the weighed flask. He determined the total solids, then took another part evaporated to dryness, extracted the fat and weighed. He found that by weighing the fat, then the solids not fat, and adding them together, the total so obtained sometimes exceeded the total solids found, but in no instance to a greater extent than 0·25 per cent., the increase in weight being probably due to an oxidation of the fat, as he sometimes found a decided gain in weight upon prolonged drying of the fat.

CHINESE METHOD OF MANUFACTURING VERMILION.

By Hugh Mac Callum.

There are three vermilion works in Hong Kong, the method of manufacture being exactly the same in each. The largest works consume about six thousand bottles of mercury annually, and it was in this one that the following operations were witnessed :—

First Step.—A large, very thin iron pan, containing a weighed quantity, about 14 pounds, of sulphur, is placed over a slow fire, and two-thirds of a bottle of mercury added ; as soon as the sulphur begins to melt the mixture is vigorously stirred with an iron stirrer until it assumes a black pulverulent appearance with some melted sulphur floating on the surface ; it is then removed from the fire and the remainder of the bottle of mercury added, the whole well stirred. A little water is now poured over the mass, which rapidly cools it ; the pan is immediately emptied, when it is again ready for the next batch. The whole operation does not last more than ten minutes. The resulting black powder is not a definite sulphide, as uncombined mercury can be seen throughout the whole mass ; besides, the quantity of sulphur used is much in excess of the amount required to form mercuric sulphide.

Second Step.—The black powder obtained in the first step is placed in a semi-hemispherical iron pan, built in with brick, and having a fireplace beneath, covered over with broken pieces of porcelain. These are built up in a loose porous manner, so as to fill another semi-hemispherical iron pan, which is then placed over the fixed one and securely luted with clay, a large stone being placed on the top of it to assist in keeping it in its place. The fire is then lighted and kept up for sixteen hours. The whole is then allowed to cool. When the top pan is removed the vermilion, together with the greater part of the broken porcelain, is attached to it in a coherent mass, which is easily separated nto its component parts. The surfaces of the vermilion which were attached to the Porcelain, have a brownish-red and polished appearance, the broken surfaces being somewhat brighter and crystalline.

Third Step.—The sublimed mass obtained in the second step is pounded in a mortar to a coarse powder, and then ground with water between two stones, somewhat after the manner of grinding corn. The resulting semi-fluid mass is transferred to large vats of water, and allowed to settle, the supernatant water removed, and the sediment dried at a gentle heat; when dry, it is again powdered, passed through a sieve and is then fit for the market.—*Oil and Drug News.*

THE ADULTERATION OF DRUGS IN AMERICA.

[CONCLUDED.]

Solution Citrate Magnesia.—Classen (*New Remedies*, October, 1881,) traces the reason why there is no precipitate in this solution, as made by a popular New York manufacturer, to the fact that it has no magnesia in it, but consists of sodium tartrate.

Orange and Lemon Oils.—It is reported that the cheapness of ess. oils orange, lemon and bergamot, made in Messina, Italy, is not so much due to the use of improved methods and apparatus as it is to a way they have of rectifying the French spirit of turpentine, and obtaining a fragrant non-oxidized product from it that admits of free admixture with the ess. oils without ready detection.

Essential Oils Adulterated with Alcohol.—Drechsler (*Zeitch. F.*, Anal. Chem.) employs a test—a solution of potassium bichromate, one part, in nitric acid (sp. gr. 1·30) ten parts. Alcohol is betrayed by the odour given off of ethyl nitrate.

Bismuth Subnitrate.—Vitali (*Bulletino Farm*), reports meeting this contaminated with calcium phosphate as an adulterant.

Coriander Ess. Oil—Bergamot Ess. Oil.—Both are adulterated with colourless rectified oil orange, on account of lower cost of the latter, and may be detected by its insolubility in 95 per cent. alcohol. The pure oils dissolve in all proportions; the mixed ones make a turbid mixture.

Caraway Seed Oil.—Is adulterated with ess. oil derived from caraway chaff, and this chaff oil is first mixed with rectified spirits of turpentine. This can be detected by the same test as foregoing.

Saffron.—Grispo (*Jour. Phar. D'Anvers*, February, 1881), has analysed a factitious saffron, and found vegetable filaments of unknown origin, with water, glucose, and baryene. Kanoldt (*Pharm. Zig.*, No. 34) has examined a factitious saffron that consisted entirely of an alga, probably *Fucus amylaceus*. which had been weighted with a coloured mixture of chalk and honey.

Beeswax Adulterations.—Jean (*Chem. Zeitung*, No. 34), recommends the following tests for wax:—

For water—Knead the wax with well-dried copper sulphate, which will give a blue colour.

For mineral and starchy matters—Solve in turpentine; these remain unsolved.

Sulphur—By igniting, when sulphurous acid gas is given off. Resin gives to wax a terebinthinate odour, and makes it adhere to the teeth if chewed. Paraffin makes the wax brittle, and lowers its melting point. Lard is indicated by fatty odour and touch.

Ipecac. Powdered.—Mrs. Stowell (*Microscope*, April, 1881), reports upon microscopical examination of this drug, and of finding potato starch in every specimen she examined, and two had cornmeal in them.

Catechu.—Jossart (*Jour. Phar. D'Anvers*, Feb. 1881), has observed catechu which contained from 60 to 70 per cent. of ferrous carbonate.

Wines and Liquors.—Leffmann (*Medical Times*, July 16th), restates his opinion that the adulterations used in falsifying and fabricating these articles are no more harmful than are the true articles, but lays stress upon the fact that they are commercial frauds, and so reprehensible. The chairman of your committee has always insisted that the adulterations of liquors were of little moment as poisons, or as injurious, for reasons that the poison of the whole class lies in its alcohol, and not in its natural or artificially added flavour or odour. In its social aspects, the adulteration of liquors is offensive, for reasons that no sophisticated wine or liquor can or does have the flavour or bouquet of even the poorer naturally flavoured ones. In their relations to medicines, sophisticated and adulterated wines and liquors, while commercial frauds, and to be so treated, are not fatal as poisons except inasmuch as the alcohol they contain is so. What the public require and need, as he apprehends it, is that if they pay for natural wines and spirits, they want what they pay for, and that only.

ADULTERATION OF DRUGS IN ENGLAND.

The Society of Public Analysts report that the percentage of adulteration of drugs examined in 1880 was 16 per cent., against 28 per cent. in 1879. In most case the pharmacists were not the delinquents. Many of the instances were of paregoric destitute of opium, sold by small shopkeepers who were not pharmacists, and therefore, prohibited by the British Pharmacy Act from dealing in an article containing poison. A curious distinction—the shopkeeper may sell paregoric without opium, while the pharmacist must sell paregoric with opium.

Sodium Bi-carbonate.—Roster (Arch. D., Pharm. July, 1880), finds that this salt made by the Leblanc's so-called American process, while it stood all the tests of the German Pharmacopœia, was found to contain nearly 4 per cent. of ammonium bi-carbonate.

Asafœtida.—Dr. J. Muter reports this drug adulterated by dropping properly formed pieces of magnesian lime stone into melted asafœtida. It possessed outwardly an excellent appearance, but consisted of 79 per cent. of limestone.

Pea Nut Oil—Is largely used for adulterating chocolate.

Peru Balsam.—Fluckiger (*Pharm. Zeitung*, 1881) says that this balsam has, for many years, in Hamburg, been adulterated with rosin, benzoin, styrax, copaiba, and even castor oil, and mixtures of these substances. He bases his test upon, first, its specific gravity, which at 15 degrees cent. must be between 1·140 and 1·145; second, ten drops of balsam produce, with four-tenths gram of slaked lime, a mixture which remains soft and does not harden; and, third, when shaken with three times its weight of carbon bi-sulphide, the balsam is separated into dark-brown resin, which clings to the glass, and should be about one-third its weight; and cinnamein which imparts but little colour to the carbon bi-sulphide.

Corks.—Old, and once used, are collected and bleached with sulphurous acid and recut.

Copaiba—Is reported to be adulterated with gurjun oil, but the writer thinks it improbable, for reasons of the high quoted price of the latter.

Quebracho.—Hitherto only the bark of the older and stronger trees have been imported, while that of the younger is better, containing a much higher percentage of active matter.

Potassium Bromide.—Maschke (*Pharm. Zeit.*) finds this contaminated with lead, which is detected by ammonium sulphide, but not by sulphuric acid.

Commercial bromide should contain not less than 98 per cent. of pure bromide, the balance being chloride, sulphate or carbonate of potash, without any bromates or iodides.

COMMENT.

Your reporter does not find recorded in the medical press of this year as many instances of adulterated drugs as one would be led to believe have become prominent and notorious. It is asserted that the American market is one crowded by imports of drugs of low grades, or at least grades lower than those authorized in the official and standard works on materia medica.

The writer is not prepared to admit such assertions to be true, believing as he does that there is in this country a demand as well as abundant supply of crude foreign drugs of high grades, and that the intelligent purchaser can generally find his wants for such high grades easily and promptly met.

London, which is the drug receiving as well as drug distributing centre of the world, has a well defined system of grading all drugs received from foreign ports, a system which probably has its analogue in this country in the grading of grain. So far as the writer can judge from his private experience and from published drug price lists, as well as those of importers and jobbers, no like system of grading obtains in this country.

The manufacturer and large buyer who is constantly in the market, if an expert, can control the relation between quality and price in his purchases, but to the moderate buyer, opium is simply opium, and whether it contains 5 per cent. or 15 per cent. of morphia, he is alike uninformed by its price or by any grade established before it is offered for sale. It seems to the writer important that every importation of drugs should be in some way graded, and its grade branded on each parcel in such a way that the least expert when buying shall know by official seal just what he is paying for. It seems to the writer as if it would be impossible to fix a legal standard for crude medicines, save one that shall be somewhat flexible and adjustable to the general average of good drugs, or one that shall establish certain grades based upon each drug having a fixed percentage of active matter. Many drugs are imported lower than the official standards, but which have a legitimate and proper value. For instance, opium for medicinal use, as opium and its galenical preparations, should have a fixed morphiometrical strength, but that is no reason why opium of higher or very much lower morphio percentage should not be used by the manufacturing chemist for the manufacture of morphine, provided he finds the relation of its cost to its morphio yielding value profitable to him.

Again, take the cinchonas. While it is imperative that the barks swallowed in substance are used in making the official tinctures, should have a fixed and high quinia-alkaloid standard, it does not follow but that lower grades may be legitimately and profitably used by the manufacturers of the cinchona alkaloids, and it seems that there is a legitimate use for still lower grades of cinchona barks in replacing the simple tonics like gentian and colombo, for it must be conceded that the cinchona barks that contain, perhaps, nothing more than the cincho-tannates, must be better tonics than the simple bitters.

What, therefore, the writer thinks is greatly needed in this country in the primary markets and ports of entry for foreign drugs, is a rigid official system of grading drugs, which shall insure to the buyer expert knowledge of what he pays for, and not the arbitrary exclusion of all drugs which shall not conform to high official standards.

In the execution of the newly-passed Acts to prevent adulteration of food and medicine, it is not unlikely that with the appointment thereunder of an army of examiners,

analysts, and other officials, spurred on by zeal to make their official acts show ample results, will overdo the matter oftentimes, as has been notably the result under similar recent legislation in Great Britain, and that many a poor grocer and still poorer pharmacist shall be made to feel the heavy arm of the law he has unwittingly and unintentionally violated. It must not be forgotten that in establishing these laws adapted to communities only of almost Utopian perfection, they have to apply in fact to a vast army of merchants in a country yet new and crude, whose preliminary drill and education in nowise compares to the standard implied and demanded from those these laws affect. One great reason why, heretofore, it has been so difficult to get favourable action from proposed pharmacy laws in the State Legislatures has been a distrust among legislators of this kind of class legislation. It is also a common experience, that unless legislative enactments are in accordance with the needs of an overwhelming majority of the people, they simply encumber the statute books and are never enforced. Public opinions, like revolutions of nature, are of slow growth and of steady movement, but like the progress of a glacier adown its eroded valley, are as irresistible as fate, and it would seem the wise course to mould public opinion gradually to the groove it needs to follow in, rather than by any too radical haste defeat the purpose for which wise laws are framed.—*Oil and Drug News.*

REVIEWS.

Commercial Organic Analysis, Vol. II.

By Alfred H. Allen, F.I.C., F.C.S. London: J. & A. Churchill.

We note with pleasure the completion of the second, and, as at present advised, the concluding volume of this excellent work, which not only fills a vacuum so often felt in the libraries of analysts, but also occupies the space in a thoroughly systematic manner. In the preface to the present edition, the author says: "I have been reluctantly compelled to omit several important sections which it was my original intention to include," and under essential oils, drugs, resins, &c., there are expressions to the effect that as these articles only specially interest a few druggists any scheme for their analysis is omitted, but the reader is referred to certain authorities which are duly named as treating on the subject. Mr. Allen was wise not to load his work with such special information, and to stick to the great commercial products which are continually passing through the hands of an analyst in general practice.

The present volume, commencing with the hydrocarbons, takes us through oils and fats to sugar and allied bodies, and finally winds up with alkaloids and the aniline bases. Under the hydrocarbons we meet with careful and excellent directions for fractional distillation now greatly simplified by the use of the bulb apparatus therein described, and an account of the separation and estimation of the various paraffins. We then meet with a very carefully written portion devoted to the constitution and analysis of coal tar distillates, especially the benzols and antharacene. The mysteries of 90 and 50/90 benzols are fully elucidated, and the "contract" method of testing fully described. Very proper stress is also laid upon the great reduction in the value of a benzol which is caused by the presence of light hydrocarbons so common in the Scotch and Cannel products, and due directions

are given for their estimation. The best methods of examining commercial oil of mirbane and anthracene are also given—the latter in special detail. There is much original matter in this chapter.

The section on oils and fats is very complete, and the analytical matter is brought down to the latest date. The enormous number of old empirical tests for the various oils are, to a great extent, passed over, and only those which have stood the test of use by modern observers are retained. The analysis of fatty oils for mineral oils by Mr. Allen's own process, whereby shaking the soap solution with ether is adopted, instead of the more cumbrous extraction of the dry soap with petroleum spirit, and Koettstorfer's most useful alkaline saturation method for aiding in the distinguishment of oils and fats, and Muter's improved method for oleic determination, are all in their proper places. The systematic method for qualitative detection is Muter's modification of Chateau's scheme, which is all placed by the author in one table, an arrangement conducing to simplify its use. In such an extensive subject as fats, of course it is not to be expected that every point can come under the notice of one man, and therefore it is not astonishing perhaps, that, while the old adulteration of lard by water is discussed, and is stated to be the only common one, no mention being made of the far more frequently met with modern artificial "lard-olein," now so extensively used as an adulterant, although its existence is perhaps only known to a few specialists in fat analysis. It is evident that in writing this section of the work, the author has given much time to the actual practical proving of the processes employed, and this being so, it makes it the more remarkable that, in estimating water in lard, butter, palm-oil, and other kindred fats, he should adopt the old slow method of heating them in an air-bath till the moisture is expelled, instead of the more rapid and convenient one of placing the fat in a small tared porcelain dish, heating it over a low gas-flame, and stirring with a thermometer till the frothing ceases.

Under the head of soap, the author gives the fullest directions, not forgetting the very essential modifications in the process necessary in dealing with Ceylon soap, or that made from palm-nut oil, both of which contain soluble acids. But here again an omission is made in our opinion by no notice being taken of the process for estimating rosin in soap, which depends on the formation of perfectly dry neutral sodium soap, and the percolation of the same with a mixture of ether and absolute alcohol in proper proportions, which is a method always giving good results in our hands.

The next section of the work deals with sugar and allied bodies, and some excellent formulæ are given for the analysis of the modern brewing glucose by the combined use of solution-density, Fehling's solution, and the polariscope, whereby the respective amounts of glucose, maltose, and dextrin, are simply and readily obtained. Under the head of cellulose, the microscopic characters of the various commercial fibres are shortly discussed.

In the final section of the book, we meet with the alkaloids, including a *resumé* of the best methods for the assay of cinchona bark and opium, and excellent directions for the detection of the various poisonous alkaloids in toxocological cases. Finally, we meet with aniline, and its derivatives, and have directions for the assay of aniline oils, and the identification and assay of the more common dyes derived from them. This is, however, but shortly touched upon, and other dye stuffs are altogether omitted, the author stating in his preface that he considers this subject to have been so adequately treated in Calvert's and other allied works, as not to require repetition in the present book.

In conclusion, we have simply to say that we sincerely recommend Mr. Allen's work to our readers, as one evincing great care in compilation and more originality than is usually met with in books on analysis. In a word, no modern analyst's library can be considered complete without a copy.

A Manual of Sugar Analysis.

By J. H. Tucker, Ph.D. New York: D. Van Nostrand. London: Sampson, Low & Co.

From America comes the first attempt to write a work in the English language entirely devoted to this interesting and commercially important subject, and we may at once admit that our American cousin has done his work thoroughly well. The book is divided into eighteen chapters of which the first four are devoted to the theoretical chemistry of the substances afterwards treated. The fifth chapter gives directions for taking the specific gravity of saccharine liquids by every known method; while the sixth is specially interesting. In it we have a full account of the theory and practice of saccharimetry by the polariscope and illustrated descriptions of every known instrument, the author preferring evidently the "shadow" class, and especially favouring Dubosq's and Laurent's system, especially the latter, for which he claims the important advantage of its working with coloured solutions. Then follows a minute consideration of the various systems of decolorizing a solution before using the polariscope which is copiously illustrated by experiments, showing the possible error with each of the commonly used agents such as basic acetate of lead and animal charcoal. After a short chapter on the purely chemical methods of estimating sucrose, we arrive at the estimation of glucose with Fehling. Here the author is again very minute, pointing out sources of possible error, and then follow in due order special chapters on the analysis of raw rugar, molasses, cane juice, beet juice, waste products, commercial glucose, milk sugar, diabetic urine, and animal charcoal. We will not follow the author into the discussion on the method of reporting results and making allowances, and the relative merits of the French and other systems suffice it to say that we do not go altogether with him on some of these disputed points. Taken as a whole, however, the book is an excellent one, and supplies a most decided want on the part of a large number of analysts and sugar refiners, and we have no doubt of its success.

SKIMMED MILK IN NEW YORK.

A Test Case Decided in the Court of General Sessions, New York:—

A case of more than usual interest to milk-dealers and consumers was brought to a conclusion in the General Sessions Court, New York, on January 11th. It was brought for the purpose of testing the power of the Board of Health to prevent the sale of skimmed milk in this city. The defendant was Thomas R. Gray, a milk-dealer, doing business at No. 79, East Broadway. He was defended by Messrs. Spencer and Dunning, and counsel for the Board of Health conducted the prosecution. The evidence showed that on September 27th, J. W. Taintor, a member of the firm of Woodhull & Co., dairymen, at Monroe, N. Y., shipped to Gray 10 sealed cans of milk from which the cream had been skimmed. After the milk reached the city a messenger was sent to the Board of Health with the information that Gray was selling skimmed milk. Gray, as alleged, advertised such milk for sale, and displayed a large placard in front of his store containing the same announcement. Dr. J. Blake White, an Inspector of the Health Board, promptly visited Gray's store with a number of assistants and seized the milk, which they found on sale at 3 cents per quart. On Dec. 15th, Gray was indicted for selling adulterated milk,

and held in 250 dols. to await the result of a trial. The Board of Health based the prosecution of Gray on the ground that skimmed milk was not a wholesome article of human food, and that its sale was a violation of law. The defence, on the other hand, contended that such milk, unmixed with water or any other substance, was a wholesome article of food, and consequently did not come under the head of "adulteration." The ordinance prohibiting its sale they held to be unconstitutional. In support of their argument, the defence examined a number of experts, the most prominent of whom was Prof. R. Ogden Doremus, who testified that milk from which the cream had been removed, unadulterated by any other substance, was not unwholesome. He admitted, however, that for infants or invalids who could take no other nourishment it was probably not as wholesome as milk from which the cream had not been skimmed.

In charging the jury Recorder Smyth said he should uphold the constitutionality of the law from which the Board of Health derived its authority. In view of the great importance of the case, he would require the jury to hand in a special verdict in writing, consisting of answers to four questions propounded by the court. The jury then retired, and after a short deliberation announced that they had come to an agreement. The questions and answers comprising the special verdict were then read by Chief Clerk Sparks, and were as follows:—

First.—Did the defendant, on the 27th day of September, 1881, at the County and City of New York, expose for sale at his store, No. 77, East Broadway, in this City and County, impure, adulterated, and unwholesome milk? The jury found, as matter of fact, that he did.

Second.—Did the defendant on that day keep, have, or offer for sale milk which had been watered, adulterated, reduced, or changed in any respect by the addition of water or other substance, or by the removal of cream? The jury found that he did.

Third.—Was the milk kept, had, or offered for sale by the defendant watered or adulterated, reduced or changed in any respect other than by the removal of the cream therefrom? The jury found that it was not.

Fourth.—Is milk which has been reduced by the removal of the cream therefrom impure and unwholesome as an article of human food or injurious to health? The jury found that it was both injurious and unwholesome.

The answers to the questions were subscribed to by every member of the jury. The Recorder postponed judgment in order to give counsel for Gray an opportunity to argue for a new trial. The decision of the jury is looked upon as one of great importance, and it is a practical indorsement of the declaration of the Board of Health that the sale of skimmed milk is a violation of law.—*New York Times.*

*** With reference to the above case, we are informed that the considerations urged were that skim milk administered as whole milk to children and invalids is unwholesome, and on that ground such a decision was rendered. The U.S. local Boards of Health are empowered to pass certain ordinances which shall protect the public health, the violation of which by law constitutes a misdemeanour of a certain grade. The prosecution was brought under one of those ordinances prohibiting skim milk from being held for sale in New York city, and the law enacted by the N.Y. State legislature last summer, also practically does the same thing, and one of the counts was under that law. The reason for such action is that milk supplied, for instance, in the morning to customers, might be in cans plainly marked "skim milk" without the actual purchaser really seeing them and knowing that he was being supplied with skim milk. Also the cans might be placed behind a counter, or as in the above case in ice tubs so that the mark on the cans of "skim milk" might be concealed from the purchaser. To permit the sale of skim milk from cans even when conspicuously marked as containing it seemed to open the door to too much possible fraud, and its sale therefore has been prohibited. In this case they proposed to test the constitutionality of such action on the part of the Health Board and of the Legislature. The sample of milk in question contained the extraordinarily small amount of 0·079 per cent. of butter fat, and about 9·4 or a little over of solids not fat.—ED. ANALYST.

The Local Government Board have sent a letter to the Dorchester Town Council inquiring why during last year no samples were submitted to the Borough Analyst. At the meeting of the Council recently it was decided to reply that the reason was because there were no samples to submit.

THE PUBLIC WATER SUPPLIES OF ENGLAND.

VALUATION, ACCORDING TO "WIGNER'S VALUATION SCALE," OF THE VARIOUS WATER SUPPLIES.

	Average for 1881.	January 1882.	Feb. 1882.
LONDON— Kent	29·5	36·5	34·0
New River	24·7	35·0	24·0
East London	33·2	40·0	64·0
Southwark and Vauxhall	34·3	44·0	35·0
West Middlesex	33·0	40·0	29·0
Grand Junction	30·3	41·0	29·0
Lambeth	35·7	40·0	36 0
Chelsea	34·0	48·0	31·0
Bath	12·0		
Birmingham	34·6	36·0	33·0
Bolton	22·7	27·0	26·0
Bradford	48·3		
Brighton	23·9	27·0	32·0
Bristol	25·1	25·0	26·0
Bury	29·5	36·0	
Cambridge	25·3	23·0	24·0
Canterbury	16·0	15·0	20·0
Coventry	32 5		
Croydon	23·1	24·0	24·0
Darlington	54·2	57·0	100·0
Derby	17·6		
Doncaster	35·0		
Droitwich	39·0		
Dublin	18·5	16·0	42·0
Dudley	45·0		
Edinburgh	25·9	21·0	39·0
Exeter	20·2	20·0	18·0
Grantham	32·9	31·0	27·0
Guildford			29·0
Hastings	26·2		22·0
Huddersfield	24·3		
Hull	22·7		
Huntingdon			37·0
Ipswich	27·7	29·0	27·0
King's Lynn	96·6	103·0	80·0
Leamington	25·5		23·0

	Average for 1881.	January 1882.	Feb. 1882.
Leeds	32·8		
Leicester	33·1		34·0
Liverpool	36·3	48·0	27·0
Llandrindod	13·0		
Maidstone—			
Water Company	30·5	31·0	37·0
,, Public Conduit	26·3	27·0	30·0
Manchester	25·7	30·0	27·0
Newark	38·4	30·0	29·0
Newcastle-on-Tyne	43·6	41·0	33·0
Northampton	39·5		
Norwich	36·6	32·0	35·0
Nottingham	45·6	35·0	37·0
Oldham	23·6		
Plymouth	28·7		
Pontefract	171·0		
Portsmouth	27·4	25·0	26·0
Reading	25·8	31·0	29·0
Rochdale	8·4	8·0	11·0
Rotherham	18·9		
Rugby	47·0	45·0	68·0
Salford	19·9	15·0	22·0
Sevenoaks	19·9		
Sheffield	21·4		
Shrewsbury	22·6		25·0
Southampton	42·6	44·0	36·0
Stockport	17·4		
Stourbridge	37·3		
Stourport	27·0		
Sunderland	25·0		
Swansea	15·1	16·0	12·0
Tunbridge Wells	35·0		
Warwick	36·1	27·0	
Whitehaven	10·0	7·0	13·0
Wolverhampton	38·7		
Worcester	54·9		

We give above a list of all the towns whose water supplies have been examined and reported upon during the last year, together with the average valuation of the impurities in each supply for the year. We also give the usual valuation of the month's supplies. We are compelled to defer making any remarks on these valuations until our next number.

At a recent meeting of the Middlesex Magistrates, Mr. A. G. Crowder moved:—"That the inspectors under the Sale of Food and Drugs Act, 1875, be instructed to make a practice of submitting for analysis, each quarter, samples of intoxicants of all kinds, also a larger number of samples of food and drugs than heretofore." He said the Act had been in force about six years, and was intended to have a general application to all food and drugs; but he had observed that in the matters referred for analysis, a large proportion were as to the purity of samples of milk, while no mention whatever was made of whisky or other intoxicants chiefly in use amongst the poorer classes, and he thought there ought not to be only an analysis of these intoxicants, but also of ale and porter. Sir W. H. Wyatt said as the analysis of each sample cost a guinea, if there were an increased number it would entail a serious expense, and he thought this was a subject that should be referred to the Committee of Accounts and General Purposes Committee for consideration, and he moved an amendment to that effect. The Chairman put the motion, and the amendment was carried.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in February, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Feb. 23	c. yellow blue	none	2·05	none	·83	·0008	·0032	·004	·012	23·6°	7·0°	32·2	veg. debris	Wigner & Harland.
New River	,, 15	clear	none	1·12	trace	·31	·0021	·0042	·009	·025	15·5°	4·5°	22·4	satisfactory	B. Dyer.
East London	,, 14	yellow blue	slight	1·42	h. trace	·53	·0012	·0163	·036	·048	15·0°	6·0°	22·8	animal., veg. deb., fibres	Wigner & Harland.
Southwark & Vauxhall	,, 24	p. yell. & clear	none	1·24	trace	·14	none	·0040	·039	·074	15·5°	4·5°	21·2	satisfactory	J. Muter.
West Middlesex	,, 20	greenish	none	1·20	trace	·09	·0130	·0044	·021	·037	14·0°	3·0°	21·0	satisfactory	O. Hehner.
Grand Junction	,,	p. yellow tint		1·15	trace	·24	·0057	·0058	·031	·102	15·1°	4·0°	20·9		A. Wynter-Blyth.
Lambeth	,, 24	p. yell. & clear	none	1·49	trace	·15	·0050	·0050	·033	·065	16·0°	4·5°	23·2	satisfactory	J. Muter.
Chelsea	,, 13	c. p. green	none	1·19	trace	·19	·0014	·0042	·003	·086	19·0°	5·0°	23·2		A. Dupré.
Birmingham	Feb. 6	c. yell. green	none	1·47	trace	·23	·0020		·024	·047	8·9°	7·1°	19·6	none	A. Hill.
Brighton	,, 8	yellow blue	none	2·13	none	·38	·0011	·0014	·018	·022	16·0°	5·0°	22·8	animal., veg. deb., fibres	Wigner & Harland.
Bolton	,, 10	s. turbid	none	·42	none	·04	·0024	·0040	·020	·037	3·4°	3·4°	8·1	mineral and veg. debris	W. H. Watson.
Bristol	,, 13	p. brnsh. green	none	·68	trace	·06	·0002	·0035	·020	·041	17·9°	1·8°	22·0	sand and veg. debris	F. W. Stoddart.
Bury (Lan.)	,, 11	s. turbid	s. mossy	·88	none	·04	·0038	·0098	·024	·044	4·7°	4·5°	7·8	mineral and veg. debris	W. H. Watson.
Cambridge	,, 15	c. pale blue	none	1·40	traces	·46	·0030	·0020	·005	·012	·16°	5·5°	25·0	satisfactory	J. West Knights.
Canterbury	,, 21	c. pale blue	none	1·47	none	·33	·0050	·0050	·004	·005	6·6°	3·6°	12·0	s. mineral	S. Harvey.
Croydon	,, 21	brgt. colourless	none	1·12	traces	·09	·0030	·0060	·009	·009	16·0°	4·5°	26·0	satisfactory	C. Heisch.
Darlington	,, 17	c. yellow	s. peaty	·70	traces	none	trace	·0077	·140	·218	5·0°	4·5°	8·1	satisfactory	W. F. K. Stock.
Edinburgh	,, 9	v. s. brown	none	·72	none	trace	·0040	·0016	·096		4·2°	4·0°	5·2	none	J. Falconer King.
Exeter	,, 11	f. brnsh. yellow	none	·91	trace	·15	·0007	·0004	·015	·030	2·9°	2·9°	7·0	none	F. P. Perkins.
Grantham	,, 13	c. p. blue	none	·10	trace	·62	·0011	·0014	·009	·009	15·0°	4·7°	23·0	diatoms	A. Ashby.
Guildford	,, 10	f. grnsh. yell.	none	1·09	trace	·17	·0043	·0042	·021	·028	15·5°	6·7°	23·8	satisfactory	A. Angell.
Hastings	,, 20	c. blue	none	4·50	trace	·03	·0021	·0028	·001	·008	6·0°	3·5°	22·1	none	H. F. Cheshire.
Huntingdon	,, 13	c. p. blue	none	1·96	trace	·17	·0015	·0070	·024	·044	18·0°	7·5°	38·5	satisfactory	J. West Knights.
Dublin	Jan. 30	s. yellow	none	·89	trace	trace	·0015	·0045	·056	·196	1·4°	·6°	4·2	satisfactory	C. A. Cameron.
Ipswich	Feb. 18	c. colourless	none	2·35	trace	·32	·0037	·0045	·001	·005	22·0°	3·9°	32·8	satisfactory	J. Napier.
King's Lynn	,, 7	drty. mlky. wht.	earthy	1·62	trace	·28	·0018	·0056	·182	·266	16·5°	5·5°	24·6	veg. debris, diatoms, &c.	W. Johnstone.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in February, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Leamington ..	Feb. 16	c. greenish	none	1·54	none	none	·0021	·0028	none	none	24·8°	11·9°	25·9	none	A. Bostock Hill.
Leicester.....	,, 20	v. s. yellow	none	1·55	trace	·08	·0013	·0062	·027	·091	8·7°	5·5°	14·4	satisfactory	W. M. Emmerson.
Liverpool	,, 17	yellow green	s. peaty	1·02	trace	·04	·0014	·0070	·110	·063	4·8°	3·7°	7·2		A. Smetham.
Maidstone—															
Wtr. Company	,, 15	p. green s. turb.	none	2·93	trace	·57		·0021	·018	·024	21·3°	8·6°	38·0	none	M. A. Adams.
Public Conduit	,, 15	c. p. blue	none	2·71	trace	·72		·0007	·003	·018	20·0°	7·7°	31·6	none	M. A. Adams.
Manchester....	,, 23	s. turb. f. yell.	none	·74	none	none	·0030	·0028	·024	·092	1·8°	1·6°	4·7	s. mineral	W. Thomson.
Newark	,, 11	c. p. green	none	1·12	trace	·05	·0019	·0037	·015	·036	17·0°	12·5°	33·7	satisfactory	A. Ashby.
Newcastle-on-Tyne.....	,, 8	f. yellow	none	·91	trace	·04	·0010	·0080	·051	·091	16·4°	5·9°	21·2	satisfactory	J. Pattinson.
Norwich	,, 13	p. grnsh. yellow	none	1·75	trace	·04	trace	·0044	·036	·047	14·0°	3·7°	16·5	satisfactory	W. G. Crook.
Nottingham ..	,, 16	c. p. blue	none	1·56	none	1·24	·0007	·0064	·004	·004	16·0°	5·0°	21·6	veg. deb., sand, anl. fibres	Wigner & Harland.
Portsmouth ..	,, 4	v. s. turbid	none	1·26	trace	·18	trace	·0042	none	none	13·4°	2·0°	18·5	decomp. veg. deb. diatoms	W. J. Sykes.
Reading	,, 9	c. f. green	none	1·95	none	·12	·0007	·0049	·023	·085	14·6°	4·0°	18·9	satisfactory	J. Shea.
Rochdale	,, 19	greenish	none	·65	none	·01	·0038	·0040	·001	·004	4·0°	2·8°	5·6	satisfactory	T. A. Collinge.
Rugby	,, 10	v. f. turbid	none	1·21	trace	·30	·0105	·0168	·019	·100	10·0°	9·0°	16·8	veg. deb., sand, diatoms	A. P. Smith.
Salford	,, 8	c. yellow	none	·60	none	none	·0028	·0035	·017	·112	3·0°	2·5°	6·0	none	J. Carter Bell.
Shrewsbury ..	,, 18	c. colourless	none	1·45	trace	·33	·0025	·0060	none	·004	22·0°	6·0°	25·0	none	T. P. Blunt.
Southampton..	,, 14	grnsh. yellow	none	·98	h. traces	·17	·0036	·0086	·011	·080	12·6°	5·0°	20·0	satisfactory	A. Angell.
Swansea	,, 17	clear	none	·90	trace	none	·0007	·0056	·003	·004	1·4°	1·4°	3·6	none	W. Morgan.
Whitehaven ..	,, 10	c. f. green	none	·39	none	·01	none	·0014	·007	·022	·4°	·4°	2·2	veg. deb., diatoms	A. Kitchin.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

A UNIVERSAL FLUX FOR SILVER ASSAYS.

George L. Stone, 1879, gives us a universal flux for the assay of basic silver ores. Its composition is as follows—

Soda	...	...	9 parts.
Borax Glass	...	...	3 ,,
Argol	...	...	1 part.

Mix thoroughly and keep on hand ready for use. For one third assay ton of ore, fill the crucible about two-thirds full of the flux, adding two or three iron nails when the ore contains much sulphur.—*Columbia College School of Mines Quarterly.*

The Testing of Oil of Bitter Almonds.—This substance is frequently adulterated with artificial oil of bitter almonds (essence of mirbane or nitro-benzol). This adulteration is best detected by the reaction by which it yields aniline under the influence of nascent hydrogen, which the genuine oil does not. The test is applied in the following manner: To an alcoholic solution of the oil some fragments of granulated zinc are added, and then about half its volume of strong hydrochloric acid, after which the solution is gently warmed. An energetic reaction ensues, which should be allowed to proceed for about five minutes. The liquid which now contains, if nitro-benzol was present, chloride of aniline is poured off from any undissolved zinc and treated with an excess of strong solution of caustic potash until the precipitate at first formed is redissolved. The aniline thus set free is extracted from the liquid by agitation with ether, the ethereal layer is removed, placed in a test-tube with an equal bulk of water and a few drops of a cold solution of bleaching powder added, when a splendid mauve coloration will be produced, the intensity of which depends upon the amount of nitro-benzol, originally present in the sample under examination. Boyveau gives the following as the characters of the genuine oil: The specific gravity varies from 1·048 to 1·060, while some specimens of the spurious oils had a specific gravity of 1·019 to 1·030. The genuine oil, if mixed with an equal volume of sulphuric acid, turns red but remains limpid and clear. The spurious oil, on the other hand, turns dark red in color and then becomes brown, at the same time becoming dull and thick, and finally congealing to a brownish mass.—*Sanitary Engineer of New York.*

ANALYSTS' REPORTS.

At a recent meeting of the Bristol Town Council, the report of Mr. F. W. Stoddart, Public Analyst, was presented. He stated that he had examined seventy-six samples, comprising a considerable variety of articles, and had found eleven adulterated. Some of the results of analysis were as follows:—One sample of mustard was adulterated with 40 per cent. of starch, turmeric, &c.; four samples of mustard were genuine; four samples of coffee were genuine; three samples of pepper were genuine; three samples of arrowroot were genuine; two samples of butter were genuine; two samples of sugar were genuine; one sample of castor oil was genuine.

At the quarterly meeting of the Neath Town Council the Borough Analyst reported that during the quarter he had analysed a sample of coffee which was a mixture of 60 per cent. of coffee and 40 per cent. of chicory; a sample of mustard adulterated with a mixture of 25 per cent.; and a sample of pepper which was genuine.

Dr. J. F. Hodges, Analyst for Belfast, reports that during the past quarter he examined forty-six articles of food, drink, and drugs, viz., thirty-five samples of sweetmilk, four of aerated water, one of restorative, two of sarsaparilla, one of ginger ale, two of kali water, and one of cream of tartar. Of these seven samples were adulterated or impure, viz., five samples of milk to which water had been added, and two samples of aerated water containing metallic impurities During the past twelve months 213 articles have been examined by him, as Analyst for the Borough, of which he found 52 samples to be adulterated or impure. Some of the samples of milk sold in Belfast were largely adulterated by the addition of water, and fines, amounting to £35 5s. 6d. were imposed by the magistrates.

LAW REPORTS.

Adulteration of Porter :—

At Downpatrick Quarter Sessions, before Mr. Thomas Lefroy, Q.C., County Court Judge, the case of Anderson appellant, the Holywood Justices respondents, was heard. The appellant is a publican in Holywood, and his appeal was from a decision whereby he was fined £5 for having sold porter which Dr. Cameron, the County Analyst, certified contained 4 per cent. of solids and 5 per cent. of alcohol, whereas it should have contained from 6 to 9 per cent. of solids. Mr. M'Kane, B.L., was engaged for the appellant; and Mr. H. N. Johnston appeared to support the decision of the Justices. William Dunne, constable at Holywood, proved the purchase of the porter, and the sending of it to Dr. Cameron. He purchased it on the 9th June, and received the certificate from the analyst on the 18th July. He had no instructions to take this sample of porter, and merely took it in the discharge of his duty as inspector under the Food and Drugs Act. Dr. Cameron, Public Analyst, was then sworn, and corroborated the certificate. He said the liquid was of the nature of porter, but not of the usual quality. The porter sent to workhouses, which is generally of a pure quality, contains from 6 to 7 per cent. of solid matters. Cross-examined by Mr. M'Kane: There is no standard for the quality of porter laid down in the Act of Parliament. He gave evidence before a Select Committee of the House of Commons in favour of fixing a standard for drinks. It was afterwards fixed for gin, rum, whisky and brandy, but for nothing else. He would say this porter was not adulterated, as he did not find any deleterious ingredients. He would say that it was of the nature and substance of porter; but he objected to its quality. John Anderson, the appellant, gave evidence that he bought the cask of porter from which the sample was taken from Mr. Dempsey, and he had been selling his porter for years, and up till the present; the price for the cask was 7s. for nine gals., and he retailed at 2d. per pint. He sold all this cask, part of it was drunk at the counter, and there was no complaint. The porter has always given satisfaction, and many of the publicans in Holywood were selling it. John O'Halleran, chemical analyst, Inland Revenue, Belfast, was also examined. He said there was no standard of the quality of porter. He had tested porters and ales with lesser solids than in this sample, and would say they were good of their class. This sample had a high alcoholic strength, and the fermentation would proceed further in the month of June than at this season of the year. The figures given would represent a fair sample of porter at the price it was sold at. He knew of beer being retailed in England at 1½d. a quart, and it was a very weak beer, but might at the same time be of sound character. Sugar might be used in brewing or any non-deleterious material. He would say from the description given of the sample that it was of the nature, substance, and quality of porter, and was not adulterated at all. Cross-examined by Mr. Johnson, he said he had not analysed this sample of porter, but he had many other samples in Belfast and in London, principally for drawback on exportation. These beers were strong beers, and his principal attention was given to ascertain their original gravity by which duty was charged. If he got skim milk instead of new milk he would consider it an offence under the Act, but in this instance the case was not a parallel one. James Dempsey, brewer, Belfast, deposed that he believed the statement of appellant that the porter was bought from him. It was of the usual class of porter sold to the trade, and was brewed at a gravity, leaving a small margin of profit. He never heard of any standard laid down by which he was bound, but if any standard was laid down to bind all brewers alike, he would be quite prepared to fall in with it. For thorough analysis, he believed the sample sent by Dr. Cameron was quite too little, as he could not check his operations. He had only got the third of a pint, which he got on the 9th June, and gave a certificate six weeks after. If this small quantity was drawn from a cask some time on usage, and kept in the bottle so long as six weeks, it would be very flat and much thinner than when delivered by him. Brewers looked principally to the original gravity as their standard, and under it he paid the beer duty. In the case of bitter ales the attenuation was carried further than in that of porter, and

no brewer was able to keep his drinks at a standard of gravity while undergoing secondary fermentation, which was the case with all light porters for draught. This secondary fermentation might either leave the porter rich in alcohol or injured by acetic acid, and the formation of either alcohol or acetic acid takes place at the expense of the saccharine or solids, and if the acetic acid had developed in this sample the solids would very much disappear. Dr. Cameron said the sample of porter was sound and free from acidity. This porter appeared to be made with a proportion of sugar, for the reason that it did not contain a fair amount of extract. Porter brewed with sugar would contain a larger amount of alcohol and less of extractive matter than if made from genuine malt. The alcohol in the porter was largely the result of fermentation, and therefore the article was not genuine as people generally understood genuineness in this connection. Mr. Dempsey said Dr. Cameron had been analysing the highest sample of porters, and his certificate in favour of some brewers was largely used in advertising their manufacture. He did not think it necessary to employ Dr. Cameron to analyse his porter, and this probably explains why he was selected for a test case. He said that the proportions of malt used in that brewing were 12 barrels of best malt to 2 cwt. of sugar, and it was customary in all porter breweries to use sugar at the discretion of the brewer. This was probably an exceptional case with him, as he seldom used sugar; but a good beer could be brewed from the materials mentioned. Mr. M'Kane then addressed the Court, replying on the facts that there was no fixed standard defined in the Act of Parliament, and that no adulteration had been practised, that the public taste, as evidenced by its sale, with competition, in Holywood, was proof in favour of its good quality. His Worship said that he did not know it was absolutely necessary to show that there had been adulteration in the old-fashioned sense of the term, which meant that some foreign substance was added. It was a great difficulty in the way that there was no fixed standard; and, under all the circumstances, he did not see any reason to alter the decision of the magistrates below. This case was different from one that could be regulated by a fixed standard. He would, therefore, only allow the ordinary costs of 10s. 6d., and leave the county to pay the rest.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No. 1881	Name of Patentee.	Title of Patent.	Price.
1716	J. Storer	Obtaining Ammonia	2d.
2747	G. Bischof	Purification of Water	4d.
2838	C. F. Claus	Purification of Coal Gas	4d.
2863	A. M. Clark	Manufacture of Dye Products from Indigo, and Derivatives of Aniline	4d.
3005	J. W. Bottomley & R. Molesworth	Manufacture of Chlorate of Soda	2d.
3049	F. W. Haddan	Electric Lamps	6d.
3072	C. F. Claus	Manufacture of Compositions Containing Pyroxiline or Nitro Callulose	4d.
3076	W. R. Lake	Disinfection or Purification ol Alcohol Obtained from Beetroot or Molasses	4d.
3138	F. Versmann	Treatment of Soap Lyes for Separation of Glycerine ..	2d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Oil and Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record: Oil and Drug Journal; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine.

THE ANALYST.

APRIL, 1882.

SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held at Burlington House, on the 15th March. In the absence of the President, the chair was taken by Dr. Muter, Vice-President.

The minutes of the previous meeting were read and confirmed.

The following gentlemen were proposed for election as Members:—Mr. R. Tervet, Clippens Oil Works, Analytical Chemist, and Mr. T. Harrington, Public Analyst for Cork.

The following papers were read and discussed:—

"On Milk Analysis," by Dr. Vieth.

"Some Points in Milk Analysis," by O. Hehner.

The letters received by the President in reply to his circular respecting the proposed adoption by the Society of a Water Valuation Scale were then opened and read. The discussion on the question was then resumed by the Members present, and a division taken on the original motion, made in June last—viz.: "That a Water Valuation Scale, analogous to that which has been suggested, be recommended by the Society for the adoption of its Members"—with the following result:—

	Against.	For.
Letters	17 ..	9
Members present	8 ..	2
	25	11

Two Members were neutral.

The question of the continuance of the publication in THE ANALYST of the monthly valuations was raised, and after discussion it was resolved: "That the Editors be requested not to publish in THE ANALYST a valuation for the analyses of those Analysts who send their forms up without them.

The next Meeting of the Society will be held at Burlington House, on Wednesday, April 19th.

ON MILK ANALYSIS.

BY DR. P. VIETH, F.C.S., &c.

Read before the Society of Public Analysts on 15th March, 1882.

AT the November meeting of this Society I was requested to bring before the Society my experiences in analysing milk, especially those obtained in my present position as an analyst to the Aylesbury Dairy Company. I understand perfectly well that it will be of greater importance to you to hear some figures obtained in my laboratory here than those obtained elsewhere, still I think it will not be without interest to you if I tell you in the first place about the method practised and the results of milk analysis arrived at in other places, even in another country—in Germany.

There has been a great deal done in milk analysis in Germany lately, but whilst nearly all the milk analyses carried out and published in England are done by Public

Analysts for the purpose of controlling the milk sold to the public, in Germany the said analyses are done for the greater part with regard to dairying, and only in some few larger places the government think it necessary to have the milk analysed which is brought into the market. Much attention has been paid to dairy farming in all parts of Germany since the last ten or twelve years, and as the experimental stations for agriculture, of which there is a great number in Germany, have done a great deal of good, it has been thought desirable, even if not necessary, to establish such stations especially for dairy purposes. These dairy experimental stations were established to support practical dairying by scientific researches. The first of those stations is that of Raden in Mecklenburg, established in the year 1876, and presided over by Professor Dr. Fleischmann, together with whom I had the honour to work for four years. There are two other dairy experimental stations at Kiel and at Proskau, under the direction respectively of Dr. Schrodt and Dr. Schmoeger, both very skilful analysts. As all the work done at those dairy stations relates exclusively to scientific experiments and researches, as further those analysts work quite independently, and—last, not least—as they are thoroughly educated for their work, I have reason to believe that the results of milk analyses published by them are quite correct.

The method adopted for analysing milk is the following. To ascertain the water, about 5 grammes of milk are placed in a weighed dish—generally very thin glass dishes are used—containing some sea sand, heated strongly before use, and heated in an air-bath at a temperature of 100° to 105° C, until the dish does not lose any more in weight, that is to say, until two weighings do not differ by more than one millegramme. The increase of weight of the dish with sand gives the total solids, the decrease of weight of the dish with sand and milk the amount of water. To ascertain the fat, about 10 grammes are dried up with sea sand, glass powder, or plaster of Paris. The dry powder is put into a case of filter paper covered with cotton wool and extracted in Soxhlet's extraction apparatus, with quite pure dry ether. After one hour the extraction is generally finished, the ether is then distilled, and the fat remaining dried and weighed. To ascertain casein, albumen and sugar, about 10 grammes of milk are diluted in a beaker with 200 c.c. of water and acetic acid added to precipitate the casein. Care must be taken to avoid an excess of acid. The casein is collected on a weighed filter, washed, dried and weighed. The filtered fluid is boiled and somewhat concentrated, thus coagulating the albumen, which is collected on a weighed filter. In the filtrate then the milk sugar is ascertained by titration with Fehling's solution or by polarisation. The nitrogenous matters—casein and albumen—may be ascertained by combustion of the solids of a weighed portion of milk with soda-lime, and multiplication of the percentage of nitrogen with 6·25. To ascertain the ash, about 10 grammes of milk are evaporated in a platinum crucible on the steam-bath, the solids are charred, the coal extracted with boiling water, and burnt to ash. The solution of the soluble salts is put back into the crucible, the water evaporated again on the steam-bath and the residue heated very carefully only to dark red-heat. All the quantities of milk taken for analysis are not measured but weighed. All the examinations are made in duplicate and the mean taken. The two examinations must not differ more than 0·1 per cent.; for the ash a still smaller difference is allowed.

Having made the analyses in this manner I always came very close to 100 in summing up the yielded percentage of the component parts. Generally I found 0·2 to 0·3

per cent. less, in some cases 0·2 per cent. more than 100. The total solids or the water were, as I stated, ascertained by drying at a temperature of 100 to 105° C., that is a temperature at which milk sugar, heated by itself, loses its crystallization water. But the behaviour of milk sugar when heated differs greatly under different circumstances, certainly the changes of its physical properties are not always the same. Dr. Schmoeger, of Proskau, who made a great many investigations regarding this question, wrote to me some months ago—"The behaviour of milk sugar does not agree with my experiences in analysing milk. I never found the total solids less than the sum of the component parts." Dr. Schmoeger found that milk sugar loses all its crystallization water already by evaporating a solution on a briskly boiling water-bath. If the milk solids are heated higher they lose still more in weight. I found a loss of from 0·2 to 0·4 per cent. when I heated the solids of 5 c.c. of milk for two hours at a temperature of 110° to 115° C.; the solids had been obtained by evaporating the milk and keeping it on the steam-bath for three hours and drying in an air-bath of 95° to 100° C. for two hours. I think that this loss is not only owing to the decomposition of the sugar, but also of the fat and protein.

Much attention is paid in Germany to the specific gravity, and you will scarcely find any analysis of milk published on which the specific gravity is not mentioned.

Now I will give you some results of milk analyses—in the first place those I obtained at Raden. There is a herd of about 120 cows at Raden, and an average sample of the whole morning—and one of the evening—milk is analysed at least once a week. During the year 1879 the limits for specific gravity, total solids and fat were the following:—

	Morning Milk.		Evening Milk.
Specific Gravity	1·0308 to 1·0325		1·0311 to 1·0329
Total Solids	11·71 „ 12·76%		11·90 „ 12·84%
Fat	2·88 „ 3·80%		2·87 „ 3·91%

The average was—

Specific Gravity	1·0319		1·0319
Total Solids	12·18%		12·27%
Fat	3·29%		3·32%

For the year 1880 the following figures were obtained—

Limits—	Morning Milk.		Evening Milk.
Specific Gravity	1·0304 to 1·0325		1·0309 to 1·0328
Total Solids	11·21 „ 12·50%		11·29 „ 12·72%
Fat	2·95 „ 3·68%		2·92 „ 3·82%

Average—

Specific Gravity	1·0315		1·0316
Total Solids	11·84%		11·93%
Fat	3·26%		3·27%

The figures for solids not fat are in far the most cases between 8·5 and 9·0, they never rise above 9·0, but fall occasionally below 8·5.

There were some other researches made at Raden regarding the composition of milk yielded by cows of four different breeds, each of them being represented by four cows. Altogether 124 analyses were made for the purpose of those researches. The specific gravity fell only once below 1·029, and rose to 1·0339. The lowest and highest figures for total solids were 10·66 and 13·45 per cent., for fat 2·60 and 4·70 per cent. The average of all analyses was for specific gravity 1·0316, for total solids 11·78, and for fat 3·23 per cent. The amount of solids not fat varies from 8 to 9 per cent., falls even below 8·0, and rises in a very few cases above 9·0.

At the dairy experimental station at Kiel ten cows are kept exclusively for the purpose of making experiments. The milk contained in average—

In the year	1878.....	Total Solids	12·43	per cent.....	Fat	3·70	per cent.
„	1879.....	„	12·13	„	„	3·42	„
„	1881.....	„	11·93	„	„	3.40	„

The solids not fat generally fall between 8·5 and 9·0 per cent.

At Proskau the milk of a herd of Dutch cows is at the disposal of the dairy institute. The cows are milked three times a day. The average composition of the milk was in the year 1879—Total solids 11·61 per cent., fat 3·19 per cent., the solids not fat fluctuating from 8 to 9 per cent.

Looking over all the figures previously mentioned, you will see that the specific gravity does not fluctuate very much, say from 1·029 to 1·034. Regarding the total solids and the fat, we may say that all the milk, with very few exceptions, is to be considered as not at all rich milk. The most striking point, however, will be to you the small amount of solids not fat. The solids not fat are never taken into consideration in Germany, and therefore I had to reckon them out for this paper especially. Now, as I know the value of the figures for solids not fat, I wonder that nobody cares for them there. Two figures account for the amount of solids not fat, namely, those for total solids and for fat. If the former are reduced to the lowest point, the latter raised to the highest, the solids not fat will be found proportionately low. That is the case in the previous analyses, but I repeat that I firmly believe them to be right. Thus much about milk analysis in Germany.

It is now about eighteen months since I first came to England, and not quite as long as that since I began my regular work. The Aylesbury Dairy Company thought it necessary to establish on their premises a laboratory fitted up very completely with all instruments and appliances, and to employ an analyst, so that they might be able to extend the system of controlling the milk, as then carried on, to the largest scale, and give their customers the greatest possible security of a regular supply of good, pure milk. Setting aside the two to three hundred examinations by means of the lactometer, to take the specific gravity, there are forty to sixty milk samples analysed daily to secure the object mentioned. Having this work before me, I had to think of three points—firstly, how to manage it; secondly, how to get the most correct results; and thirdly, how to come as close as possible to the method of analysing milk generally adopted by Public Analysts. The first thing was, that I had to abstain from weighing the portions taken for analysis. I measure them by means of correct pipettes. Further, I evaporate the milk taken for ascertaining the total solids in platinum dishes without any addition, and lastly, I do not extract the fat in such a way that I have to use the balance, but ascertain it by means of Marchand's lactobutyrometer. I perfectly know that I cannot claim for analyses carried out in this manner the fullest exactitude, but what they lose of correctness on the one side, they certainly gain by their vast number on the other.

Regarding the total solids, I carried out a series of experiments to decide whether there is any remarkable difference by evaporating milk with or without sea sand. In all cases I placed 5 c.c. of milk in platinum dishes, and kept the same for three hours on a boiling water-bath, and for two hours in the air-bath at a temperature of 95 to 100° C. When weighed, the platinum dishes containing sea sand generally yielded a little less total solids, but the difference was only a very small one, and never exceeded 0·1 per cent.

Regarding the fat, of course I had to abstain from extracting it after Soxhlet's method, which I consider the very best and exactest one we have. I had to employ a simple method, taking as little time as possible, and I never was doubtful what method I would have to choose. As I had made testing milk my special study, I always looked out for instruments and methods proposed for this purpose, and found opportunity to examine most of them myself. On the basis of my own experiences, and of those obtained by other analysts, I must say that of all the instruments proposed for ascertaining fat in milk, Marchand's lactobutyrometer is by far the best one. I expressed that in a book I wrote three years ago, *On the Methods of Testing Milk*, and notwithstanding some new methods having been brought out during the last years, the opinion about the lactobutyrometer has not been changed, as you may see in a book just published entitled *Communications of the Board of Health of the German Empire*. You will find there the same opinion about the lactobutyrometer.

The way to work the lactobutyrometer is a very simple one. 10 c.c. of milk are measured and placed in the tube; 10 c.c. of ether and some few drops of a solution of potassium hydrate are added, the tube then closed and shaken, so that all is well mixed. Then 10 c.c. of alcohol are added, and the closed tube shaken again. After this the tube is placed in water of about 40° C., until all the fat has risen. Then it may be placed in water of about 20° C., and the extension of the fat layer on the top read off. By the aid of a table you will find to how much fat it is equal. The whole operation is finished in about twenty minutes, but even a boy is able to carry out twenty to twenty-five examinations during one hour.

When I tried the lactobutyrometer against Soxhlet's method, I generally found 0·1 to 0·2 per cent. of fat less. I do not want to harass you with figures, and therefore I only give you some few results of ascertaining fat in milk by the said two methods obtained in my laboratory here. The first figure always refers to Soxhlet's, and the second one to Marchand's method:—3·63 and 3·4, 1·98 and 2·0, 3·16 and 3·0, 3·31 and 3·2, 4·06 and 3·8, 4·23 and 4·0, 3·13 and 3·0, 2·82 and 2·6, 2·90 and 2·8, 2·73 and 2·7, 3·54 and 3·4, 3·73 and 3·4, 3·26 and 3·2, 4·30 and 4·2. I call those results very satisfactory, and am sure you will arrive so close to the truth as the previous figures tell you; that is to say, you will not find a larger difference against Soxhlet's method, whenever you work the apparatus in the right manner, and use pure washed ether and pure alcohol of the right strength, namely, of 90 to 91 per cent. The strength of the alcohol is of very great importance. In my laboratory very much less satisfactory results were obtained when alcohol was accidentally used which was stronger than expected and forgotten to be diluted.

The lactobutyrometer is now very well known in Germany, both in laboratories and in dairies and large milk shops. It does not seem to be the same in this country. I by no means think that every analyst ought to buy any new instrument brought out, but I do think one might be allowed to expect some interest in new apparatus, especially when they are brought directly before the eyes of the chemical world. I regret to say that such an interest is not everywhere to be found, otherwise events like the following would be impossible. There was a query in the number of the *English Mechanic and World of Science* issued January 20th:—"To Mr. Allen or any correspondent. Would you kindly tell me what the lactobutyrometer is that is made by the Aylesbury Dairy Company, and

how it is worked? It seems very complicated in the drawings that they publish with their advertisements. I should have thought the quickest method of getting at the fat was that employed in milk analysis. Signed, Aconite." In the number of the same paper issued February 10th, a reply to this query was published as follows:—"I have not seen the advertisement of the Aylesbury Dairy Company referred to by 'Aconite' in his query addressed to Mr. Allen or any correspondent, but presume the instrument in question is one for ascertaining the quantity of fat in milk by estimating the extent of the opacity produced by the suspended fat globules. There are many sources of error in such a method, but it would probably give useful results in certain cases, and certainly would be much more rapid than any process based on the extraction of the fat. Signed, A. H. Allen." I may mention that an advertisement with drawing of the lactobutyrometer was published on the front page of the December and January numbers of THE ANALYST, the journal of this Society, so that everybody who took THE ANALYST in his hand must have seen it. But it is not that what I should like to point out. I want to protest very strongly against mixing up an instrument—which, in my opinion, is of the greatest value for ascertaining the fat in milk in all the cases where it is impossible to make an exact analysis—with the so-called lactoscopes, instruments which are, if of any value—only of a very little one, as the principle on which they are based is wrong. I do not want you to understand that I think the results obtained by using the lactobutyrometer irreversibly right. I myself extract the fat by means of Soxhlet's apparatus in all the cases of any importance. But I certainly think the lactobutyrometer a very valuable instrument for judging a milk, especially if you have two other figures besides those for the specific gravity and the total solids. At the last meeting it was mentioned that there is a possibility to account the specific gravity of a milk by addition of the figures for solids, fat, and water. I suppose that was an error, at least I do not know anything of this kind. Certainly there exist some relations between specific gravity, solids, and fat, and by a series of researches carried out by Dr. Behrend and Dr. Morgen, it seems to be possible to find the amount of total solids of a milk, if the specific gravity and the amount of fat is known, and a table, worked out for that purpose by the said analysts, is used. In most of the cases I checked this table, I found that it answers very well, and I hope one day I shall find time to go thoroughly into this matter, as I think it quite worth while. If the table is right, I should think it still of greater value to ascertain the specific gravity and the total solids, and account the fat. I must not omit to state that the lactobutyrometer cannot be used for ascertaining fat in skim milk, as the instrument does not indicate any fat if there is only 1·2 per cent. or less.

I mentioned previously that there are about forty to sixty analyses made in my laboratory daily; a great deal of this work is done by my assistant. The way in which the work is carried out has been communicated in what precedes, now I will give you some of the figures obtained.

The specific gravity of all the milk samples brought into the laboratory—about 250 daily—was generally found between 1·030 and 1·033; in some few cases it fell down to 1·029, and in some other it rose to 1·034. The average specific gravity of the milk examined during the past year, 1881, was 1·0315. The amount of total solids is in far the most cases 12 to 13 per cent., as lowest figure 11·3, as highest 15·7, was noticed; the

yearly average was 12·8 per cent. Fat was generally found to amount 3·0 to 3·5 per cent., the lowest and highest figures being 2·4 and 5·3, the average 3·1 per cent. The last figure, however, is to be considered too low, as there are some wrong figures among them, owing to the use of a too strong alcohol on working the lactobutyrometer. Of course, the figures for solids not fat are affected thereby as well. Generally the amount of solids not fat is between 9 and 10 per cent., the lowest figure noticed was 8·5, the highest 10·6, the average 9·7 per cent. The last figure has to be diminished to the same extent as the average figure for fat is to be raised.

I am fully aware that those figures just communicated to you cannot be compared directly with figures obtained by Public Analysts, as the methods of analysing differ. But I should like to put before you the question—Are milk analyses carried out in the same manner by all the Public Analysts, or by all the members of this Society, or even by all the members here present? I do not think they are. There are, as far as I know, some differences in ascertaining the total solids regarding time and temperature. There are—and on this point I am quite sure—some differences in extracting the fat. One analyst employs Soxhlet's apparatus, a second one extracts the fat by pouring cold ether over the total solids repeatedly, whilst a third one prefers the extraction with boiling ether. No wonder, when the results of analysing samples of the same milk by different analysts differ so much, and give a favourable opportunity to daily papers to speak about untrustworthiness of chemical science. I saw myself the analyses of samples of the same milk made by two Public Analysts, showing the following considerable differences:—

Milk I.	Analyst	1.	Total Solids,	13·5%	; Fat,	4·1%	; Solids not fat,	9·4%.
,,	,,	2.	,,	12·9%	; ,,	3·2%	; ,,	9·7%.
Milk II.	,,	1.	,,	13·5%	; ,,	3·9%	; ,,	9·6%.
,,	,,	2.	,,	12·9%	; ,,	3·2%	; ,,	9·7%.
Milk III.	,,	1.	,,	13·1%	; ,,	4·1%	; ,,	9·0%.
,,	,,	2.	,,	13·5%	; ,,	3·2%	; ,,	10·3%.

Those figures speak for themselves.

Two reasons may account for the fact that some Public Analysts deviate from the method of analysing milk adopted by this Society—namely, the bringing out a more convenient or a more correct method. I should object to a certain degree to the first reason, but cannot object to the second one. Thus when you would find that the extraction of fat is more correct by using Soxhlet's method, I should advise you to adopt this method generally, even then, when you would find that the figures for solids not fat would fall occasionally below your present standard. After all, what I have seen in the time since I have been in England, I believe that the milk yielded here is in general a great deal better than that yielded in the north and middle of Germany. But I also believe that 9 per cent. as standard for solids not fat is too high. To support my assumption, I give you in the following some few figures chosen without selection out of a great number of similar ones—

	1	2	3	4	5	6
Specific Gravity....	1·0305	1·0300	1·0305	1·0300	1·0300	1·0300
Total Solids.....	13·02%	12·60%	12·44%	12·64%	12·24%	12·38%
Fat	4·20%	3·80%	3·60%	3·80%	3·40%	3·60%
Solids not Fat.....	8·82%	8·80%	8·84%	8·84%	8·84%	8·78%

In all those samples the solids not fat fall below 9 per cent., and in average you would say they contain 2 per cent. of added water. I, however, consider them not only as samples of quite pure but of a very fair milk. Just in the present month, when, with the winter, hay and clover grow towards an end, and the farmers—as it is the same here and

everywhere—do not like to put their hands into their pockets and spend some money for buying food, you will find a great deal of genuine milk with an amount of solids not fat below 9 per cent. I should propose to take 8·5 per cent. as standard for solids not fat. The standard for fat might be raised to 2·75, so that the smallest amount of total solids demanded would be 11·25 per cent.

I should like to touch on yet another question. We all know perfectly well that in some cases it is quite impossible to state that some water had been added to milk. Add 10 per cent. of water to a milk with a specific gravity of 1·033, with 14 per cent. of total solids and 4 per cent. of fat, and you will have a mixture with a specific gravity of 1·030, 12·7 per cent. of total solids, and 3·6 per cent. of fat. By adding 15 per cent. of water the solids not fat would fall below the limit of 9 per cent., they would come down to 8·7 and you would state the milk contains 3 per cent. of added water. I must say that I have always a peculiar impression by reading such a statement. Everybody will know that the profit of an addition of 3 per cent. of water to milk would not cover the risk, and that therefore an adulteration in such an extent will scarcely be executed. I think you could come very easily over this little difficulty if you would not state that so and so much water has been added to the milk, but that the milk falls so and so many per cent. below the standard. By adopting this form for your statements you would be able at the same time to distinguish milk with higher amounts of solids, saying it runs so and so many per cent. above the standard, and such a statement might be of some value now and then.

Before I conclude my paper I should like to call your attention to the great importance of taking the specific gravity of milk to be tested. I ascertained the specific gravity of thousands and thousands of milk samples, but never found it below 1·029 when I had a normal and well mixed milk of at least five cows. There are so many milk analyses published in this country without mentioning the specific gravity, which in many cases would give a very good control of analytical figures. Of course, if a lactometer is employed or taking the specific gravity, one has to examine the instrument, whether it shows the right specific gravity. I have had a great number of lactometers in my hand which differed two, three, and even more degrees. The larger the space for one degree on the scale is, the better it is. Those lactometers are very convenient which are combined with a thermometer, so that specific gravity and temperature may be read off at the same time.

ON SOME POINTS IN MILK ANALYSIS.

By Otto Hehner, F.C.S., F.I.C.

Read before the Society of Public Analysts on 15th March, 1882.

It can hardly be expected that anything very novel can be brought forward in a subject which has been so well ventilated, and which before all others has engaged the attention of Public Analysts, as milk analysis. But from some statements which have recently been made before us (see Mr. W. Johnstone's paper in No. 72 of The Analyst) and elsewhere, it appears that not a few analysts have forgotten, that the results obtained by the analysis of milk are not results laying claim to absolute scientific accuracy, but are only comparative ones, and that the limits adopted by the Society—9 per cent. of solids not fat and 2·5 per

cent. of fat—hold good only when each analysis is made in the manner which led to the adoption of these limits; namely, by drying five grammes of the milk for two and a half to three hours over an open water-bath, and by exhausting the residue with from three to six successive quantities of boiling ether. Modifications of this plan have gradually crept in, and concurrently with the adoption of these modifications, instances have multiplied in which undoubtedly genuine milk did fall below the Society's limits. Although it cannot be held that the deficiency in solids not fat was in every case due to the modification in the analytical process, it yet appears certain that in many instances the cause lay less with the milk than with the analyst.

The object of the few experiments laid down in this paper was to ascertain how far the results depended upon the details of the process adopted.

I.—Time and Manner of Drying.

A. 5·2967 grms. of milk were evaporated in a platinum basin, the residue dried on an open water-bath, and weighed every hour.

Weight of residue after	2 hours	·6037	or 11·39 per cent.
	3 „	·5971	11·27
	4 „	·5960	11·25
	5 „	·5944	11·22
	6 „	·5941	11·21

B. 5·0916 grms., treated as above.

Weight of residue after	2 hours	·5764	or 11·32 per cent.
	3 „	·5727	11·25
	4 „	·5714	11·22
	5 „	·5702	11·19
	6 „	·5698	11·19

C. 5·3288 grms. of the same milk were evaporated on a water-bath, and the residue dried in a closed water oven.

Weight of total solids after	2 hours	·6094	or 11·43 per cent
	3 „	·6033	11·32
	4 „	·6006	11·27
	5 „	·5981	11·22
	6 „	·5972	11·20
	7 „	·5958	11·19

D. 5·3354 grms. dried in a water oven, as in C.

Weight of total solids after	2 hours	·6209	or 11·63 per cent.
	3 „	·6091	11·41
	4 „	·6042	11·32
	5 „	·6015	11·27
	6 „	·6001	11·25
	7 „	·5977	11·20

C and D, weighed after eight hours, showed no further decrease.

E. 5·2980 grms. of the same milk, dried in a water oven.

Weight of total solids after	2 hours	·6132	or 11·57 per cent.
	3 „	·6047	11·41
	4 „	·6015	11·35
	5 „	·5965	11·26
	6 „	·5951	11·23
	7 „	·5925	11·18
	8 „	·5919	11·18

F. 5·0560 grms. of another milk gave, on drying on the open water-bath—

Weight of solids after	3 hours	·5500 or	10·88 per cent.
	4 „	·5464	10·80
	5 „	·5438	10·75
	6 „	·5438	10·75

G. 5·2227 grms. of the same milk, treated like F., gave total solids, after

	3 hours	·5655 or	10·83 per cent.
	4 „	·5629	10·78
	5 „	·5610	10·74
	6 „	·5597	10·71
	7 „	·5590	10·70

H. 5·3447 grms. of the same milk dried in a water oven.

	3 hours	·5818 or	10·88 per cent.
	4 „	·5774	10·80
	5 „	·5743	10·75
	6 „	·5727	10·71
	7 „	·5720	10·70

I. 5·1463 grms., treated as H., gave total solids, after

	3 hours	·5667 or	11·01 per cent.
	4 „	·5590	10·86
	5 „	·5546	10·77
	6 „	·5525	10·73
	7 „	·5519	10·72

It follows from these figures, that milk residues are not really dry after having been heated for three hours, but continue to lose weight until they have been heated from six to eight hours. The results obtained are almost absolutely uniform after drying to constancy, but are by no means so satisfactory after three hours only. Thus, while the greatest difference between the really dry solids was in case of milk I., ·03 per cent.; and in milk II., 0·05 per cent., the percentages differed after three hours ·17 and ·18 from each other. The loss on drying from three hours to constant weight—the weight being taken constant when the loss per hour was less than one milligram—varied from ·06 to ·29 per cent.

It is also seen that milk residues dry somewhat more rapidly on an open water-bath than in a closed water oven.

II.—Temperature of Drying.

The dry residues from A and B were placed side by side into an air-bath, heated to 110° C.

A.	Weight of residue after	1 hour's drying at 110°	·5894 or	11·13 per cent.
		2 „ „	·5871	11·09
		3 „ „	·5834	11·01
		4 „ „	·5817	10·98
		5 „ „	·5809	10·97
		6 „ „	·5783	10·92
B.	Weight after	1 „ „	·5582 or	10·96 per cent.
		2 „ „	·5492	10·79
		3 „ „	·5480	10·76
		4 „ „	·5465	10·73
		5 „ „	·5446	10·70
		6 „ „	·5440	10·68
F.	Weight after	1 „ „	·5390 or	10·66 per cent.
		2 „ „	·5363	10·60
		3 „ „	·5347	10·57
		4 „ „	·5340	10·56

All residues, heated at 110°, become highly rancid, and slightly brown. A had diminished ·29 per cent., B ·51 per cent., and F ·19 per cent., by drying at 110°, after constant weight at 100° had been obtained. It is remarkable that A and B, although heated in the same bath together, yet lost weight very unequally.

III.—Mode of Fat Extraction.

D. The dry residue from D was extracted in a Soxhlet apparatus with absolute ether, and then dried in a water oven to constancy.

Weight of solids not fat after 1 hour's extraction	0·4554	or 8·54 per cent.
2 „ „	0·4521	8·47

The weight did not further diminish by a third treatment of one hour.

C. The dry residue of C. was boiled out with six successive quantities of ether.

Weight of solids not fat .. .. ·4618 or 8·67 per cent.

E. The residue of E. was digested with ether over-night, and next morning boiled out with six lots of ether.

Weight of solids not fat .. .. ·4589 or 8·66 per cent.

After further treatment with six quantities of boiling ether:

Weight of solids not fat .. .. ·4538 or 8·56 per cent.

Residues A and B (dried at 110°) were treated in Soxhlet's apparatus for two hours.

A.—A gave ·4361 grms. or 8·23 per cent. of solids not fat.
B.—B „ ·4101 „ or 8·05 „ „ „

G. The dry solids were boiled out with ether.

3 times.	Weight of solids not fat	·4508	or 8·63 per cent.
6 „	„	·4422	8·46
9 „	„	·4420	8·46

H. Extracted in Soxhlet.

1 hour.	Solids not fat	·4484	or 8·39 per cent.
2 „	„	·4469	8·36

I. The dry solids were treated with ether over-night, then boiled six times with ether.

Solids not fat .. .. ·4363 or 8·48 per cent.

F. The solids dried at 110° were extracted in Soxhlet for two hours.

Solids not fat .. .. ·4184 or 8·28 per cent.

K. 12,9100 grms. of milk, which yielded by two hours treatment in a Soxhlet extractor 3·12 per cent. of fat, were evaporated on a water-bath with occasional stirring so as to granulate the residue; this was boiled out with six quantities of ether, and the fat determined direct. Obtained ·3509 grms. or 2·72 per cent.

L. The perfectly dry residue from 5 grms. of the milk K. was extracted six times with absolute ether, containing 10 per cent. of absolute alcohol. Fat obtained, 2·98 per cent.

From the results of these fat and solids not fat determinations, it follows that boiling out the total solids with three, six, or more successive quantities of ether, yields about 0·2 per cent. less fat than is obtained by two hours' treatment in a Soxhlet extractor; that no more fat is extracted by prolonged action of ether upon the solids than by merely boiling out; that granulation of the milk residue does not render the latter more amenable to the ether treatment; that 10 per cent. of absolute alcohol in the ether used for extraction but little effects the result; and lastly, that by the drying of the total solids at 110° the amount of fat is not appreciably affected, but that only the solids not fat are diminished.

IV.—Ash Determination.

A weighed quantity of milk I. was evaporated and incinerated at the lowest possible temperature—below visible red heat. Found ·68 per cent. ash. Another quantity, incinerated at red heat, yielded ·66 per cent., and a third portion, heated to bright red heat in a large Bunsen flame gave 0·64 per cent. of ash.

A sample of milk II., weighing 5·2286 grms., incinerated at the lowest practicable heat, furnished 0·0342 or 0·65 per cent. of white ash. This, heated in a Bunsen flame with gradually increasing gas pressure, fell to ·64, ·60, 0·59, and lastly, at bright red heat to ·58 per cent.

The solids not fat of the same milk, carefully incinerated, yielded 0·68 and 0·67 per cent. of ash ; and in two further experiments, at red heat 0·65 and 0·62 per cent.

It follows, that identical results are obtained by incineration of the whole milk, and of the solids not fat; that is to say, that the mineral constituents of milk are quite insoluble in ether. It also appears that milk should be incinerated at the lowest possible temperature, a sensible proportion of ash being volatile at red heat.

The figures of the few simple experiments recorded above, place beyond doubt that apparently slight deviations from the commonly adopted procedure of milk examination lead to widely discrepant results, and in every instance do the modifications in the method of analysis which I have examined tend to yield a lower amount of solids not fat, and a larger percentage of fat than does the original (Wanklyn) method. Thus, taking the average of nine observations, milk solids, dried for three hours, diminished by ·14 per cent. by drying them at 100° C. to constant weight; the constant solids further diminish 0·33 per cent. when heated at 110° (average of three observations). The same milk will therefore yield after three hours drying 0·47 per cent. more solids than when dried to constancy at 110°. And further, by ether treatment in a Soxhlet extractor from 0·1 to 0·2 per cent. more fat is obtained than by the ordinary boiling out with six successive quantities of ether; so that altogether the solids not fat may readily be diminished by 0·6 to 0·7 per cent. by thorough drying and extraction, and a milk furnishing by the Wanklyn method 9 per cent. of solids not fat be credited with no more than 8·3 by other methods.

That this is a very notable difference will not be gainsaid, and Public Analysts will have to consider most seriously whether the time has not arrived to alter both the official method of analysis and the official limits.

It appears to me, that as much more concordant results are obtained when the solids are dried to constant weight than for three hours only, and that as the fat is much more completely, readily, and with a less amount of trouble extracted in an extractor such as Soxhlet's, it would be well to discard the old plan, and accordingly to lower the limit of solids not fat from 9 to 8·5 per cent. Drying at 110° is inadmissible and mischievous.

The plan then would be to dry about 5 grms. of milk for from 6 to 7 hours at 100° ; to extract the dry solids for two hours in an extractor with absolute ether, again to dry the solids not fat to constancy, and then to incinerate them at the lowest possible temperature, only *one* quantity of 5 grms. being used for the whole analysis.

Such a procedure should not, however, be adopted without the full consent of all Public Analysts, in order to insure in a greater measure than heretofore absolute uniformity in the method and in the results obtained.

THE PUBLIC WATER SUPPLIES OF ENGLAND.

VALUATION, ACCORDING TO "WIGNER'S VALUATION SCALE."

Under the above heading we have published for the last nine months the valuations of the various waters, the analyses of which have appeared in this Journal from month to month. In the great majority of instances these valuations have been made by the analysts themselves, and in the cases in which they have been missed, or have been obviously incorrect, by one of the Editors of this Journal. They have been published solely on the authority of the Editors, and not as part of the Society's proceedings. It will be seen from a report of the General Meeting of the Society, which we publish on another page, that a majority have decided against the adoption of the scale as a Society's scale, and it remains as before, simply on the same footing as any other paper which has been read before the Society.

Under these circumstances it appears to the Editors undesirable to continue the publication of these monthly valuations, especially as some analysts, whose analyses are published, do not agree with the system of valuation.

ON METAPHENYLENE DIAMINE AS A REAGENT FOR THE DETERMINATION OF NITRITES IN WATER.

By A. Percy Smith, F.I.C., F.C.S., Assistant Chemical Master, Rugby School.

The use of metaphenylene diamine was introduced to the notice of the Society of Public Analysts on Feb. 16th 1881, by Mr. Williams [Analyst VI. 36]. Since then I have at various times tried to obtain from wholesale chemists, either the base, or its salts, but without success. This failure impressed me with the belief that there was some difficulty in the preparation of metaphenylene diamine, but upon trial I found that such was not the case; that is to say, it is easy to prepare a reagent that will give an orange colour with NO_2. I will not guarantee its purity. The method I have pursued is as follows:

Take of	Nordhausen Sulphuric Acid	100 c.c.
	Strongest Nitric Acid	100 c.c.
	Nitrobenzene	20 c.c.

Place in a flask, agitate, boil, and allow to stand till cold, when pour into much cold water Allow to stand for some time; filter, wash the precipitate first with cold water, and then with cold alcohol, and finally crystallize from hot alcohol, decanting the alcoholic solution from any orange oily liquid that does not readily dissolve.

The crystals which separate from the alcohol on cooling, consist chiefly of metadinitrobenzene. They should be of a very pale yellow colour, almost white, and yield M.Ph.D. on reduction by nascent hydrogen. I tried various methods of effecting this object, the most successful being by the use of iron filings and HCl. The flask or beaker may be heated. When reduction is complete, filter, *nearly* neutralize the now red liquid with KHo solution, leaving a slight amount of free acid; heat and filter from precipitated FeO. Acidify filtrate with H_2SO_4, add animal charcoal and filter; both precipitates may be washed with alcohol. The resulting solution should be colourless, or faintly yellow, and may amount to about 400 c.c. 1c.c. will give a decided colour with KNO_2 and H_2SO_4 in the manner recommended

by Mr. Williams. [op. cit.] The actual strength of the solution does not seem to be of very much importance. If economy be studied, the mother liquid from which the MDNB was crystallized may be precipitated by the addition of water, and the resulting crystals reduced, the product will however be coloured. This colour is not of much consequence, as owing to the small quantity used in testing, the tint is unappreciable.

The residue which does not readily dissolve in hot alcohol, will also yield some M.Ph.D. on reduction, but it is not worth while to do so as the solution will be highly coloured and contaminated with aniline, formed by the reduction of residual nitrobenzene.

With regard to the manner of employing the reagent, I have nothing to add to the directions already given by Mr. Williams, except that I find it convenient to evaporate the water I am testing from 500 c.c. to 100 c.c. or less.

[Note].—Since writing the above I find, on referring to Hofmann's original researches on the aromatic diamines [*Proc. Roy. Soc.* Vol. XI. 521] that he prepared phenylene diamine by *distilling* dinitrobenzene with iron and acetic acid. I have not tried this method. Hofmann does not say if he distilled in a current of H. or CO_2; I presume not. Since, however, metaphenylene diamine oxidizes with facility, it might be better to do so, or receive the distillate in weak acid so as to form a salt at once, and then crystallize.

A METHOD OF DISCRIMINATING BETWEEN OXYGEN ABSORBED BY NITRITES AND ORGANIC MATTER.

By Frank P. Perkins.

Beautiful as the permanganate process, elaborated by Dr. Tidy, undoubtedly is, its usefulness in relation to water analysis would be much enhanced were it possible to determine and definitely fix by its aid the limits of absorption of oxygen by nitrites and organic matter. The artifice at present employed—viz.: to allow the standardized permanganate to act for a few moments, and then place the oxygen consumed in that time to the credit of the nitrites—appears unsatisfactory, for evidently an approximation to the truth can only be arrived at by acting in this way. It occurred to me that oxygen absorbed by nitrites may be more correctly estimated (in an indirect manner) by altogether destroying them before applying the permanganate.

When my last paper was submitted to you, I was not aware that the action of magnesium on water was sufficient, in the cold, to decompose it rapidly enough for the purpose there required; but experiments since performed have assured me of the fact. It is advantageous, however, to favour the reaction by the addition of a small quantity of sodium chloride. Contact with platinum is unnecessary, although, if preferred, increase of power may also be gained in that way. It will be needless to enter into minute particulars: it is enough to say that the nitrites (and nitrates) having been broken up (and care must be taken by the application of some qualitative test to a portion of the water that this is effectually done) 250 c.c. of the prepared water and 250 c.c. of the water in its original condition are placed in flasks, and 10 c.c. of dilute sulphuric acid, prepared in the usual way, added to each.

The flasks are now heated, and the water brought to the boiling point; the lamp is then removed, and after a short interval 10 c.c. of the standard permanganate run into

either vessel and allowed to act for three hours, the water gradually cooling during the time. The usual manipulations accompanying the titration with hyposulphite are then gone through with, and the experiments being concluded the difference between the two represents the amount of oxygen consumed by the nitrites contained in the water.

EXETER WATER FROM TANK.

	Per 100,000 pts. oxygen absorbed.
1. The water before being acted on by Mg.	·101
The water after being acted on by Mg.	·068
Difference due to Nitrites ..	·033 = ·028 N.
2. The water before being acted on by Mg.	·103
The water after being acted on by Mg.	·081
Difference due to Nitrites ..	·022 = ·019 N.

FROM LABORATORY TAP.

	Per 100,000 pts. oxygen absorbed.
3. The water before being acted on by Mg.	·0937
The water after being acted on by Mg.	·0593
Difference due to Nitrites ..	·0344 = ·0301 N.
4. Experiment with Copper-Zinc Couple—	
Water before being acted on	·098
Water after being acted on	·0644
Difference due to Nitrites ..	·0336 = ·0294 N.

ANHYDROUS BINOXIDE OF BARIUM.

ANHYDROUS binoxide of barium, as is well known, is a powerful bleaching agent. Treated by almost any acid, in presence of water it yields peroxide of hydrogen, the discoloring action of which chemical on the organic matters has been made use of for various purposes. In this manner raw silks, woollen and cotton fabrics, straws, skins and furs, feathers and hair can be bleached, and articles of little commercial value otherwise, or even worthless, can be made to bring remunerative prices. There is a demand for anhydrous binoxide of barium made in this country for the different uses quoted above; but until lately we have been entirely dependent upon Europe for the supply of this product. It is now manufactured in this country. An exchange says that the qualities imported have been in many cases inferior, and the prices asked entirely out of proportion with the purity of the article. But even when carefully manufactured, and of a proper strength and purity, the anhydrous binoxide imported presents a drawback. Its usefulness depends upon the amount of active peroxide of hydrogen it can yield under chemical treatment, and this quantity, which, in fact, does represent its real value, is much diminished when it has been prepared for a length of time, even a few weeks—a fact well known to chemists, and well established amongst those who know how to employ the chemical. This loss of action or of energy, so to speak, can reach as much as 15 per cent. of the original value of the substance as first prepared after a month or so, whatever care and skill might first have been given to its manufacture, and however pure it might have been originally. It is easy to realize that a transportation on steamers, besides the time it requires to make the transit, is very objectionable. Notwithstanding all the precautions taken, it is impossible to guard against the access of moisture and other sources of deterioration; and the article, however superior it might have been, is necessarily, as it reaches us, inferior to what it was when first prepared in Europe.—*New York Oil and Drug News.*

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in March, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Mar. 27	p. blue clear	none	1·84	trace	·46	·0020	·0053	·014	·024	21·4°	6·9°	33·0	satisfactory	Wigner & Harland.
New River	,, 14	clear	none	1·12	trace	·23	·0007	·0021	·062	·019	14·0°	4·5°	20·7	satisfactory	B. Dyer.
East London	,, 9	clear greenish	none	1·20	none	·38	·0017	·0025	·036	·082	15·0°	5·0°	25·4	mycm. vg. db., fib., anml.	Wigner & Harland.
Southwark & Vauxhall	,, 25	p. y. & clear	none	1·24	trace	·23	none	·0056	·027	·052	15·5°	3·5°	19·2	satisfactory	J. Muter.
West Middlesex	,, 22	greenish yellow		·98	trace	·18	·0007	·0053	·027	·062	12·5°	2·0°	20·5	none	O. Hehner.
Grand Junction	,,	p. yellow		1·14	trace	·26	·0020	·0060	·028	·094	14·2°	3·7°	19·8		A. Wynter-Blyth.
Lambeth	,, 25	p. y. & clear	none	1·49	trace	·29	·0007	·0049	·026	·049	16·0°	3·5°	20·7	satisfactory	J. Muter.
Chelsea	,, 15	c. p. green	none	1·12	trace	·95	·0028	·0056	·036	·084	18·0°	5·0°	19·7		A. Dupré.
Birmingham	Mar. 7	grnsh. v. s. turb	none	2·66	trace	·31	·0028		·022	·064	11·5°	6·3°	20·4		A. Hill.
Brighton	,, 9	pale blue clear	none	2·13	none	·36	none	·0031	·008	·040	13·0°	5·0°	20·6	fibres, veg. debris	Wigner & Harland.
Bolton	,, 14	s. turbid	none	·50	none	·04	·0020	·0032	·018	·040	3·6°	3·4°	8·8	mineral and veg. debris	W. H. Watson.
Bristol	,, 6	grnsh. brown	none	·90	none	·05	·0003	·0048	·018	·040	17·4°	2·9°	19·6	sand, algæ	F. W. Stoddart.
Cambridge	,, 16	c. p. blue	none	1·40	trace	·45	·0014	·0028	none	·026	16·0°	5·0°	24·5	satisfactory	J. West Knights.
Canterbury	,, 17	p. blue	none	1·47	none	·33	·0050	·0050	·003	·006	4·9°	4·0°	10·0	s. mineral	S. Harvey.
Croydon	,, 21	brgt. colourless	none	1·19	trace	·30	none	·0030	none	·012	15·0°	6·5°	24·6	none	C. Heisch.
Dublin	Feb. 28	s. yellow	none	·89	trace	traces	·0010	·0040	·060	·190	1·3°	·7°	4·3	satisfactory	C. A. Cameron.
Edinburgh	Mar. 16	s. brown	none	·80	none	f. trace	·0008	·0040	·012	·050	4·7°	4·4°	5·5	none	J. Falconer King.
Exeter	,, 7	f. brnsh. yellow		·98	trace	·15	·0014	·0056	·018	·045	2·4°	2·4°	7·0	minl. and veg. diatoms	F. P. Perkins.
Grantham	,, 8	c. p. blue	none	1·09	trace	·59	·0009	·0015	·006	·007	15·6°	6·6°	23·9	diatoms, mvg.orgms., &c.	A. Ashby.
Hastings	,, 15	blue	none	4·80	trace	·01	·0007	·0014	·002	·005	11·0°	6·0°	27·5	satisfactory	H. F. Cheshire.
Ipswich	,, 18	c. colourless	none	2·30	trace	·28	·0036	·0060	·007	·010	19·2°	8·2°	31·2	satisfactory	J. Napier.
King's Lynn	,, 17	dirty yellow	weedy	1·10	trace	·31	·0007	·0063	·152	·230	19·0°	5·5°	21·2	veg. debris, diatoms mvg.	W. Johnstone.
Liverpool	,, 7	yell. green	s. peaty	·95	trace	·04	·0014	·0028	·042	·100	3·4°	3·1°	7·8	[orgms. bacteria, &c.	A. Smetham.
Maidstone—															
Wtr. Company	,, 13	c. p. green	none	2·60	trace	·63		·0007	·011	·018	17·0°	7·6°	37·5	none	M. A. Adams.
Public Conduit	,, 13	c. p. blue	none	2·39	trace	·62		·0007	·007	·009	16·6°	7·3°	33·9	none	M. A. Adams.
Manchester	,, 16	s. turb. f. yell.	none	·74	none	none	·0029	·0028	·017	·076	1·8°	1·7°	4·7	s. mineral	W. Thomson.

SOCIETY OF PUBLIC ANALYSTS.

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*Newark	Mar. 4	v. turb. p. brwn.	none	1·19	trace	·09	·0013	·0084	·046	·099	16·2°	11·2°	26·4	amorphs.mtr. mvg. orgms	A. Ashby.
Newcastle-on-Tyne.....	,, 8	s. turb. f. yell.	none	·94	trace	·04	·0010	·0090	·060	·107	16·0°	6·0°	20·0	satisfactory	J. Pattinson.
Nottingham ..	,, 15	bluish green	none	1·91	trace	·74	·0020	·0124	·018	·026	10·4°	6·4°	23·4	veg. deb.	Wigner & Harland.
Norwich	,, 9	f. grnsh. yell.	none	1·85	trace	·52	trace	·0060	·054	·094	14·0°	4·0°	20·0		W. G. Crook.
Poole	,,				trace	·05	trace	·0032	·039	·039	1·5°	1·3°	3·6	diatoms, veg. deb., peaty	A. Angell.
Portsmouth ..	,, 4	s. turbid	none	12·50	trace	·17	trace	·0042	none	none	11·5°	2·0°	18·3	veg. deb., diatoms	W. J. Sykes.
Reading	,, 11	c. greenish	f. weedy	1·00	trace	·12	·0007	·0056	·033	·048	14·9°	3·8°	19·1	none	J. Shea.
Rochdale.....	,, 20	light green	none	·66	none	·009	·003	·004	·0007	·006	2·80°	2·80°	6·00°	satisfactory	T. A. Collinge.
Rugby	,, 5	p. yellow turb.	none	1·03	h. trace	·38	·0056	·0280	·035	·102	8·0°	6·5°	14·5	veg. deb., animal.	A. P. Smith.
Salford	,, 5	c. l. yellow	none	·90	none	none	·0014	·0028	·003	·035	3·0°	2·5°	5·5	none	J. Carter Bell.
Shrewsbury ..	,, 17	c. colourless	none	1·45	none	·33	·0025	·0030	·004	·004	22·0°	6·0°	25·0	none	T. P. Blunt.
Southampton ..	,,			·90	h. trace	·19	·0051	·0087	·015	·089	12·6°	5 0°	20·0	satisfactory	A. Angell.
Swansea	,,	clear	none	·90	trace	trace	·0010	·0056	·003	·004	1·4°	1·4°	4·2	none	W. Morgan.
Whitehaven ..	,, 3	c. f. green	none	·39	none	·01	none	·0008	·006	·016	·4°	·4°	2·1	veg. deb., diatoms	A. Kitchin.
Schuylkill .... Philadelphia	Feb. 21 ,,	turb. yellow	none	·32	trace	·107	·0063	·0084			4·0°	4·0°	6·44	veg. deb., diatoms animal.	H. Leffmann.

* The Trent was in flood when this sample was taken.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

ERRATA.—In the February Table the West Middlesex Free Ammonia should have been ·0013 instead of ·0130; Exeter Albuminoid Ammonia should have been ·0039 instead of ·0004; Reading Chlorine should have been ·95 instead of 1·95.

THE WORK DONE BY PUBLIC ANALYSTS DURING 1881, UNDER THE SALE OF FOOD AND DRUGS ACT.

In the course of a few days we purpose issuing forms to all Public Analysts, in order to enable us to prepare the tabulated statement which we have published for several years past. As the compilation of such a table, which is becoming larger and larger every year, necessarily occupies some considerable time, we shall be greatly obliged if analysts will fill up and return the forms with as little delay as possible.

DEFENCE ANALYSTS.

THE refusal of the Home Secretary to permit a third analyst to be present on behalf of the defence during the analysis of the viscera of Percy Malcolm John, has elicited adverse comments in the public press. The reply of the Home Secretary to Lamson's solicitor, stating that the application must be refused, as it was contrary to precedent, is of course indefensible. The refusal might, however, have been made on other and better grounds. The right course was pursued of having a second analyst present in a case of such a serious nature. In his evidence, Dr. Stevenson stated that it was at his request that Dr. Dupré was appointed to assist. Both of these gentlemen were in the position of independent experts appointed by the Home Office, at the request of the coroner, to assist in the determination of the cause of death; and they were not responsible to the actual prosecuting authority, viz., the Treasury. It was not until nearly a week after the analyses were entrusted to Dr. Stevenson, that application was made for the presence of a third analyst on Lamson's behalf. By this time, the analyses must have been well in hand; and we fail to see what good result could have ensued from the presence of a gentleman responsible only to his employer, the prisoner. Were the rule introduced of having an analyst present on behalf of the defence, grave results might ensue, and the public interests would not be subserved by the change. The third party would usually be introduced at a late stage in the analysis; he could have no voice in, or control of, the analyses; his objections might or might not have weight with the official analysts. Moreover, it would be practically impossible to secure the collective attendance of three analysts eminent in their profession day by day for perhaps two or three weeks. The semblance of injustice done to Lamson by the refusal of the Home Secretary was, we believe, a semblance only; though we must admit that the refusal was made on quite insufficient and erroneous grounds.—*British Medical Journal.*

LAW REPORTS.

Oatmeal Adulteration:—

At the Yorkshire West Riding Police-court recently, Mr. William Heap, grocer, Bentley, was summoned for having adulterated oatmeal in his possession. Mr. Allen, of Sheffield, the Public Analyst, reported that the meal contained 20 per cent. of other ingredients than the meal produced from oats. On behalf of the defendant it was stated that Mr. Fairley, a well-known analyst at Leeds, had also analysed defendant's part of the oatmeal, and he stated that it was only adulterated to the extent of 5 per cent. No doubt this portion of foreign ingredient had been mixed with the meal when first it was ground at the mill. It was impossible to get oatmeal free from such ingredients. The magistrates decided to send the parcel of oatmeal still in the hands of the police for analysis by the Inland Revenue authorities. Last Saturday the report from Somerset House was produced, and it stated that the meal contained 10 per cent. of foreign matter. The defendant said he did not know he was selling adulterated meal, as he sold it as he received it from the millers. A nominal fine of 10s. and 30s. costs was imposed.

Mark Elvidge, Mill Lane, Burton Road, was summoned by Sergeant Richardson for selling milk which was not of the nature, substance, and quality demanded. Dr. Harrison, Public Analyst, said the milk had been deprived of one-third of its fat; it had either been partially skimmed, or else skimmed and new milk mixed. The defendant was fined 15s., including costs.

Butterine Sold as Butter.—Heavy Fines :—

At the Wednesbury Police-court, recently, Mr. Timothy Carter, grocer and provision dealer, Steelhouse Lane, Birmingham, was charged before Mr. W. F. F. Boughey (stipendiary), by Mr. Horder, the inspector under the Sale of Food and Drugs Act for the South Staffordshire district, with selling butter which was not of the quality and nature demanded by the purchaser. Mr. Stirk, of Wolverhampton, appeared for the defendant. Francis Henry Summerville, an assistant to Mr. Horder, stated that he had lately visited a stall kept in the Wednesbury Market by the defendant, and asked to be supplied with one pound of butter. An assistant supplied him with an article which he supposed to be genuine butter, for which he paid 8d. He informed the assistant that the article supplied him would be analysed by the County Analyst, Mr. Jones, and if it were found to be adulterated his employer would be summoned before the magistrate. Upon this the assistant stated that the article supplied was butterine. By Mr. Stirk: He was quite sure that he asked for butter. He was not told that the article before being supplied him was butterine. It was after it was purchased that he was informed it was butterine. It reply to Inspector Horder, witness stated that he had bought butter at 8d. per lb. which the analyst had certified to be pure. Mr. Horder stated that on the 4th inst. he received two packets from the last witness, and he delivered one of them to the County Analyst (Mr. Jones), who had since sent him a certificate to the effect that the article was not butter, and contained less than 1 per cent. of real butter fat. The analysis was—water 6·55, salt 1·32, curd 1·50, fat 90·53. Mr. Stirk said the article was no sold as butter, but as butterine, and as it was supplied by a young assistant, he trusted the Stipendiary would dismiss the case. The Stipendiary said he considered the case clearly proved, and as it was highly important that the public shonld be supplied with genuine articles, it was necessary that he, as a magistrate, should enforce the law. He considered the present case a bad one, and defendant would have to pay a fine of £5 and £1 14s. 6d. costs.

James Powell, grocer, &c., Dudley Port, was summoned on 9th December for selling adulterated butter. Mr. E. H. Thorne defended. Fras. Summerville, assistant to Mr. J. G. Horder, the inspector under the Sale of Food and Drugs Act, visited the defendant's shop on the 3rd of November, and asked for 1lb. of roll butter. Mrs. Powell gave him a sample, for which he paid 1s. A portion of the sample was afterwards analysed by Mr. E. W. T. Jones, analyst, who found that it was a fictitious article, containing only 7 per cent. of real butter fat. All the other portion was animal fat, made to represent butter. The article was butterine. For the defence, it was contended that the article was sold as butterine, and the purchaser was told so when he was supplied. Mr. Boughey, after some lengthy remarks on the fraud committed by defendant, and the worthless character of butterine, imposed a fine of £10, and said he should impose similar penalties in all these cases.

Sale of French Coffee :—

At the Cannock (South Staffordshire) Police Court, lately, before Messrs. F. V. Forster, R. H. Briscoe, and B. Gilpin, Mr. Leonard Adams, grocer, residing at Cannock, was summoned by Mr. J. G. Horder, the inspector under the Sale of Food and Drugs Act, for selling adulterated coffee. Mr. Tanner, of Birmingham, appeared for the defence. Henry Francis Somerville, assistant to Mr. Horder, stated that he visited the defendant's shop on the 16th ult., and asked for a tin of coffee, for which he paid 10d. The contents of the tin were afterwards analysed by Mr. Jones, the County Analyst, and were found to contain 72 per cent. of chicory. In reply to Mr. Tanner, Mr. Horder said he was not aware that French coffee was an extensive article of commerce. When people asked for a pure article they expected to get one. Chicory and coffee could not be looked upon as pure. Mr. Tanner contended that there was nothing fraudulent in connection with the sale, as French coffee was a well-known article of commerce, containing 28 per cent. of coffee, which was worth 4d., the chicory and the tin making up the value of the whole to 8½d. Further, the label "French coffee," protected the defendant from any action. He afterwards proceeded to quote decisions in his favour, and asserted that the magistrates could not legally convict. The Bench decided to dismiss the case; but the chairman remarked that it was a proper case to bring before the court. Mr. Briscoe said he thought it was only right that the public should know the rubbish they were purchasing. Mr. Horder said he should on behalf of the county authorities appeal against the decision.

Mustard Labelled as a Condiment:—

A case of some importance has lately been disposed of in Scotland, and as it will probably rule similar cases—at least in that part of the kingdom, we give a short note of the matter. An inspector bought a quarter of pound of mustard, and he received a tin, rolled in paper, containing what afterwards proved to be a mixture of mustard and flour, or starch. He was not told that the mustard was mixed, and although the packet bore a label saying that the contents consisted of mustard and choice condiments, his attention was not drawn to that. He paid 2s. per pound for the mixture, which was understood to be the price of pure mustard. The Sheriff convicted, and fined the defendant, who gave notice of appeal to the High Court of Justiciary (Supreme Court in Scotland). The manufacturer, who was believed to have something to do with the appeal, was understood to say that similar cases have been dismissed on appeal, and that in point of fact it is necessary to mix mustard with flour or some similar substance to make it keep. Subsequently, however, the defendant withdrew his appeal against the Sheriff's decision.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No. 1881	Name of Patentee.	Title of Patent.	Price.
3100	W. R. Lake	Utilization of Carbonic Acid, &c., for obtaining Motive Power	6d.
3166	W. Morgan Brown	Electric Lamps	6d.
3189	W. R. Lake	Electric Lamps	8d.
3214	A. M. Clark	Electric Lamps	8d.
3216	W. E. Halse	Manufacture of Sugar, &c.	4d.
3378	H. F. S. D'Esplaviz	Manufacture of Artificial Manure	2d.
3149	H. R. Randall	Manufacture of Malt Extract	6d.
3281	W. A. Barlow	Purifying Oils	4d.
3286	R. E. Goolden and A. Mackay	Deodorizing and Disinfecting Agent	4d.
4011	B. Hunt	Electric Lamps	8d.
3352	W. W. Hughes	Extracting Copper and other Metals from their Ores	6d.
3402	J. H. Johnson	Electric Lamps and Manufacture of Carbons	6d.
3403	J. Duncan	Manufacture of Sugar	6d.
3535	J. C. Johnson	Manufacture of Portland Cement	4d.
3584	W. Clark	Manufacture of Sulphur, Arsenic, &c., from Gases containing combinations of these substances, &c.	4d.
3599	C. Lever	Electric Lamps	8d.
3646	H. J. Haddan	Process for Wet Extraction of Lead, Silver, &c.	4d.
3650	G. Pfannkuche	Electric Lamps	2d.
3651	C. D. Abel	Dephosphorization of Iron in Blast Furnaces	2d.
5464	K. Troback and A. Cards	Distilling Alcohol	6d.
3681	T. Hogben	Apparatus for Generating Carbonic Acid Gas	2d.
5579	C. Semper and C. Fahlberg	Removing Iron from Ferruginous Aluminous Solutions, &c.	4d.
3711	F. H. Engel	Electric Lamps	2d.
3712	C. D. Abel	Manufacture of Ammonia	4d.
5589	H. H. Lake	Refining Impure Copper	4d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Oil and Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record; Oil and Drug Journal; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine.

THE ANALYST.

MAY, 1882.

SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held on the 26th April, at Burlington House, the President, Mr. Heisch, in the chair.

The minutes of the previous meeting were read and confirmed.

Messrs. Dyer and Hehner were appointed scrutineers to examine the voting papers, and reported that Mr. R. Tervet, Clippens Oil Works, Analytical Chemist, and Mr. T. Harrington, Public Analyst for Cork, were duly elected as Members.

Mr. A. E. Ekins, Analytical Chemist, St. Albans, and Mr. B. Halford, Analytical Chemist, London, were proposed as Members, and will be ballotted for at the next meeting.

The following papers were read:—

"The action of Sulphuretted Hydrogen upon Compounds containing Oxide of Iron," by J. Carter Bell.

"On the Composition of Some Samples of Pure Coffee," by A. Smetham.

"The Water Supply of Toronto, Canada," by W. Hodgson Ellis.

The next Meeting of the Society will be held at Burlington House, on Wednesday, May 31st.

ON THE COMPOSITION OF SOME SAMPLES OF PURE COFFEE.

BY A. SMETHAM, F.C.S.

Read before the Society of Public Analysts, on 26th April, 1882.

THE object with which the analyses of the samples of coffee which I embody in this paper were undertaken, was to determine the variations in the composition of various qualities found in the market, and to ascertain, as far as the limited number of samples worked upon would enable me, the degree of exactitude with which the several constituents may be used in deciding the amount of adulteration when chicory is used as an adulterant. With this end in view, therefore, I have limited the estimations to those constituents which can be determined with facility as well as exactitude; but as I have been unable to complete a similar series of experiments on the various kinds of chicory, the composition of which appears to vary considerably, I am unable to do more than bring the figures before the members of the Society, in the hope that by comparison with the work of others some good may accrue.

All the samples were purchased in the roasted condition, and were ground by myself; and I can, therefore, vouch for the purity of all the samples operated upon:—

No. 1 was sold retail at 1s. per lb., under the name of Ceylon Coffee.

No. 2 as Costa Rica Coffee, at 1s. 2d. per lb.

No. 3, Plantation Ceylon Coffee, at 1s. 4d. per lb.

No. 4, East India Coffee, at 1s. 6d. per lb.

No. 5, Jamaica Coffee, at 1s. 8d. per lb.

Nos. 6 and 7, in which I have only made partial analyses, were given to me by a wholesale merchant, as representing the greatest differences in value obtainable—No. 6 being the finest, and No. 7 the commonest coffee, which he had in his possession.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Water (loss at 212° F.)	3·89	3·49	1·84	3·54	1·59	—	—
Oil (Ether extract)	12·13	11·40	10·13	10·63	10·13	11·75	10·80
Crude fibre	70·84	71·14	73·58	72·62	74·50	—	—
Cellulose.....	26·33	27·50	34·40	30·26	27·90	—	—
Total ash	4·63	4·29	4·40	4·08	4·19	4·25	4·20
Soluble ash	3·34	3·50	3·60	3·14	3·40	3·25	3·35
Nitrogen.....	2·26	2·19	2·34	2·14	2·38	—	—
Crude fibre, in sample dried at 212° F.	73·71	73·71	74·96	75·28	75·70	—	—
Specific gravity of 10 per cent. infusion	—	—	—	—	—	1009·4	1009·2

In remarking upon these results, it may be desirable to state the methods by which they were obtained:—

1. The water was determined by noting the loss in weight on drying at 212° F. in the usual way.
2. In obtaining the ether extract, 3 grms. were operated upon in an extraction apparatus, and the ether passed through until the last traces were dissolved. The oil was dried at 212° F. previous to weighing.
3. Crude fibre was obtained by boiling 2 grms. of substance with three successive quantities of water (about 100 c.c.), and washed with boiling water on a counterpoised filter until the washings were colourless. It was then dried at 212° F. until the weight was constant.
4. The cellulose was obtained by boiling with 5 per cent. solution sulphuric acid, excess of acid removed, again boiled with 5 per cent. solution caustic potash, filtered and washed with hot water. It was then treated with dilute hydrochloric acid, washed until free from acid, and then treated successively with alcohol and ether. After drying at 212° F. the weight was noted.
5. Ash and soluble ash were determined in the usual way.
6. The nitrogen was estimated by combustion with soda-lime.

The first point worthy of note is the varying proportions of water. This leads me to the conclusion that it would be desirable to dry the sample, or correct for moisture in the ordinary course of analysis. Chicory is more subject to variation in this respect than coffee, and it is obvious that a possible error, greater than the extremes of variation, may be introduced if the calculation is based in the specific gravity of a 10 per cent. infusion, and correction be not made.

The percentage of oil, although considerably higher than is found in chicory, is only useful as a check on results, as the natural variations, amounting to 2 per cent. in the seven samples examined, are sufficiently large to vitiate the accuracy of any calculations on this basis, and the difficulty is still further increased by the fact that chicory also varies in this respect.

The estimation of crude fibre in the sample dried at 212° F. appears a test which can be applied with some degree of accuracy to determine the percentage of adulteration where chicory alone is used. The extreme variation in the five samples examined is under 2 per cent., whereas the greatest difference from the average is only 1·03 per cent. The difference between the crude fibre in coffee and chicory is very wide, so that I believe this test may be used with advantage. The result obtained in this case will, of course, be practically the same as that obtained by taking the density of 10 per cent. infusion; but it has, I believe, an advantage in the fact that the extraction is complete. In working with large quantities it is necessary to filter only a portion of the infusion, and no certainty, therefore, exists that the whole of the extractive matters have been removed; whereas, by repeated boiling and weighing the insoluble we obtain a perfectly extracted residue. The time occupied is somewhat longer, but the actual labour expended is not materially increased.

The other constituents which I have determined are practically useless, except as a check on results. The soluble ash, as Mr. Allen has already shown, varies to a sufficient extent to render it of little use.

The determination of nitrogen is also a useful check, but the possible errors are as great, or nearly so, as in the case of the soluble ash.

In conclusion, I would remark that it appears to me desirable to determine the water (in order to correct), the oil, the crude fibre, the soluble ash, and the nitrogen, as well as the specific gravity of the 10 per cent. infusion in the case of adulterated samples. The average of the results will then, probably, nearly represent the percentage of adulteration where chicory only is used. The adulteration of a large quantity of the chicory found in the market complicates the matter considerably; but even in this case the error will probably be less, if the whole of the constituents enumerated above be determined, than if one only be used for calculation.

Mr. Heisch said that one of the most curious things seemed to him to be, that although the crude fibre varied so little, the cellulose varied enormously.

Mr. Kingzett thought the variations in the cellulose might be accounted for by the author not working under the same conditions.

Mr. Hehner said that cellulose determinations in roast coffee could not be but inaccurate, as the residue usually termed cellulose would be mixed with more or less carbon produced by the roasting.

Dr. Dupré referred to a recent case in which he had been engaged. Some samples of coffee were specially prepared in Birkenhead, and three of them sent to him. He determined the sp. gr. of the 10 per cent. extract, the soluble ash, the total ash, and the alkalinity. He sent in his results, and then, to his astonishment, he found the analyses were published, and the actual composition of the samples given.

Another series was sent to Mr. Jones, and others, for analysis, and the remaining one to Somerset House. The professed adulteration was as stated in the first line :—

Per Centage of Chicory actually mixed with the Samples of Coffee forwarded	A 10 Per Cent. Chicory.	B 30 Per Cent. Chicory.	C 37½ Per Cent. Chicory.
E. W. T. Jones, Wolverhampton....	7 per cent. chicory	31 per cent. chicory	38 per cent. chicory
Alfred Smetham, Liverpool	7 „ chicory	32 „ chicory	34 „ chicory
Somerset House	2½ „ not more chicory	35 „ not less chicory	48 „ not less chicory
Dr. Davies, Liverpool.....	5 to 10 „ chicory	25 „ chicory	50 „ chicory
Mr. Carter Bell, Manchester	10 „ upwards of chicory	30 „ upwards of chicory	40 „ upwards of chicory
Dr. Dupré, London.....	16 „ chicory	35 „ chicory	47 „ chicory
Dr. Vacher	Genuine	31 „ chicory	50 „ chicory

In each case his estimation was highest by taking the sp. gr. from Allen's tables. In fact, had he been contented with his own determinations of ash, he should have made them 12, 30, 40, but the sp. gr. of the solution threw it out so far. Somerset House was more out than he was.

Dr. Vacher, the analyst for Birkenhead, in his analysis of the same samples, made out the first as genuine, the second as containing 32 per cent. of chicory, and the third 50 per cent. of chicory, and wrote a letter to the *Birkenhead News*, in which he made out that his results were better than his (the speaker's), although in one case the chicory was missed altogether, and in the other two cases overstated. Dr. Dupré said he had written to the Town Clerk protesting against the publication of the analyses without asking his permission, and allowing their officer to publish a criticism of them.

Although the fact of chicory being present was certain, the amount was uncertain, and anyone who came exactly right did so by accident; any chemist would know that with such mixtures it was not possible to make exactly accurate quantitative analyses.

THE ACTION OF SULPHURETTED HYDROGEN UPON COMPOUNDS CONTAINING OXIDE OF IRON.

By J. Carter Bell.

Read before the Society of Public Analysts on 26th April, 1882.

As is well known hydrated oxide of iron and other compounds of iron are largely used in gas works for absorbing sulphuretted hydrogen; but the way in which the gas combines with the iron may vary in each case. Some oxides, though poor in iron, readily take up the gas, while others containing a large percentage of iron, owing to their physical characters, decompose the gas but slowly. I have had to examine many examples of oxide of iron, which were intended to be used for absorbing sulphuretted hydrogen, and my practice has been to pass the gas through a tube containing the oxide of iron many times, allowing the sulphide of iron which has been formed in the tube to oxidise after each passage of the gas, and at certain periods to estimate the percentage of sulphur; great care must be used, when the sulphide of iron is undergoing oxidation the temperature may rise so high as to ignite the sulphur. The following experiment will prove this :—Some oxide of iron was prepared and dried at 212° F., this was put into a tube and dry sulphuretted hydrogen was passed through; on the passage of the gas the oxide in the tube became very hot; when the contents of the tube were quite black, the tube was emptied, and the sulphide of

iron allowed to oxidise; a portion was now used for the estimation of the sulphur, the oxide was put back into the tube and the gas passed a second time, again it was turned out, this time the action was so intense that the sulphur ignited. The experiment was continued up to the fifth time, estimating the sulphur after each passage of the gas.

After passing the gas once, the percentage of sulphur was	12·28
Second time, the sulphur ignited	0·16
Third time	6·20
Fourth time	8·68
Fifth time	16·60

Two samples were taken, No. 1 was a Lincolnshire iron ore containing about 35 per cent. of metallic iron. No. 2 was a slag from an iron foundry containing about 55 per cent. of iron. Sulphuretted hydrogen was passed through these over one hundred times, with the following results :—

	Percentage of Sulphur. 1	2
After passing H_2S 10 times	33·671 ..	24·926
,, ,, 20 ,, ...	38·521 ..	34·762
,, ,, 30 ,, ...	41·729 ..	37·891
,, ,, 40 ,, ...	43·916 ..	42·918
,, ,, 50 ,, ...	46·512 ..	43·769
,, ,, 70 ,, ...	55·321 ..	54·261
,, ,, 90 ,, ...	60·122 ..	60·571
,, ,, 110 ,, ...	63·816 ..	65·789
,, ,, 140 ,, ...	— ..	71·564
,, ,, 160 ,, ...	— ..	74·612

Mr. Heisch said they were all perfectly aware of the great difference in the absorptive powers of samples of iron of sulphuretted hydrogen; some samples sent to gas works were of no use at all, and very few of them in practice reached 74 per cent.

Dr. Dupré asked if the President was acquainted with any instance where a mixture of sulphur and iron actually took fire on exposure to the air—the sulphur being in a fine state of division.

Mr. Heisch said that after it had been exposed to the air once or twice, a large amount of free sulphur was obtained, and this free sulphur became fired if they oxidized too quickly.

Mr. Wigner said a shower of rain was quite sufficient to fire a charge brought out from a purifier.

Mr. Lyte said he had seen it spontaneously fire.

THE WATER SUPPLY OF TORONTO, CANADA.

By W. Hodgson Ellis, M.B., School of Practical Science, Toronto.

Read before the Society of Public Analysts on 26th April, 1882.

During the past six months I have made monthly analyses of the water supply of Toronto, according to the instructions published in The Analyst, the results of which are embodied in the following table.

Toronto is situated on the shores of a bay which is nearly closed by a long sandy island, which is situated opposite the town. At each end of the island there is a narrow

channel between the island and the main land. The sewage of the town is poured into this basin at various points along the shore, and the water supply is drawn from the opposite or island shore of the basin, and brought by a pipe across the basin a distance of 4,500 feet.

Dangerous as is such a source of supply, sewage contamination does not seem to have occurred to any appreciable extent, owing, doubtless, to the large size of the basin, and to the fact that a current continually blows through one gap and out of the other, and thus sweeps the foul water away.

A sample of the water of the bay, close to the mouth of one of the principal sewers, gave :—

Ammonia	·0196
Albuminoid Ammonia	·0154
Chlorine	·336

A sample of water from the lake, outside the island, gave :—

Ammonia	·0013
Albuminoid Ammonia	·0084
Chlorine	·203

Analysis of the Toronto Water Supply for the Six Months ending March, 1882.

GRAINS PER GALLON.

	October.	November.	December.	January.	February.	March.
Colour.	pale yellow.	pale yellow.	pale yellow.	pale greenish yellow.	chalky white.	chalky wht. sly. turbid.
Smell at 100° F.	veg. mattter.	none.	none.	none.	none.	none.
Chlorine in Chlorides.	·21	·23	·21	·21	·21	·21
Nitrogen in Nitrates.	·015	·0161	·0132	·0184	·0156	·0173
Phosphoric Acid in Phosphates.	none.	none.	none,	none.	none.	none.
Ammonia.	·0028	·0013	·0008	·0056	·0022	·0014
Albuminoid Ammonia.	·0098	·0076	·0028	·0154	·0056	·0063
Oxygen absorbed at 80° F. in 15 min.	·0223	·0308	·0196	·0342	·0216	·0154
Oxygen absorbed at 80° F. in 4 hours.	·0463	·0476	·0411	·0658	·0496	·0560
Hardness—Clarks' Scale before boiling	6·5°	7°	7°	6·5°	6·5°	6·5°
Hardness after boiling.	2·0°	2·5°	2·5°	2·5°	2·5°	2·°
Total Solid Matter dried at 220° F.	9.50	9·52	9·80	10·36	9·66	9·24
Microscopical Exam.	vegetable deb. diatoms, algæ and infusoria.	vegetable deb. algæ,diatoms, infusoria.	algæ,diatoms, infusoria.	algæ,diatoms, infusoria.	algæ,diatoms, infusoria.	algæ, diat., infusoria.

We hope next summer to get water from the open lake (Ontario) beyond the island. When this is effected, I hope to send the analysis of the water from this source.

BREAD ANALYSIS IN MASSACHUSETTS.

A recent report of the Massachusetts Board of Health gives the following interesting particulars as to the analysis of samples of bread bought in the State. One hundred and three samples of bread were tested for alum. Of these seven were known to contain it, and two known to be free from it. Of the remaining number, seven contained a very small quantity, less than one-tenth of one per cent., and eighty-eight were entirely free from it. These ninety-five samples were purchased from as many different bakehouses, without it being known to the baker for what purpose the bread was to be used. Twenty

of these samples were also incinerated, and the ash examined for other mineral adulteration —but none was found. All the bread examined looked, smelled, and tasted well. The moisture was estimated in thirteen samples, and varied from 31·42 per cent. to 65·27 per cent. Only four of these contained over 38 per cent. The fat was estimated in house-made and in baker's bread. The two samples of home-made bread gave 1·12 per cent. and 1·17 per cent.; four of baker's gave 1·33 per cent., 1·34 per cent., 1·10 per cent., and 2·10 per cent. respectively. This would show that there is no important difference in the amount of moisture and fat in baker's bread and that ordinarily made in families. The "logwood solution" was used in testing for alum. This, though criticised, never failed to show alum when it was known to be present; and it is so delicate that it will show the presence of less than one part in ten thousand of crystallized alum in bread, and will do this even after the bread has been baked a month, and has become covered with mould. This was proved by the following experiment: samples of pure flour that had been tested were mixed with known amounts of alum, and baked in the ordinary way, taking care that no alum was introduced. The test worked very satisfactorily, both upon the samples of flour thus prepared and the bread which had been made from them.—*Sanitary Record.*

ACTION OF ORGANIC MATTER ON SILVER SALTS.

By Wm. Ripley Nichols.
Mass. Inst. Technology, Boston.

In the March number of The Analyst occurs a paper "On the Action of Organic Matter on Silver Salts," by Henry Leffman, M.D., Microscopist to the Pennsylvania State Board of Agriculture. In this article occurs the rather remarkable statement: "The action of organic matter upon silver salts is well known, but I am not aware of any attempts to utilize this method for the examination of water."

Although less commonly employed than the chloride of gold, nitrate of silver has long been used, and is still frequently used, as a qualitative test for organic matter in water. That it was the custom to apply this test forty and fifty years ago, appears from the water reports of 1830-40. For example, I have in my hand at the moment a report of Dr. C. T. Jackson, dated July 1, 1834, and Silliman's Report on the Analysis of the Waters, dated October 29, 1845, in both of which the test is used without special remark. When the test was *first* used I do not know. Glauber knew that nitrate of silver would blacken hard wood so as to make it look like ebony, and would also colour hair, feathers, &c. *(Mirac. Mundi Explic.*, Amsterdam, 1656, p. 44.) In a number of mineral water analyses reported between 1750 and 1800, the nitrate of silver seems to have been used merely as a test for chlorides; but in Baumé's *Chymie Expérimentale* (Paris 1773), nitrate of silver is used to see whether a mineral water contains any "principe phlogistique ou sulfureux": if the precipitate is white, it is a sign that the water is not charged with "matière inflammable."

Coming to later times, the author of the paper alluded to ignores utterly Fleck's method for the *quantitative* use of the test, and for distinguishing thereby between what he designates as "Moderstoffe" and "Fäulnissstoffe." Fleck's method was first published in the *Journal für Prakt. Chemie*, iv. (1871), p. 364, and is given in Tiemann's *Anleitung zur Untersuchung von Wasser*. Fleck has published the results of the examination of a considerable number of samples of water by this method in the various annual reports of the *Chemische Centralstelle*, in Dresden. Although this method has not been used to a very great extent except by its originator, it is, I presume, well known to water analysts.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in April, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Apr. 17	p. blue clear	none	1·56	none	·40	·0010	·0022	·012	·024	20·0°	5·0°	33·2	veg. deb., mycm., anml.	Wigner & Harland.
New River	,, 15	c. faint yellow	none	1·12	trace	·22	·0014	·0028	·025	·030	14·0°	3·5°	17·9	satisfactory	B. Dyer.
East London	,, 17	c. grnsh. yellow	none	1·35	trace	·16	·0026	·0047	·016	·026	13·6°	4·4°	23·2	veg. debris, animalculæ	Wigner & Harland.
Southwark & Vauxhall	,, 26	v. p. y. & clear	none	1·24	trace	·20	·0007	·0050	·038	.061	14·5°	3·5°	20·3	satisfactory	John Muter.
West Middlesex	,, 25	greenish yellow	none	1·02	trace	·12	·0005	·0047	·017	·040	12·0°	2·0°	19·1		O. Hehner.
Grand Junction	,,	p. yellow	none	·98	trace	·13	·0018	·0046	·009	·074	14·3°	3·7°	21·7		A. Wynter-Blyth.
Lambeth	,, 26	v. p. y. & clear	none	1·24	trace	·20	·0007	·0050	·038	·061	14·5°	3·5°	20·3	satisfactory	John Muter.
Chelsea	,, 25	c. p. yellow grn.	none	1·12	trace	·11	none	·0042	·017	·031	16·0°	5·0°	20·3		A. Dupré.
Birmingham	Apr. 12	turbid greenish	none	·91	trace	·11	·0021		·006	·023	9·1°	5·8°	16·9	vegetable debris	A. Hill.
Bolton	,, 12	s. turbid	none	·58	none	·04	·0014	·0050	·012	·028	3·2°	3·0°	8·1	mineral mtr., veg. debris	W. H. Watson.
Brighton	,, 11	c. p. blue	none	1·91	none	·30	·0014	·0037	·006	·012	12·0°	5·0°	22·8	vegetable debris	Wigner & Harland.
Bristol	,, 3	grnsh. brown	none	·90	none	·06	none	·0063	·011	·067	16·2°	2·1°	21·6	sand, algæ	F. W. Stoddart.
Bury (Lanc.)	,, 1	s. turbid	s. mossy	·95	none	·04	·0040	·0093	·012	·024	4·5°	4·2°	8·7	satisfactory	W. H. Watson.
Cambridge	,, 15	c. p. blue	none	1·40	trace	·34	none	·0010	·008	·016	18·0°	5·0°	25·2	satisfactory	J. West Knights.
Croydon	,, 25	c. colourless	none	1·12	v. h. traces	·14	none	·0030	none	·006	16·5°	4·5°	24·4	none	C. Heisch.
*Darlington	,, 15	brnsh. yellow	peaty	·59	trace	·04	·0028	·0070	·195	·333	5·0°	4·5°	7·8	satisfactory	W. F. K. Stock.
Dublin	Mar. 31	s. yellow	none	·85	trace	traces	·0020	·0050	·060	·198	1·36°	·7°	4·2		C. A. Cameron.
Edinburgh	Apr. 12	s. brown	none	·80	none	traces	traces	·0056	·012	·038	4·2°	3·7°	5·2	none	J. Falconer King.
Ely	,, 15	p. yell. s. turbid	s. weedy	1·61	trace	·23	·0005	·0091	·046	·086	19·0°	6·5°	30·1	diatoms, desmids., &c.	J. West Knights.
Exeter	,, 11	f. brnsh. yellow		·91	trace	·15	·0007	·0028	·030	·049	2·4°	2·4°	6·3	satisfactory	F. P. Perkins.
Grantham	,, 12	c. p. blue	none	1·12	trace	·60	·0005	·0015	·004	·007	15·5°	4·3°	23·0	satisfactory	A. Ashby.
King's Lynn	,, 12	yellow	weedy	1·49	trace	·35	·0008	·0105	·192	·437	14·5°	5·5°	19·3	veg. debris, diats., bact.	W. Johnstone.
Leamington	,, 19	c. greenish	none	1·54	none	none	·0021	·0014	none	·005	25·0°	11·9°	26·6	satisfactory	A. Bostock Hill.
Liverpool	,, 17	yell. green	s. peaty	·95	trace	·02	·0007	·0028	·036	·067	3·5°	2·7°	6·7		A. Smetham.
Maidstone—															
Wtr. Company	,, 15	c. p. green	none	2·90	trace	·33		·0021	·011	·013	16·1°	5·7°	34·3	satisfactory	M. A. Adams.
Public Conduit	,, 15	c. p. blue	none	2·20	trace	·35		·0014	·009	·010	16·0°	5·5°	32·3	none	M. A. Adams.

* River in flood.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in April, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Manchester....	Apr. 26	v. sl. tb. f. yl. col.	none	7·45	none	none	·0030	·0027	·022	·077	1·7°	1·6°	4·5	slight mineral sediment	William Thomson.
Newark	,, 6	c. blueish green	none	1·19	trace	·05	·0011	·0032	·011	·025	17·0°	12·2°	34·9	satisfactory	A. Ashby.
Newcastle-on-Tyne.....	,, 12	f. yellow	none	·91	trace	·03	·0010	·0008	·062	·108	14·4°	5·4°	19·0	satisfactory	J. Pattinson.
Nottingham ..	,, 17	s. opq. grnsh.	slight	1·84	none	1·40	·0021	·0032	·006	·012	14·8°	6·8°	30·2	veg. debris, mycelm.	Wigner & Harland.
Norwich	,, 11	p. grnsh. yell.	none	1·70	trace	·11	trace	·0030	·039	·074	12·0°	3·7°	16·8		W. G. Crook.
Portsmouth ..	,, 13	s. turbid	none	1·23		·18	trace	·0042	none	none				veg. deb., diatoms	W. J. Sykes.
Rochdale.....	,, 22	light blue	none	·60	none	none	none	·0010	none	·006	3·6°	3·0°	7·2	satisfactory	T. A. Collinge.
Rugby	,, 2	p. yell. turbid	none	1·17	h. trace	·19	·0072	·0142	·040	·095	15·0°	7·5°	19·6	veg. deb., diatoms	A. P. Smith.
Salford	,, 4	c. s. yellow	none	·80	none	none	·0028	·0042	·014	·070	4·0°	3·5°	9·0	none	J. Carter Bell.
Southampton ..	,, 24	pale yellow	none	·95	trace	·14	·0023	·0063	·018	·088	14·5°	5·0°	19·2	satisfactory	A. Angell.
Swansea	,, 17	clear	none	1·00	trace	none	·0010	·0049	·003	·004	1·5°	1·4°	4·2	none	W. Morgan.
Whitehaven ..	,, 11	c. f. green	none	·44	none	·01	none	·0007	·007	·015	·4°	·4°	2·0	veg. deb., diatoms	A. Kitchin.
Schuylkill .... Philadelphia	Mar. 22 ,,	v. s. yellow	s. musty	·37	none	·124	·0007	·0056			4·0°		6·1	none	H. Leffmann.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

ERRATA.—In the March Table, New River Water, the figures for Oxygen absorbed in 15 minutes and 4 hours were transposed; Portsmouth Chlorine should be 1·25 not 12·5.

OFFICIAL CHEMICAL TESTS OF IMPORTED ARTICLES IN THE NEW YORK LABORATORY.

THE United States laboratory, established as an adjunct of the appraiser's department at this port, has been in existence since 1858. A writer in the *New York Times* says that up to the period of the establishment of the laboratory, the Custom-house authorities had been in the habit of employing expert chemists, from time to time, as necessity demanded, but the expenditure for this kind of service increased so steadily and so largely that it was deemed best to organise a government laboratory. Professor Edward Sherer, who had had several years practical experience in applying chemical tests to various imported articles for large wholesale house in New York and elsewhere, was placed in charge of the laboratory. At the present time Professor Sherer has four assistants, each of whom attends to a special branch of the work. The laboratory has proved itself to be a good financial investment on the part of the government. By reason of the chemical tests applied to imported sugars, &c., many cargoes of goods have been raised in their respective classifications, and thereby made to pay a higher rate of duty than otherwise would have been collected.

The collecting of duties on the numerous dyestuffs which are classed under the head of aniline colours causes the government and importers considerable trouble and annoyance. Aniline colours have to pay a high duty. There is a specific duty of 50 cents per pound, and an *ad valorem* duty of 35 per cent. There are several dyes, Professor Sherer says, which resemble aniline colours, and which, under the law, are dutiable as aniline, but the importers frequently have them entered as an inferior quality of stuff. Chemical analysis, however, quickly determines the character of the dyes, and duties are levied as the law directs. The importers of dyestuffs have paid the extra duties under protest, and several appeals from the appraisers' decisions are now pending.

Opium is constantly coming under the professional eye of the government chemist. In order that none but pure drugs may be brought into this country the law has provided certain stringent restrictions. No opium is admitted by the Custom-house officers if it is found to contain less than 9 per cent. of morphine. Prior to last year there were a number of instances where the chemical analysis showed the opium brought to this port to be deficient in the necessary quantity of morphine. During the last twelve months, however, there has been very little reason to find fault with the quality of opium imported. Nearly 190 tests were made during 1881.

There are several varieties of mineral water imported, to which analytical tests are applied for the purpose of ascertaining whether they are natural or manufactured waters. The latter, of course, are subject to duty, while the former are admitted free. In the case of Apollinaris water, it was ascertained by Professor Sherer that a large percentage of the salt and gas in the water was added artificially. Appraiser Howard consequently imposed a duty on that particular water, but for some reason the Treasury Department decided to admit it free. Vinegar, before it can pass the Custom-house authorities, is analyzed to ascertain the percentage of acetic acid which it contains. Vinegar is taxed according to its strength, the higher the degree of acetic strength the greater the duty. Metals and all alloys are required to pay a duty in accordance with a graded tariff based on their value. The chemical analysis is made for the purpose of finding out the proportion of different

metals in all of the alloys that are being constantly imported. Colcothar (pure oxide of iron) is free under the tariff, and some importers take advantage of that fact to bring in many varieties of painters' colours under the name of colcothar. Of 158 specimens of so-called colcothar analyzed by Professor Sherer and his assistants last year, not more than one-quarter of them were found to be pure colcothar.

Immense quantities of bone-blacks are imported into the United States annually, and there are sugar refiners who attempt to get them through the Custom-house free, under the pretext that they are merely calcines or burned bones. The latter are on the free list, whereas bone-black, which is used in the refining of sugars, is dutiable at 25 per cent. *ad valorem*. Nearly 200 chemical tests of this material were made by the chemists of the United States laboratory during the last year, and in every case the stuff entered as calcines or burned bones was found to be bone-black.

The alcohol exported and perfumery made in bond is analyzed, in order to determine the amount of the rebate which the law allows the exporter.

The total number of analyses made by the attachés of the laboratory during the year 1881 were 4,975, a few of which were made in Philadelphia, Boston, Baltimore and New Haven. The cost to the Treasury Department of the analytical work alone, if paid for at the lowest contract rates charged by chemists of repute, would, it is claimed, be from 20,000 to 25,000 dollars, and the cost of the special investigations conducted under the direction of the laboratory, if made by chemists not in the employ of the department, cannot be definitely estimated. The actual expenses last year were 9712 dols. 26 cents.—*New York Oil and Drug News*.

PARLIAMENTARY NOTES.

COFFEE AND CHICORY.

In the House of Commons, on the 3rd April,

Sir E. Lechmere asked the President of the Board of Trade whether the Treasury Minute of the 20th of January, 1882, by which the importation, under a duty of twopence a pound, of "coffee or chicory, roasted and ground, mixed, without reference to the proportion of the mixture, and the permission to extend to any other vegetable matter applicable to the uses of chicory or coffee," was made upon the recommendation of the Board of Trade, as stated in the reply to a memorial lately presented to the Lords Commissioners of the Treasury upon the subject; and, if so, if he would explain the reasons for such a recommendation, which appeared to be in contradiction to the Adulteration of Food Acts.

Mr. Chamberlain: As the subject of this question has excited a good deal of interest, I am much obliged to the hon. baronet for giving me an opportunity of making an explanation. I should say, in the first place, that the change in the Treasury regulations does not make any alteration whatever in the law with regard to adulteration; nor does it in my opinion tend to increase the practice of adulteration. The matter was brought to my knowledge in the first instance by a number of tradesmen of Leeds and elsewhere, who complained of what they considered to be the anomaly in the Customs regulations. They informed me that while coffee which was pure could be imported, and that chicory and other vegetable substances applicable to the use of coffee could also be imported, and, having been imported,

could be legally mixed in this country and legally sold, the same articles could not be imported if they were mixed abroad. When I came to enquire into the matter I found that the anomaly had arisen from the fact that at one time the duty on chicory differed from the duty on coffee, and that it was necessary that it should be imported separately and not be allowed to come in mixed. The regulation was purely one relating to revenue, and was not passed to prevent adulteration. The change which has been made amounts to this only, that whereas previously coffee and chicory could only be imported separately, and mixed afterwards, they can now be imported ready mixed. I should say that the interests of the consumer are protected not by any regulations of the Customs, but by the provisions of the Adulteration Act. The Sale of Food and Drugs Act provides that no article of food, or drug, shall be mixed with any ingredient injurious to health and sold, under a penalty of £50, and that no article shall be sold to the prejudice of the purchaser mixed with any ingredient, unless at the time of the sale the article so sold is described as mixed. Under these circumstances I think the interests of the consumer will be protected, because the local authorities can step in and secure a penalty of £50 against any tradesman who sells coffee mixed with chicory or with any other things not injurious to health.

In reference to this subject it will be seen from the annexed resolutions which were introduced by Mr. Gladstone in his Budget speech on the 24th ultimo, and have been passed by the House of Commons, that the sale of coffee mixtures containing such things as dates, malt, figs, will now be entirely illegal, and chicory alone may be mixed with coffee.

These resolutions are:—"Resolved, that the duty of Excise on vegetable matter grown in the United Kingdom, applicable to the uses of chicory or coffee (other than chicory,) shall cease to be payable, and the sale or exposure for sale of any such vegetable matter in imitation of, or mixed with, chicory or Coffee shall be rendered 'illegal.'" And, "Resolved, that the duties of Customs on vegetable matter applicable to the uses of chicory or coffee (other than chicory) shall cease to be payable, and the importation as merchandise of any such vegetable matter mixed with coffee or chicory shall be prohibited."

Willow Leaves and Tea.—A chop of tea, consisting of upwards of 100 half-chests, recently imported from Hong Kong as "extra choicest Ningchow Congou," was sold publicly on February 28th, at from 6d. to 6¼d. per lb. The teas have been re-sold at a profit, and distributed throughout the Kingdom, and some have also been shipped to the Continent. The top of the package consists of sound tea, but the remainder is composed of willow or other leaves mixed with some substance which has become putrid. The appearance of the dry leaf, however, is such as to justify the Custom House and the Dock authorities passing it into consumption. According to the terms of sale, no allowance is usually made on account of any damage, rubbish, or false packing, after the goods have left the warehouse; but in this instance, it is understood, the selling brokers have allowed the packages to be returned. The Customs authorities, however, refuse to return the duty which has been paid.—*Grocer.*

Mr. Alfred Ashby has been appointed Public Analyst for the Borough of Newark.

THE WORK DONE BY PUBLIC ANALYSTS DURING 1881, UNDER THE SALE OF FOOD AND DRUGS ACT.

As announced in our last number, we have sent forms to nearly every Public Analyst in the United Kingdom. We have received a very large number of returns, but many are still missing. We shall be glad if those analysts who have not yet sent their returns will do so at once, so that the tabulated statement may be as complete as possible.

OFFICIAL ANALYST IN POISON CASES..

The President of the Royal College of Physicians of London has nominated Dr. Stevenson, of Guy's Hospital, to the post of scientific analyst to conduct any analyses of bodies of deceased persons that may be ordered by the Secretary of State in the interests of justice during the year beginning May 1st instant.

REVIEW.

New Commercial Plants and Drugs, No. 5.

By Thos. Christy, F.L.S. London: Christy & Co.

The author of this work is supplying a want long felt by colonists and others engaged in agricultural pursuits in tropical and semi-tropical countries, by drawing attention to plants hitherto to a great extent neglected, containing substances of sufficient commercial importance to render them well worthy of careful cultivation.

In the article on tannin and tanning materials the author does not confine himself to the substances commonly used in this country for the preparation of leather, but gives a list of the trees, plants, and shrubs containing anything like a notable proportion of tannin; in most cases analyses are given; in one or two instances, however, more particularly in the case of the betel nut (*Areca catechu*), although the production in Penang alone is said to amount to upwards of 3,000 tons, yet no mention is made as to the quantity of tannin which these nuts contain, nor are any hints given as in other cases as to a mode of rendering these valuable nuts useful for other purposes besides the preparation of a chewing material for Malays and Indians.

We should feel inclined to doubt the statement of the author that leather tanned with the peel of the pomegranate rind (*Punica granatum*) is little affected by the atmosphere of a room in which gas is burnt, as we question whether morocco or any other leather will long withstand the action of the products of combustion of London coal gas without suffering some amount of deterioration.

We should recommend all who are interested in the extended use of coca, coraiba leaves, papav. and other drugs, to read the concluding chapter.

On the whole, the number contains a variety of sound and practical information, a great deal of which is of such a nature as to be directly available to persons interested in the culture, preparation, and sale of the articles of commerce treated upon. The author is also prepared to report upon plants and seeds likely to contain new commercial products, and to give advice as to the best mode of culture.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

BACTERIA.

To the Editor of "The Analyst."

Sir,—May I ask, through your columns, what is understood amongst water analysts by the term *Bacteria?* I do this from no mere idle curiosity, but because I have reason to believe that there exists a considerable amount of confusion in the minds of many persons as to what should be included under the term *Bacteria*. For instance, a Public Analyst, a friend of mine, writing about the Lynn water, makes use of the following expression:—"*Bacteria*, which, according to Dr. Cohn, includes all the very minute spherical, elongated, rod-like, straight and spiral filamenous plants endowed with more or less active spontaneous motion."

Now this definition may include not only *Bacterium* (Duj.), but also *Bacillus* (Cohn), *Micrococcus* (Hall), *Spirochæte* (Ehr), *Spirillum* (Ehr), *Vibrio* (Ehr), *Beggiatoa* (Trev.), and a host of allied genera, which have during the past 50 years been recognised by students of this science. I must confess, however, that when I hear a water spoken of as containing *Bacteria*, I naturally connect the term with the genus *Bacterium*, of which *B. termo* (Ehr), *lineola* (Cohn), and *rubescens* (Ray-Lank) are the types. If it be the custom of the profession of analysts to use the word in its more extended sense, I think it would be only fair to the general scientific public to let them know such is the case.

I am, Sir, yours obediently,

CHARLES B. PLOWRIGHT,

7, *King Street, King's Lynn.* *Medical Officer of Health.*

ARTIFICIALLY INCREASING THE QUININE HARVEST.

To the Editor of "The Analyst."

Sir,—Referring to the singular experiments at present being conducted in Ceylon by a Mr. Schrottky with the object of increasing, by a process of inoculation, the quinine in cinchona bark, I have much pleasure in handing you the following corroborative testimony from my brother, Mr. Michael Cochran, M.A., F.C.S., as to the experimental success so far of the suggestion. He writes from Colombo, Ceylon, under date 24th March, as follows:—"I have been analysing some cinchona bark for a chemist named Schrottky, who has been trying to increase the percentage of quinine in the bark of trees about to be cut down, by causing them to absorb certain chemicals. He takes a ring of bark off the tree near the root, applies a solution, then, after about eighteen days, the bark is taken off. I analysed two sets of samples from the same trees before and after treatment, the sample being taken from the same height in each case; the increase of quinine was marked while the total alkaloids varied but little."

Should more extended observations confirm this result, it is hardly necessary to add that the pecuniary advantages likely to accrue to owners of well-grown cinchona plantations in Ceylon and elsewhere, will soon prove highly important, and quinine, so necessary a febrifuge in tropical climates, may at no distant date be brought well within the means of even the poorest coolie.

I remain, Sir, your obedient Servant,

Overdale, Dunblane, Perthshire, 17th April, 1882. WILLIAM COCHRAN.

THE LACTOBUTYROMETER IN MILK ANALYSIS.

To the Editor of "The Analyst."

Sir,—In Dr. Vieth's paper on milk analysis, reported in the issue for April, he refers to the lactobutyrometer as quite a new instrument. I have not seen the instrument referred to, but from the description, it is similar, if not identical with Horsley's Milk Tube, which is worked in identically the same manner, and with the same proportions of ether and alcohol. This instrument was discountenanced when first introduced, and I suppose very few laboratories possess such a thing now-a-days.

I have had one for a number of years, and used it continually for the estimation of fat in milk, and have always found it accurate and speedy. If, however, the complete analysis be carried out by Horsley's directions then the process becomes more lengthy than the usual method.

"There is nothing new under the sun." Certainly the lactobutyrometer, although re-christened with a longer name, is no exception to the proverb.

I am, yours, &c.,

Chemical Laboratory, Marshall Street, Edinburgh.
4th April, 1882.

THOS. W. DRINKWATER.

REPORTS ON ADULTERATION IN THE STATE OF NEW YORK.

In this number we reprint, from the *Sanitary Engineer* of New York, the first of a series of Abstracts of Reports which have been presented to the New York State Boards of Health by the analysts appointed, as we announced last September, to examine and determine the extent of the adulteration practised in articles of food and drugs sold in the State. This examination is, as we mentioned, simply of a preliminary nature, but the Reports contain matter of so much interest to English analysts that we need make no apology for reprinting the admirable abstracts made by the *Sanitary Engineer*. The samples examined were collected by two inspectors appointed by the Board of Health.

ANIMAL FOOD.

Group I.

MILK: FRESH AND CONDENSED.

Report by Prof. C. F. Chandler, Ph.D., of New York, with whom was afterwards associated C. E. Munsell, Ph.B.

The first part of the report is devoted to the composition of pure milk, and the most common frauds, which consist of watering, skimming, or both.

The frauds in milk differ from those of most other articles of food, in that pure milk varies in composition to a very marked degree, making it impossible to establish a standard of purity except by selecting for this purpose the poorest milk produced by healthy cows. As the frauds generally consist in increasing the amount of water, or diminishing the amount of fat (skimming), the chemist can only decide by his examination whether the frauds practiced have reduced the original milk below the standard adopted.

The report then details the investigations by which the standard has been fixed. The minimum specific gravity of 1·029, which has long been the standard in Europe, was confirmed by the examination of nearly 1,000 cows in New York State, New Jersey, and Connecticut. The maximum specific gravity was 1·0394, or 136 on the lactometer. It came from an Alderney cow. The lactometer employed, therefore, is the one in use in Europe, on which 0 stands for the specific gravity 1,000, or that of water, and 100 stands for that of 1·029 which is the specific gravity of the poorest normal milk from healthy cows. Thirty-eight analyses of pure milk were made by C. E. Munsell, and 12 more are quoted which were made by Elwyn Waller, Ph.D. The standard adopted by the English Society of Public Analysts and the New York City Board of Health is confirmed and adopted in this report. It is for the poorest milk from a healthy cow. Fat, 2·5 per cent.; solids, not fat, 9 per cent.; water, 88·5 per cent. From the examination of commercial milk it appears that the sophistications of this article of food are extremely common. While a large proportion of the milk sold has been but moderately watered and skimmed, and is still above the standard of the poorest milk, much of the milk has been extended and skimmed far below this standard.

So openly are these frauds practiced that "creameries" have been established in many localities; the names and locations of seventy-three of such establishments being known to the writers, of which sixty-three are known to send skimmed milk to New York city, all of which is sold as whole milk on its arrival. Special attention was paid to the use of brewers' grains as food for cows.

It is found that when these grains are used in moderate proportions with good pasture, or hay, &c., and the cows are properly cared for, no evil results occur either in the quality of the milk or the condition of the animals. The excessive use, however, of this food has a very bad effect on the cows.

The condensed milk as sent to customers in New York city was carefully analysed and found to be unobjectionable and of good strength, except in one or two cases, where the small percentage of fat showed that the milk must have been partially skimmed before it was condensed.

(To be continued).

ANALYSTS' REPORTS.

At the Breconshire Quarter Sessions, Mr. W. Morgan, the Public Analyst, stated that among the samples submitted to him for analysis during the past quarter was one of pepper, which he found to be genuine.

The County Analyst for the West Riding of Yorkshire, in his annual report, states that the total number of samples examined during the year was 218, against 192 in the previous twelve months. Of the entire number, thirty, or 13·8 per cent., were adulterated to a serious extent; and an additional nineteen, or about 9 per cent., were of very inferior quality, of doubtful purity, or impure to an insignificant extent. The remaining 169 samples were genuine, or not found to be adulterated.

Out of the seventeen samples of food and drink submitted for analysis to the County Analyst for Cumberland, Mr. J. W. Montgomery, only one was found to be adulterated, and that was gin, which was diluted with water to a greater extent than is allowed by law. The samples were as follows: three of rum, two of whiskey, one of gin, one of brandy, two each of pepper, mustard, and coffee, and one each of lard, sago, tea, and milk. This satisfactory report is held to be highly creditable to the tradesmen of the district.

Dr. Alford, the Public Analyst for the county of Somerset, reported at the Quarter Sessions, held at Wells, that during the past quarter he had analysed 141 samples of food and drugs, among which were thirty-three samples of butter, five samples of pepper, thirteen of mustard, two of coffee, one of corn-flour, eighteen of tea, one of sugar, two of jam, seven of arrowroot, one of sago, one of magnesia. Of the whole 141 samples, eight were adulterated, but contained nothing absolutely prejudicial to health.

At the Hereford Quarter Sessions no report was presented from the County Analyst. Major Clive said he protested against this continued farce of paying an official for doing nothing. It was a waste of public money, and something should be done to put an end to such a state of things. He thought an analyst should be engaged as required. The Chairman (Sir Richard Harington) said they were unfortunately obliged to appoint an analyst, but if Major Clive would bring forward a proposal directed to getting rid of what he agreed was a farce, he was quite sure the Court would support him. The subject then dropped.

Mr. A. H. Allen, analyst for Sheffield, has presented the following report:—During the three months ending on the 31st March, I received from the inspector, and duly analysed and reported on, a total number of thirty samples of food, &c. Twelve samples of lard were all found to be genuine. This result is somewhat remarkable in the face of the fact that certain wholesale dealers have recently issued circulars offering advantageous terms to those purchasing watered lard. The explanation possibly lies in the fact of the inspectors being personally known to the vendors of the lard. Of six samples of butter five were genuine. The other sample contained very little, if any, real butter. It consisted of one of the butter substitues now so largely made from beef fat, and similar materials, and known in commerce by the names of "butterine," "oleomargarine, &c. There is no reason to suppose that these fictitious butters are unwholesome if carefully made; but they differ from true butter in several important respects. Of twelve samples of milk, six were genuine, or of fairly good quality; three were of suspiciously inferior quality, but not sufficiently bad to justify their positive condemnation as adulterated; two had been deprived of a considerable proportion of the cream or butter fat by skimming or analogous means; and one sample was adulterated with about one gallon of water to four gallons of original milk.

At Chelmsford Quarter Sessions, Mr. T. A. Pooley, the Public Analyst, reported as under:—At the date of my last report the analyses of ten samples remained uncompleted, and during the quarter I have

received and analysed ninety-five samples of food, so that 105 analyses have been completed; twelve more samples have been submitted and are now being analysed, but as the results are not yet complete, they will be referred to in my next report. The ninety-five samples included the following articles: Milk twenty-four samples, butter fourteen, bread nine, pepper eight, tea seven, gin seven, coffee six sugar six, mustard six, tapioca three, arrowroot two, sweets, whisky, and vinegar one each. Of these 60 samples came from the fourteen districts of the county, 24 from the metropolitan police district, 7 from the West Ham Local Board, and 4 from the Leyton Local Board. Of the total number of articles analysed, 86 or 81·9 per cent. were genuine, and 19 or 18·1 per cent. were adulterated. The adulterated samples included milk, butter, gin, mustard, pepper, and vinegar. Butter: Of fourteen samples analysed by me last quarter only two were adulterated. One sample contained no butter fat at all and was composed entirely of fats other than butter fat, while the other sample contained as much as 88 per cent. of foreign fats. These two samples, although submitted to me as "butter," were really not butter at all, but an article known in commerce as "butterine." I cannot say this article is absolutely injurious to health, but I am of opinion that it is far inferior to butter as an article of food. From the inspectors' report to me it appears that no proceedings have been taken in these two cases of adulterated or fictitious butter. Mustard: Two out of six samples analysed were adulterated, but the adulteration consisted simply in the admixture of wheaten meal. Pepper: Out of eight samples of this article I found only one adulterated, but this contained as much as 12 per cent. of sand. Vinegar: The single sample analysed was far below the usual strength, and I therefore certified to its being adulterated, but as there is no legal standard of strength for this article, I was unable to state the exact percentage of added water. Accompanying the report is a schedule showing in detail the results of the analyses. Of the ninety-five samples sent in and analysed during the quarter, eighteen were adulterated, and in ten cases proceedings before the magistrates have been instituted, but one of the cases has not yet been heard. In the other cases, one defendant was fined £5 and costs, four £2 each and the costs, and one £1 and the costs, for selling adulterated milk; one was fined £1 and costs for selling adulterated pepper, and two were fined 5s. each and the costs for selling adulterated mustard.

According to the report of the Devon County Analyst (Mr. A. Wynter Blyth), recently presented at the Quarter Sessions, thirty-nine samples had been submitted for analysis by the various inspectors, namely, one sample of tea, one of sugar, six of bread, one of gin, fifteen of milk, eleven of butter, and four of flour. Of these, six—or about 15 per cent.—were adulterated. Three samples of milk out of fifteen, all from Torquay, were adulterated with varying quantities of water from 12 to 30 per cent., and three samples of butter out of eleven were found to be in great part artificial.

The analyst for Cheshire, Mr. J. Carter Bell, has reported to Quarter Sessions that during the past three months twenty-three persons were proceeded against in the county under the Sale of Food and Drugs Act, of whom eighteen were fined and five dismissed. The 184 samples examined by him included four of tea, six of bread, five of vinegar, two of drugs, six of mustard, two of flour, two of oatcakes, one of oatmeal, three of pepper, eight of butter, six of lard, and nine of coffee. Of these, only four of coffee and one of butter were adulterated.

THE PUBLIC ANALYST AT GLOUCESTER.—At a special meeting of the Gloucester Town Council, the Finance and Estates Committee reported that a letter had been received from the Local Government Board suggesting that the Council should give directions for samp es of food to be procured and submitted to the Public Analyst for analysis, and that the subject generally and the terms of the Public Analyst's appointment having been considered, they recommend that the Town Clerk be instructed to give the analyst notice for terminating his appointment, with the view to the question being generally reconsidered.

LAW REPORTS.

Milk Adulteration by a Farmer—Sample taken at a Railway Station :—

George Myers, farmer, Pondtail Farm, Warnham, near Horsham, Sussex, appeared to a summons taken out by Inspector Stevenson, for consigning to a milk dealer milk which was afterwards found to be adulterated. The defendant said he would plead guilty, but declared, whatever the adulteration, it

was without his knowledge or sanction. Mr. Marsden asked that the full penalty under the Act should be imposed. The defendant was a farmer in a good position, and the authorities had for a long time tried, especially after remarks which had fallen from the magistrates, to find out if statements so often made by defendants summoned under the Act were true, that they sold the milk as they received it from the country. He had full evidence in this case to show the conveyance of the milk direct from the defendant's farm to the railway station, and so on to Champion Hill Station, Camberwell, where it was consigned to Mr. West, a milk dealer. Inspector Stevenson handed in the certificate of Dr. Bernays, showing that the milk, of which witness took samples at Champion Hill Station, was adulterated to the extent of 18 per cent. of added water. The defendant said he could say no more in answer to the complaint, that he knew nothing whatever of water being added. Mr. W. H. Fullagar said he attended on behalf of Mr. West, to whom the milk was consigned. The defendant had undertaken to supply him with pure milk, but in consequence of complaints from customers, Mr. West had at once communicated with the authorities in order to find out how the adulteration was effected. Mr. Chance said it was highly important that such a thing should be traced if possible, as no doubt it came very hard upon those in the position of Mr. West, who might at any moment be summoned for selling adulterated milk, believing at the same time they had received it pure from the farmer. He ordered the defendant to pay the full penalty of £20, together with £3 costs.

Coffee and Chicory :—

James Spitty, grocer and tea-dealer, of High Street, Whitechapel, was charged with having sold coffee containing a mixture of chicory. The sanitary officer of Whitechapel it appeared sent a lad into the defendant's shop to purchase half a pound of coffee. The lad was asked by the assistant "What price?" and replied, "Shilling." The assistant then suggested "Mixture," and the lad said "Coffee." He paid 6d. for what he received, and gave it to the sanitary officer before leaving the shop. The analyst's certificate handed in showed the "coffee" to be adulterated with thirty-seven per cent. chicory. —The defendant said that he had been in the trade thirty years, and never knew pure coffee sold at 1s. a pound, and customers well knew that "shilling coffee" was a mixture.—Mr. Bushby said that, by the 8th Section of the Act, articles of food or drugs sold as "mixtures" were to be labelled as such. He would not assume a fraudulent intention, but could not inflict a less penalty than £5 and costs.

Summons dismissed because not taken out within reasonable time :—

Mr. Richard Gilbert, was summoned at Devizes, on Wednesday, for selling as mustard a compound which was not of the substance or nature it was represented to be. The certificate of Mr. Stoddart, of Bristol, the Borough Analyst, was put in, showing the mustard to have been adulterated to the extent of not less than 60 per cent. with starch, and coloured with some foreign matter. For the defence it was elicited that the purchase was made on the 26th Dec. last, and the analysis was received on the 29th Dec. The summons was not issued until the 17th of March, and a technical objection was raised that this was not within "a reasonable time." The Bench sustained this objection, ruling that it was not fair to the defendant that so long a time should elapse. The case was accordingly dismissed.

Sweet Spirits of Nitre :—

At the Glossop (Derbyshire) Police Court, lately, the Compstall Co-operative Society was summoned for having sold 3ozs. of sweet spirits of nitre which was not of the quality demanded. Mr. James Harding, manager, appeared on behalf of the Society. Colonel Shortt, Deputy Chief-Constable, said that he called at the co-operative store and asked for 3ozs. of sweet spirit of nitre, for which he paid 1s. The analyst (Mr. Allen, of Sheffield) certified that the nitre was very deficient in real nitrous ether, and would have but little value as a remedy. The sample was also very deficient in alcohol, containing only 58½ per cent. of real alcohol, which corresponded to a dilution of sweet spirits of nitre of good quality with one measure of water. The dilution with water was the chief cause of the deficiency of nitrous ether, as adulterated samples decomposed in the course of several months. Mr. Harding said the Society did not meddle with the nitre, and it was sold precisely as they received it from the wholesale dealers. The magistrates observed that there was no defence, except they bought with a written warranty. They should only deal with men who could warrant the genuineness of the articles they sold. **Fined £1 and costs.**

Colman's Mustard—labelled "Mixture":—

At Jedburgh, Scotland, on the 13th of April, before Sheriff Russell, Messrs. David Cochrane, grocer, Midlem; Alexander Steele, grocer, Lilliesleaf; and James Edgar, grocer, Newcastleton, were charged, under the Food and Drugs Act, with having sold to Inspector Hoggarth certain quantities of Colman's mustard which was not of the nature or quality asked for, all of whom pleaded not guilty. Messrs. Colman determined to defend these cases, and instructed Messrs. Turnbull, Simson and Sturrock, solicitors, Jedburgh, to look after their interests, and they secured the services of Mr. Jameson, advocate, Edinburgh, to conduct the defence; and as these were test questions for Scotland, the Procurator-Fiscal employed Mr. Keir, advocate, Edinburgh, for the prosecution. For the convenience of the Court, all the cases were disposed of at one time.

Archibald Hoggarth, inspector of police and officer under the Act, deposed that he purchased the various samples at the shops of the accused, and handed them to the Public Analyst. In the two first cases he paid 6d. for the quarter-pound canister, each of which had a yellow label, and for the other he paid 5d., the label in this case being red. Cross-examined—In each I only asked for mustard; I did not ask for pure mustard. After I had bought the mustard from Edgar, and told him it was for analysis, he pointed out to me a notice on the side of the tin, "This is sold as a mixture of pure mustard, farina, and choice condiments." I expected to get pure mustard. I observe that the tins are of different shapes, and that two are marked "Double superfine," and the red is marked "Fine." I never bought double superfine for 5d. a quarter. My impression is that the loose mustard, as sold in grocers' shops, is pure.

Messrs. Falconer, King, F. Sutton, and T. W. Drinkwater, Public Analysts, gave evidence as to the composition of the mustard.

Robert Hazlewood deposed to being manager to Messrs. Colman at their works at Norwich. They employed nearly 2,000 people, and were the largest mustard manufacturers in the world. The objections to pure mustard were of two sorts. First, the grocers objected to it, as it would not keep more than perhaps three months without becoming lumpy, in consequence of the oil it contained. The oil, unless absorbed by some means, was apt to ferment and the mustard suffer as to flavour. The second objection came from the consumers. Mixed mustard when made up would keep for a week, while pure mustard would become dark and unpleasant to the sight in the course of twenty-four hours. Besides, the mixed was more palatable. The pure article had to be eaten with great care, otherwise it would cause uncomfortable sneezing, and its strength was apt to overpower the flavour of the meat. The firm sent to Scotland before the passing of the Act only about 6 per cent. of genuine mustard, but after the Act was passed it rose to 47 per cent. It had, however, gradually decreased, and now very little was sold except in bulk to be retailed in small quantities. This kind was of inferior quality, and sold at a cheap rate. The reason of sending out this kind was that grocers did not like the trouble of labelling small quantities, and were nothing but the best qualities sold the poorer classes would not be able to buy it. They did a large trade with Australia and America, and it would be impossible to send it to Australia in good order unless it was mixed, in consequence of the heat, as it had to cross the line. Mr. Colman always used the mixed at his table and as he had had the honour of entertaining the Prince of Wales to dinner, thee might be sure he would produce the best to him. The Government used the mixed for thy navy, but rice flour was put in that instead of wheat flour. All the different varieties were called mustard, and known to the trade as such. Every package is labelled, so that purchasers may know what they are getting. In some places in England nothing but mixed is sold. It is not as a matter of economy that the flour is used. The flour is of the finest quality, and very carefully prepared, and the purchaser of the mixed has as good value as he who buys the unmixed.

Mr. James Blair, wholesale grocer, Edinburgh, deposed—I do a large business in mustard. I have been in business for thirty years. During the whole of that time I have sold large quantities of Colman's mustard. Of late years we have had both mixed and pure. They go by the name of pure and condiment. After the passing of the Act I kept nothing but pure, which I found not satisfactory, as my trade was falling away. I had many complaints about it, and some was returned. It would not keep, but became lumpy and tasteless. I sell chiefly the condiment now. Unless asked for pure I always send mixed. It is the same to me. I sell a little of the pure cheap in 12lb. tins to retail out in small quantities. Customers ordering generally say if they want F. or D.S.F., and in ordering from Colman I ask for F., S.F., or D.S.F.

Mr. William Dickson, wholesale grocer, Edinburgh; and Mr. John Kay, of Messrs. Turnbull & Kay, Edinburgh, gave similar evidence, and several Jedburgh grocers gave similar evidence as to the custom in the retail trade.

After addresses from the counsel, Sheriff Russell said he had already carefully studied the Acts, and was prepared to give his judgment at once, which was one of dismissal. It was quite evident that when a customer asked for mustard he expected to get it mixed unless he asked for pure specially.

Each of the accused got £1 for expenses.

At Hammersmith, H. Aldridge, of Masbro' Road North, Hammersmith, appeared to answer an adjourned summons for selling adulterated milk to the inspector appointed under the Act. Mr. Jones, clerk of the District Board, supported the summons; and Mr. Farman appeared for the defendant. A sample of the milk had been sent to Somerset House to be analyzed, as Mr. Farman disputed the correctness of the Board's analysis. Mr. Jones said the certificate of the Board's analyst went to show that the milk contained 14 per cent. of added water. The certificate from Somerset House said the milk was adulterated with not less than 4 per cent. Mr. Farman said the certificate of Professor Redwood, who had also analyzed the milk, went to show that there was not any added water; it was poor milk. Mr. Paget said there had been failures in other cases. Therefore it was serious, as it threw doubt on the efficiency of the first examination. Mr. Jones said the difficulty arose through the want of a fixed standard. There was one at Somerset House, but it was not known to the analysts, who adopted different standards. Mr. Paget looked at the Act, and said he was not bound by the certificate from Somerset House. However, he dismissed the summons, and ordered the Board to pay six guineas costs.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No. 1881	Name of Patentee.	Title of Patent.	Price.
3473	E. J. Harling & E. Hartmann ..	Electric Lamps	6d.
3517	C. Pieper..	Treatment of Saccharine Juice	2d.
3728	E. Hagen	Production and Application of Ozonized Oxygen for Bleaching, &c.	6d.
3748	C. F. Clans	Manufacture of Hydrate of Strontia	4d.
3799	W. Crookes	Electric Lamps	6d.
3807	A. W. Gillman & S. Spencer ..	Drying Rice	6d.
3821	A. L. Fyfe..	Electric Lamps or Regulators	6d.
3844	A. M. Clark	Manufacture of Salts of Magnesia and Salts of Zinc ..	4d.
3890	D. G. Fitzgerald	Electric Lamps	6d.
3930	W. P. Thompson	Manufacture or Purification of Albumen	4d.
3958	P. Jensen	Refining and Crystallizing Starch Sugar	4d.
3959	P. Jensen	Refining Starch Sugar	4d.
4017	S. Hallett	Electric Lamps	4d.
4024	W. Morgan Brown	Electric Lamps	2d.
4088	H. E. Newton	Treatment of Sewage and Refuse Matters..	4d.
1882. 24	W. R. Lake	Removing Flocculent Matter from Spent Acids used in Treatment of Soluble Fibre	4d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Oil and Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record: Oil and Drug Journal; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine; Volumetric Analysis, by T. Sutton; Modern Metrology, by Lowis D'A. Jackson; Foods: Composition and Analysis, by A. W. Blyth (Griffin & Co., Exeter Street, Strand).

THE ANALYST.

JUNE, 1882.

SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held on the 31st May at Burlington House, Piccadilly; in the absence of the President, the chair was taken by Dr. Muter, Vice-President.

The minutes of the previous meeting were read and confirmed.

Dr. Bostock Hill and Mr. Hehner were appointed Scrutineers to examine the ballot papers, and reported that the following gentlemen had been elected members:—Mr. A. E. Ekins, Analytical Chemist, St. Albans; Mr. Bernhard Halford, Analytical Chemist, London; and Mr. W. H. Watson, Analytical Chemist, Bolton.

The following papers were then read and discussed:—

"On a Fat recently extensively offered as an Adulterant for Lard," by J. Muter, Ph.D., &c.

"On Discordant Milk Analyses," by F. P. Perkins, F.C.S.

"On the Composition of the Black Deposit which forms on the Electrolysis of Saturated Solution of Silver Nitrate," by J. W. Gatehouse, F.C.S.

The Next Meeting of the Society will be held on June 28th.

NOTE ON A FAT RECENTLY EXTENSIVELY OFFERED AS AN ADULTERANT FOR LARD.

BY JOHN MUTER, Ph.D., F.I.C.

Read before the Society of Public Analysts, on 31st May, 1882.

THIS fat (of which I exhibit a specimen) is in some respects peculiar. It is, as you see, not at all unlike lard, being similar in consistence and general appearance. According to my analyses of several samples which I have had submitted to me by firms in the lard trade, anxious to know what it is, I find on an average the following result:—(1.) It has an actual density at 100° F. of ·911·5 to ·912. (2.) It yields on saponification 95·5 per cent. of fatty acids, all insoluble. (3.) It is completely soluble in ether and in hot absolute alcohol. (4.) When melted and treated by my modification of Chateau's course, it gives reactions for cotton oil. It is, therefore, evidently the "stearine" separated out during the rectification of that oil. A most striking fact is that, although nicely made to almost the exact consistence of lard at ordinary temperature, and not becoming perfectly

fluid under 90° F., yet, after melting, it does not again solidify, but remains a yellow oil, having the distant odour of fine cotton salad oil, until it has been kept at 40° F. for some time, when it again resumes its original appearance. Its detection in lard is happily rendered simple by its high density and by the article not setting so solid as it was at first, after having been kept melted for the purpose of taking gravity. If added to "butterine" it makes the article softer and better looking in winter, and increases the density, but the high insoluble acids then serve to distinguish such a "butterine" from a mixture of fat and butter. Many recent "butterines," which on the density actually show a considerable amount of pure butter, have not a trace, but the error is due to the presence of this cotton "stearine."

REPORTS ON ADULTERATION IN THE STATE OF NEW YORK,

From the *Sanitary Engineer*, New York.

(Continued from page 88.*)*

GROUP II.

BUTTER:—Dairy and Artificial; Cheese; Lard; Olive Oil, and Fruit Essences.

Report by Prof. G. C. Caldwell, Ph.D., of Cornell University, Ithaca, N. Y.

BUTTER.

The adulteration of butter with cheaper fats was noticed by English chemists as early as 1861, and "at present oleomargarine occupies the most prominent position as an adulterant of butter."

It is stated that the production of oleomargarine butter in this State amounts to 20,000,000 lbs. per annum, which is equal to one-fifth of the quantity of dairy butter made. Lard is sometimes used for adulterating butter, but its use is much less extensive than that of oleomargarine. It also appears that certain vegetable oils, as that from cotton-seed, are sometimes employed.

Prof. Caldwell asks the question whether the addition of these cheaper fats to butter is an adulteration, since butter is only fats identically of the same character. The substitution of a cheaper for a more expensive article of food if it is sold as the latter, is a violation of the law. As to the wholesomeness of oleomargarine, the question still remains open to discussion. In 1879 the English Local Government Board "declared that it could see no reason against the use of oleomargarine, provided that it be invariably sold under a distinctive name, and not fraudulently substituted for genuine butter."

Earlier French official reports recognize oleomargarine as perfectly wholesome, but a later report expresses the opinion that its effect on the health is not good on account of the greater difficulty of digesting it. Opinions of private observers are cited, some of which are to the effect that animal tissue, &c., are found in oleomargarine, while others assert that when carefully made these objections will be found to have no support.

Another form of adulteration which is sometimes practiced is the addition of water. Butter ordinarily contains from 5 to 10 per cent. of water, although some fix 18 per cent. as the maximum. By careful manipulation, however, butter can be made to retain as high as 50 per cent. of water.

The methods of examination of butter are next considered, and are classified under five heads:—(*a*) tests by specific gravity, (*b*) tests by melting point, (*c*) tests by the microscope, (*d*) brief qualitative tests, (*e*) partial quantitative analyses.

The specific gravity test depends upon the fact that "fats generally used for the adulteration of butter have a lower specific gravity than that of pure butter fat." While the specific gravity of the latter ranges from 0·865 to 0·868 at 100° C., beef and mutton fat have a specific gravity of 0·860, and lard of 0·861. As to the use of this method it is "concluded that the test is not one upon which much reliance can be placed."

The fusing point test "depends for its usefulness on the fact that the melting point of butter is lower than that of many other fats with which it is commonly adulterated." The authorities do not agree as to what the fusing point of butter is, the differences being due to differences in manipulation, and Prof. Caldwell concludes that "one who would test butter for adulteration by the determination of its fusing point should fix upon his own standards of comparison, by many tests of his own of genuine butter and its adulterants, and of mixtures of them."

The microscope has been employed in the examination of butter to detect the crystalline structure of foreign fats, supposing that these fats have been melted in the process of manufacture. The polarizer is of much service in these examinations, but "little dependence can be placed on any microscopic test of the genuineness of butter, at least so far as the observation of crystalline forms of foreign fats is concerned, for neither does the absence of such forms prove that the butter does not contain oleomargarine nor does their presence prove the adulteration."

The general usefulness of qualitative tests, of which several are given, "is very questionable." "While most of them will answer well enough for distinguishing oleomargarine butter pure and simple, or a butter made from tallow, lard and oil," they fail to detect the presence of oleomargarine in genuine butter, even though it exists in considerable quantity.

The partial quantitative analyses "are the only ones that give positive and incontrovertible evidence" of adulteration of butter with foreign fats. Prof. Caldwell gives a very complete *resumé* of the various methods which have been suggested and to some extent employed in detecting this form of adulteration. One of the best of these methods is that devised by Hehner and Angell, which depends upon the separation and weighing of the insoluble fatty acids. These acids in genuine butter vary from 86·5 to 87·5 per cent., while beef and mutton fat and lard yield 95·5 per cent. There is considerable difference of opinion among chemists as to the exact limits to be fixed for the percentage of the fatty acids in genuine butter, some claiming that the figures given above are too high, while others consider them too low. Another process which has found much favor depends upon the distilling off of the soluble fatty acids and titrating the distillate. This method as modified by Reichert* was employed by Prof. Caldwell in his examination of butter. It consists in the saponification of the fat, the decomposition of the soap by acid, distilling and titrating a certain quantity of the distillate with a one-tenth normal alkaline solution. He employs in all cases "the same quantity of butter, of alkali for saponification, dissolved in the same quantity of alcohol, adding the same quantity of acid for decomposing the soap." It was found that 14 c.c. of this alkaline solution was required "to neutralize 50 c.c. of the distillate from the acids yielded by 2·5 grams of the filtered butter fat, while for oleomargarine only 0·95 c.c. af the alkaline solution was required, and for lard, 0·3 c.c. Reichert claims that 10 per cent. of foreign fats can be detected in this way, "and that when the distillate requires only 12·5 c.c. of the alkaline solution the butter may be considered as adulterated."

For the detection of water as an adulterant Prof. Caldwell employed a method suggested by Hoorn,† which consists in melting 10 grams of butter in a graduated tube with a narrower part at the lower end. The butter is then mixed with 30 c.c. of petroleum ether by shaking, after which the water separates in the narrow tube. Hoorn found that the water in good butter ranged from 12 to 14 per cent., and over 20 per cent. only in adulterated butter.

"The result is more reliable if the first etherial solution is decanted off and the residue is shaken up with a fresh quantity of the ether."

* Fres. Zeitschr, 18, 1879, 68. † Fres. Zeitschr, 11, 1872, 334.

Prof. Caldwell examined forty-two samples of butter, the results of which are given in the following table:

Inspector's No. of Sample.	Trade Designation.	C. C. of Alkali Solution Required.	Volume p'r cent. of Water, etc.
122*a*	Oleomargarine butter, procured at my request	* 1·5	
122*b*	Oleomargarine butter, procured at my request	* 1·7	
236	Dairy butter, costing lb. 29c	14·9	14·79
237	Dairy butter, costing lb. 30c	13 7	14·53
238	Cooking butter, costing lb. 18c	13·6	15·55
239	Dairy butter, costing lb. 25c	13·1	28·58
240	Best creamery, costing lb. 40c	13·5	15·21
241	Best dairy, costing lb. 44c	13·6	15·15
242	Best creamery, costing lb 38c		19·53
243	Good dairy, costing lb. 26c	14·	16 10
244	Fair dairy butter, costing lb. 20c	15·1	14·26
289	Butter, costing lb. 32c	* 1·	10·66
290	Butter, costing lb. 32c	1·3	15·22
291	Butter, costing lb. 20c	12·8	16·87
292	Butter, costing lb. 20c	* 1·6	13·79
293	Butter, costing lb. 22c	13·7	19·55
294	Butter, costing lb. 26c	* 1·6	10·80
295	Butter, costing lb. 26c	12·7	30·75
296	Butter, costing lb. 26c	15·3	11·17
297	Butter, costing lb. 24c	14·5	14 94
331	Dairy butter, costing lb. 28c	* 1·6	10·
332	Splendid dairy butter, costing lb. 30c	13·	14·79
333	Extra fine dairy, costing lb. 33c	13·8	12 32
334	Splendid dairy, costing lb. 30c	15·5	13·19
335	Creamery butter, costing lb. 32c	* 2·2	
336	Good dairy, costing lb. 30c	14 8	26·27
337	Roll butter, costing lb. 35c	* 1·8	7·74
338	Good creamery, costing lb. 28c	14·7	12 80
339	Fair table, costing lb. 25c	15·3	18·15
340	Dairy butter, costing lb. 30c	* 2·1	9 71
357	Genuine dairy, costing lb. 30c	14·1	16·52
358	Roll butter, costing lb. 27c	* 2·7	9·62
366	Good dairy butter, costing lb. 30c	*10·2 *11·6 *11·4	15·56
2001	Butter, costing lb. 36c	12·8	15·
2002	Butter, costing lb. 26c	15·9	11·47
2003	Oleomargarine butter, acknowledged to the Inspector, costing lb. 26c	*	12·71
2004	Oleomargarine butter, acknowledged to the Inspector, costing lb. 26c	*	8·84
2005	Oleomargarine butter acknowledged to the Inspector, costing lb. 20c	*	11·52
2006	Butter, costing lb. 30c	15·5	23·32
2007	Butter, costing lb. 48c	14·9	16·16
3102	Best country butter, from my own table, costing lb. 32c	14·1	
3103	Best country butter, from my own table, costing lb. 32c	13·9	
2016	Western butter	14·4	10 45
2017	Butter, acknowledged by seller to be a mixture of lard and butter	* 5·4	13 27

Nos. 122*a* and 122*b* were oleomargarine, while 3102 and 3103 were genuine butter, these being taken to test the method of examination.

As 12·5 c.c. of alkali is the limit fixed in Germany, where the method is most used, it appears that No. 366 is a mixture of butter and oleomargarine. Those marked with an asterisk (*) contain fatty matter other than genuine butter.

No. 295 is adulterated with water and Nos. 239, 242, 292, 336 and 2006 are considered as suspicious.

The microscopic examinations on oleomargarine butters showed in one case indications of bacteria, and in another of fungoid vegetation, and in several remains of tissue. These objects were of rare occurrence, however, and it is not considered as "proved that some of them may not be found in genuine butter of poor or ordinary quality with as much frequency." Prof. Caldwell is "not prepared to say that their occurence is characteristic of oleomargarine butter."

CHEESE.

After mentioning the possible adulterations of cheese as given by different authorities, Prof. Caldwell states that lard cheese has to a considerable extent supplanted that made from skimmed milk and oleomargarine, which was largely manufactured some years ago. There are over twenty factories in this State where lard cheese is manufactured, and an account is given of the method of manufacture. The lard cheeses so closely resemble cream cheeses that experts are often deceived by them. It is stated that the manufacture of lard cheese is confined to this State, and that for the six months ending November 1, 1881, 800,000 pounds were made by the twenty-three factories engaged in the business. Most, if not all, of this cheese is exported.

Unless lard cheese is sold under its distinctive name, its sale must be considered as a fraud—first, because "it contains less fat and fat of a cheaper kind than the ordinary full-cream cheese," and secondly, there are some grounds for the belief that the lard is less easily digested than butter fat.

In speaking of skimmed milk cheese, Prof. Caldwell says it is doubtful whether such cheeses are anywhere sold in a way to deceive consumers as to their character. To prevent these cheeses from puffing out, or "huffing," as it is technically called, from the abnormal generation of gases in the interior before they become fully ripe, patented "anti-huffing" extracts are employed. One which was examined consisted of "caustic and carbonated alkali, saltpetre and a little annatto for colouring, dissolved in water," while another was almost entirely borax.

It does not appear that any samples of cheese were submitted for examination, with the exception of one which was said to produce sickness. An examination of this sample, however, failed to reveal the presence of any poisonous substance, and Prof. Caldwell concludes that the injurious action was probably due to an "unknown organic substance resulting from an abnormal process of ripening."

LARD.

Various writers have stated that lard is frequently adulterated, and that of the adulterants employed, water, starchy matters, salt, alum, lime, &c., are the most common. The detection of these substances is a matter of no difficulty. Prof. Caldwell examined twenty-eight samples, which varied greatly in colour, texture and odour. Some had a texture reminding one of cotton, and emitted a disagreeable odour, which was much worse when the samples were melted. Aside from the question of adulteration some of these lards could not be considered wholesome articles of food. Of the twenty-eight samples examined fifteen contained "no water," three had a "little water," while the rest contained water ranging from 1 to 7·5 per cent. Prof. Caldwell concludes "that the practice of watering lard prevails to some extent, but in no case did the proportion of water reach the high figures mentioned by some writers, and in no case was the water alkaline."

OLIVE OIL.

"According to all accounts olive oil appears to be one of the most largely and variously adulterated of all substances put upon our tables." "Poppy oil, cotton-seed oil, ground or peanut oil, sesame oil, rapeseed oil, colza oil, and even coal oil are mentioned as being used for this adulteration."

"There is no evidence that any of these adulterants are injurious to health, and their use is in violation of the law only in that a cheaper article is substituted for a dearer one with fraudulent intent." "The occurrence of poisonous metals such as copper and lead may be a more serious matter from a sanitary point of view, although the quantity of these metals that might be taken into the system in the quantity of oil ordinarily consumed may be of small importance." Water and salts will not be taken up by the oil and consequently cannot be used as adulterants. "The detection of these adulterations, and especially the identification of the oil used as an adulterant, is beset with much difficulty," and there is no quick and satisfactory way of detecting adulterations.

Prof. Caldwell then reviews under the following heads the various methods that have been suggested for this purpose:—1st, methods based on specific gravity or solidifying point; 2nd, methods based on changes in consistency produced by certain chemical agents; 3rd, methods based on changes in colour

produced by certain chemical agents; 4th, spectroscopic tests; 5th, miscellaneous tests. Each is considered by itself, and various authorities are quoted with reference to the different tests mentioned. On many of these methods very little dependence can be placed and they are of no value practically. Considering the difficulty attendant upon the detection of adulterations in olive oil, Prof. Caldwell expresses the opinion that the "simplest way to clear the path of all difficulties would be that which has been proposed in the case of milk, to declare that a good article of olive oil fit for sale at good prices shall stand certain tests."

Sixteen samples of olive oil were examined, the tests being based upon the action of various chemical reagents upon the oils. "To sum up the whole matter, while there may not be in the results of these tests positive proof of the presence of this or that foreign oil in particular, there is fully sufficient proof of adulteration of some kind." Of the sixteen samples, nine are considered as adulterated, one with sesame oil, four with cotton-seed oil, two with ground nut oil, and two with ground nut or cotton-seed oils, or possibly with both.

(To be continued).

COCOA.

It is not only the makers of certain kinds of coffee mixtures who are affected by Mr. Gladstone's recent Budget resolutions; the cocoa manufacturers are now somewhat concerned in regard to the matter. In order to show how they may be affected, we give the following clause from the Customs and Inland Revenue Bill:—"(1.) If any person shall keep for sale, or sell, or offer or expose for sale, any article or substance whatsoever prepared or manufactured for the purpose of being in imitation of or in any respect to resemble chicory, or coffee, or cocoa, or to serve as a substitute for chicory, or coffee, or cocoa, or which shall be alleged or intended so to be, or shall be mixed with or called by any name of chicory, or coffee, or cocoa, such article or substance, and any chicory, coffee, or cocoa with which it is mixed, shall be forfeited, and may be seized by any officer of Inland Revenue, and the person preparing, manufacturing, or selling the same, or in whose custody the same is found, shall incur a fine of one hundred pounds. (2.) Section five of the Act of the forty-third year of the reign of King George the Third, chapter one hundred and twenty-nine, is hereby repealed, save as respects the validity, invalidity, effect, or consequences of anything already done or suffered." We are informed that at a recent meeting of cocoa manufacturers it was decided to wait upon the Government in reference to the matter, and we trust that the result will be satisfactory.—*Grocer.*

REVIEWS.

Foods: their Composition and Analysis. By A. Wynter Blyth, M.R.C.S., F.C.S.

The literature of food analysis is fast becoming bulky, and to some extent tiresome. Just at the time when we are anxiously expecting the work, on which it is an open secret that Mr. Bell, of Somerset House, has been for some years engaged, we are confronted with a second edition of Mr. Blyth's compilation. The present volume is much more ambitious in tone than the former, as Mr. Blyth has divided his original work, which treated both of food and poisons, into two distinct books, so keeping the subjects separate. It is well known that Mr Blyth is a universalist in genius; but, in this work, he surpasses himself, for he is, in turn, a historian, a lawyer, an inventor of apparatus, an analyst, a literary collector, and a biologist. The book opens with a sketch of the history of adulteration, commencing with the well-worn specific gravity experiments of Archimedes on King Hiero's crown, some

250 years B.C., taking us through all recorded matter on the subject in England, France and Germany, down to the establishment of the Society of Public Analysts. This part occupies 46 pages, and the author himself, in his preface, states it to be the result of considerable labour and research, and hopes it will be found interesting. That it is so, from an antiquarian point of view, is certain, but whether it is altogether in its right place in what professes to be a manual of practical chemistry is open to doubt. Leaving his *role* of historian, the author then assumes his legal robes, and we have a complete digest of the present state of the law as regards adulteration. The Sale of Food and Drugs Act is taken section by section, commented on, and the illustrative cases given where disputed points have occurred, together with Mr. Blyth's own legal view of some points not yet decided. This part would be useful if published separately in a little pamphlet, for the use of the inspectors and the public. Concluding this part of the book, we have, in appendix form, both the English and American Acts, and extracts from Mr. Wigner's American prize essay, which has already been noticed in these columns. Leaving the legal, the author then turns to the working bench, and we have descriptions of Soxhlet's fat extractor, the micro-spectroscope, and the author's own apparatus for extracting with volatile liquids, for the estimation of carbonic acids, and his improved Lane-Fox vacuum pump. All are very ingenious and calculated to save time, and conduce to accuracy. Turning now to the body of the book, we find that, commencing with colouring matters which are very well and yet concisely treated, it passes to the estimation and analysis of the ash of organic substances generally, and then to sugars and starches. The polarization of sugar is described, and the starches are classified microscopically, both by Muter's and Vogel's systems. In part IV. we meet with milk, a subject in which the author revels, and to which he devotes nearly a hundred pages. He refers to it in the preface as a fairly complete monograph, and in this we not only agree with him, but we go the length of saying that it is, in some points, the most complete we have yet met with. It is on this point that analysts will be anxious to compare the author's conclusions with those of Mr. Bell, when we have them. Mr. Blyth adopts the standard of 9 per cent. "solids not fat," but considers even that to be too low. He also suggests that in milks, the watering of which may be a matter of doubt, the examination of the ash for sulphates and nitrites might give good confirmatory data, and states positively that the ash of genuine milk only contains the merest trace of the former, while the latter is never present at all. In referring to milk standards, however, the author seems to have overlooked the fact which is so strongly in the minds of analysts who have considered the matter in all its bearings, namely, that the actual amount of "solids not fat" found must depend to a certain extent on the method adopted in the drying and subsequent extraction, and therefore in laying down any hard and fast line, the method of working must be also rigorously defined and adhered to. Following milk, there are 20 pages devoted to butter, in which the processes are well described, and the limits of ·911 actual density at 100 and 89·5 insoluble fatty acids originally proposed by Dr. Muter in the first number of THE ANALYST are confirmed and adhered to. Next follow sections on tea, coffee, spices, wine, beer and alcoholic liquids, all carefully written, and including Gautier's full tables for detection of foreign colouring matters in wine. The book concludes with a chapter of about 40 pages devoted to the chemical and microscopical analysis of water, in which the process adopted by our society is fully explained. Dr. Frankland's process for organic

carbon and nitrogen, and Dupré's method for organic carbon are fully described. In discussing the interpretation of the analytical figures obtained, Mr. Wigner's valuation scale is adopted and its use illustrated by a diagram of the author's monthly analyses of the Grand Junction Company's water for 1881.

Having thus briefly run through the contents of Mr. Blyth's book, we think that we have said enough to show that although loaded here and there with much extraneous matter, it is yet one without which no Public Analyst's library can be said to be complete. Like most chemical books, however, we occasionally meet with misprints due to inefficient proof reading—a specially dangerous instance of this being seen on page 353, where the specific gravity of coffee decoction is given as 1000·5. The index is also very imperfect, as, while pretending to give both the names of the substances referred to, and those of the authors of the various processes quoted, it fails so lamentably in the latter respect as to give an opening for the remark by captious critics that the author had therein ignored the existence of several of his British contemporaries. It would be wiser in future editions not to adopt such a style of index unless it can be properly carried out.

Modern Metrology.

By Louis D'A. Jackson, pp. xx. and 449. London: Crosby, Lockwood & Co. 1882.

There is, one may almost venture to affirm, but a single defect in this book: and that defect is the absence of an index. Perusal of the table of contents, and casual dips into the several chapters into which this volume is divided, serve to show that Mr. Jackson has here offered to the commercial and to the scientific world a work of great erudition and great value. The labour in collecting, arranging, re-calculating, and verifying the values given in this volume must have been enormous. A glance at any of the tables will demonstrate this, for each measure is always followed by three equivalents—namely: the English commercial, the English scientific, and the French scientific equivalents. The book is divided into two parts: the first part dealing with metrical units, the second part metrical systems. The historical introductions to the several chapters—the comparison of standards (with reference especially to the conditions under which they were made and under which they can be compared), and the recommendation by Mr. Jackson of a new metrical system—all these important sections of the work before us must be studied in the book itself: it would be impossible to do justice to them in a brief notice. We commend the volume to the consideration of all chemists.

CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

MILK ANALYSIS.

To the Editor of "The Analyst."

Sir,—Three of the samples of milk which I examined last year were the milk of a single cow, well fed and in good condition. The following is the analysis of the milk:—

Total solids	8·83 per cent.
Ash	·94 ,,
Chlorine in Ash	·267 ,,
Fat	2·98
Solids not fat	6·05
Water	91·17

These results were confirmed both by Mr. Bell, of Somerset House, and Mr. Wigner.

Mr. Bell in his report upon it says that "if the solids not fat only are made the factor for determining the purity or otherwise of the milk, we should conclude that it contained not less than 25 per cent. of added water."

In another letter from Mr. Bell, he says "We have never found the mixed milk of a dairy to yield less than 8·5 per cent. of solids not fat, and only in very few instances out of several hundreds have we found the milk of individual cows to yield less than 8 per cent." He concludes by saying, "I am of opinion that whenever the solids not fat fall between 8 per cent. and the limit or standard of 9 per cent. adopted by the Society of Public Analysts, some enquiry as to the history of the sample should be made before proceedings are instituted."

In this I quite agree with him, and I make it a rule to enquire about the history of all samples of milk.

The following extract from a letter from the Secretary of the Local Government Board respecting the same sample of milk may also be of interest to other analysts:—"The analysts' certificate is not incontestable as proof of the commission of an offence, and it would be open to the person selling the milk to bring forward evidence that it had not been watered. It would then be for the magistrate to decide whether an offence had been committed against the Sale of Food and Drugs Act, by the sale to a purchaser asking for milk, of a sample far below the quality of the article commonly known under that name."

Yours, &c.,

W. F. LOWE, *Analyst for Chester.*

CHEESE ADULTERATION.

The following letter has appeared in the *Rugby Advertiser*:—

THE FARMER'S FRIEND.

SIR,—To the well-informed Secretary of the Cheshire Chamber of Agriculture the public is indebted for a few interesting facts about the American cheese trade. As your readers know, the competition between the American cheese factory and the British dairy is keen enough, even when conducted on legitimate and thoroughly honest grounds. But when to the facilities already possessed, are added all the roguery and cuteness that the Yankee can command, it will be admitted the chance of the British farmer to make a living is a small one. Through corresponding with a cheese retailer the Secretary has discovered how "prime American" is manufactured. Messrs Burrell & Whitmore have what they call "creameries," *i.e.*, cheese factories; and in response to an application from a London cheese dealer, sent him two cheeses, one made of lard the other of oleomargarine. The exporters were rather proud of their achievement. The cheeses had been "kept for some time," and had been successfully proved by experts, and were, in short, a triumph of the adulterator's art. No secret is made of the *modus operandi*. The makers in their circular openly say—

"You will be able to judge what can be done with the bluest kind of skimmed milk when treated with lard or with oleomargarine at the rate of 1½lbs. to the 100 of milk. You will be able also to compare the quality and flavour of the lard cheese with that made with oleomargarine. Four pounds and upwards of butter were taken from 100lbs. of milk before treating it with lard, and the same as to the specimen treated with oleomargarine."

It comes to this: that our dairy farmers are exposed to a new danger. Already has Sir Herbert Maxwell made an ineffectual appeal against the defrauding of the British dairyman by the introduction of oleomargarine butter: already has our Government preferred to feed the British sailor on American salt junk instead of upon good English meat; and now the cheese producer of Warwickshire who makes his cheese in an honest manner will find himself ousted from the market by the horrid concoctions of Yankee sharpers. Where is it to end? We Englishmen throw open our ports to them free while they shut theirs to us; we buy their produce in preference to our own, and we give them every possible legislative facility for hounding the British farmer—the backbone of the constitution— out of the market. No doubt we shall be told that if people like to buy congealed oleomargarine and lard for cheese they can do so; but how is the farmer to pay his rent if he can't sell his beef, butter, or cheese? When Carlyle said the world was made up of fools he must have had in his prophetic mind the accession to office of a Government such as the present one, which is bent on committing commercial and agricultural suicide. I have only to say that a Government which protects the importation of shamefully adulterated food, encourages unprincipled opponents instead of its own people, increases the farmer's burdens though it lessens his source of revenue, and yet calls itself "the farmer's friend," is a very Liberal Government indeed. In fact, none but a Liberal Government could do it.—Yours, &c.,

G. G. LAMBERT.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in May, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	May 24	c. p. blue	none	1·56	trace	·28	trace	·0017	·006	·026	20 0°	6·0°	27·6	satisfactory	Wigner & Harland.
New River	,, 13	c. faint yellow	none	1·12	trace	·19	·0021	·0028	·033	·067	14·0°	4·0°	19·6	satisfactory	B. Dyer.
East London	,, 13	yellow grn. clear	none	1·27	none	·19	·0036	·0052	·004	·026	14·0°	4·0°	22·4	vegetable debris, fibres	Wigner & Harland.
Southwark & Vauxhall	,, 7	c. pale yellow	none	1·24	trace	·11	·0007	·0070	·040	·072	14·5°	4·0°	21·7	none	John Muter.
West Middlesex	,, 22	very yellow	none	1·01	h. trace	·11	·0013	·0061	·030	·088	12·5°	3·0°	18·9	none	O. Hehner.
Grand Junction	,,	p. yellow	none	1·15	trace	·09	·0028	·0047	·018	·096	13·4°	3·1°	19·7		A. Wynter-Blyth.
Lambeth	,, 7	c. pale yellow	none	1·24	trace	·12	·0007	·0070	·037	·061	14·5°	4·5°	21·9	none	John Muter.
Chelsea	,, 22	c. strong g. yell.	none	1·11	trace	·10	·0014	·0076	·020	·058	16·5°	5·0°	19·3		A. Dupré.
Birmingham	May 8	turbid greenish	none	1·26	trace	·16	·0021		·019	·071	10·5°	5·6°	18·6	vegetable matter	A. Hill.
Bolton	,, 1	clear	none	·40	none	·03	·0025	·0028	·010	·028	3·2°	3·0°			W. H. Watson.
Brighton	,, 8	yellow blue clear	slight	2·05	slight	·28	·0151	·0178	trace	·146	12·4°	·4°	22·8	vegetable debris	Wigner & Harland.
Bristol	,, 8	grnsh. brown	none	·91	none	·04	·0005	·0040	·017	·047	15·2°	2·5°	19·2	sand, algæ	F. W. Stoddart.
Cambridge	,, 16	c. p. blue	none	1·40	trace	·40	none	·0028	none	·008	17·5°	5·0°	25·0	satisfactory	J. West Knights.
Croydon	,, 21	c. colourless	none	1·19	h. trace	·23	none	·0025	none	·004	15·5°	6·0°	22·0	none	C. Heisch.
Darlington	,, 11	s. turb. yel. grn.	s. weedy	·63	trace	·03	trace	·0042	·141	·231	7·0°	5·0°	8·4	satisfactory	W. F. K. Stock.
Dublin	Apr. 29	clear	none	·86	trace	trace	·0020	·0055	·058	·200	1·3°	·6°	4·3	satisfactory	C. A. Cameron.
Exeter	May 9	f. brnsh. yellow	none	·91	trace	·15	·0014	·0042	·024	·047	2·8°	2·8°	6·3		F. P. Perkins.
Grantham	,, 14	c. p. blue	none	1·09	trace	·58	·0007	·0005	·003	·005	15·7°	5·3°	23·3	satisfactory	A. Ashby.
Hastings	,, 15	p. blue, s. cloudy	none	4·90	trace	·14	·0007	·0035	·004	·012	10·0°	6·0°	25·0	satisfactory	H. F. Cheshire.
King's Lynn	,, 15	light brown	weedy	1·64	trace	·17	none	·0080	·076	·487	13·5°	5·0°	17·6	diats., veg. debris, bact.	W. Johnstone.
Liverpool	,, 19	yell. green	s. peaty	1·02	traces	·35	·0014	·0042	·026	·085	3·7°	3·4°	7·84		A. Smetham.

SOCIETY OF PUBLIC ANALYSTS.

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									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Maidstone—															
Wtr. Company	May 13	pale green	none	2·50	trace	·51		·0014	·022	·067	17·7°	6·5°	33·6	none	M. A. Adams.
Public Conduit	,, 13	p. blue	none	2·28	trace	·51		·0007	·028	·058	15·8°	6·0°	32·3	none	M. A. Adams.
Manchester ..	,, 17	s. yell: clear	none	·62	none	none	·0027	·0030	·027	·060	1·7°	1·6°	4·6	satisfactory	William Thomson.
Newark	,, 17	c. p. blue	none	1·12	trace	·04	·0007	·0029	·004	·023	22·2°	13·3°	34·6	satisfactory	A. Ashby.
Newcastle-on-Tyne.....	,, 18	ft. yellow	none	·88	trace	·04	·0010	·0080	·058	·101	14·3°	5·0°	18·6	satisfactory	J. Pattinson.
Nottingham ..	,, 18	green blue clear	none	1·49	none	·91	·0053	·0039	·006	·012	11·2°	5·0°	19·0	veg. deb., fibres, anml.	Wigner & Harland.
Norwich	,, 13	p. grnsh. yell.	none	1·70	trace	·08	trace	·0102	·052	·102	14·0°	4·1°	19·6		W. G. Crook.
Portsmouth ..	,, 10	clear	none	1·25	trace	·18	trace	·0063	none	none	13·4°	3·2°	12·5	veg. matter, diatoms	W. J. Sykes.
Rugby	,, 7	c. p. yellow	none	1·12	h. trace	·19	·0070	·0189	·039	·084	13·0°	7·5°	21·0	veg. deb., mvg. orgsms.	A. P. Smith.
Salford	,, 2	clear but yellow	none	0·60	none	none	·0007	·0014	·002	·034	3·5°	3·0°	4·5	none	J. Carter Bell.
Shrewsbury ..	,, 9	c. colourless	none	1·40	none	·26	·0008	·0045	·007	·007	21·0°	5·5°	25·0	none	T. P. Blunt.
Southampton..	,, 21	p.y. rather turb.	none	·98	s. trace	·34	trace	·0071	·028	·072	15·0°	4·9°	20·3	diams. rotifers tardigrada	A. Angell.
Swansea.....	,,	clear	none	1·00	trace	none	·0010	·0042	·003	·003	1·4°	1·4°	3·7	none	W. Morgan.
Whitehaven ..	,, 9	c. f. green	none	·47	trace	·01	none	·0008	·005	·012	·4°	·4°	2·1	satisfactory	A. Kitchin.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

ERRATA.—In the Manchester Water for April, the Chlorine should read ·745, not 7·45.

ANALYST'S REPORT.

At the quarterly meeting of the Bristol Town Council, recently, the Watch Committee presented a report, in which they stated that they had appointed eight inspectors of police—viz., two from each division of the police force—to perform the duties previously undertaken by the Inspector of Nuisances under the Sale of Food and Drugs Act, 1875; and the Committee submitted for the information of the Council a statement of the proceedings under the Act from June last to March 31st in this year. The inspectors had purchased and submitted to the analyst 198 samples, of which there were fifteen of coffee, eleven of mustard, eleven of butter, five of pepper, five of tea, two of sugar, one of cheese, and one of vinegar. In consequence of the analyst's reports upon these samples the Committee directed vendors of mustard, coffee, and butter to be prosecuted, and convictions were obtained in one case of coffee and one case of butter. In one case of mustard the summons was dismissed. Mr. F. Wallis Stoddart, the city analyst, presented his report for the quarter, in which he said thirty-one samples had been examined by him, and twelve condemned as adulterated or unfit for consumption. Out of samples of butter, one contained 75 per cent. of foreign fats, and that was sent in by the public; another forwarded by the inspector consisted entirely of other fats than butter. There were seven samples of butter genuine; two samples of pepper were genuine; six samples of mustard were genuine; one sample of vinegar was genuine; seven samples of coffee were genuine, and one sample was adulterated with 40 per cent. of chicory; five samples of tea were genuine; one sample of cheese was genuine.

LAW REPORTS.

Selling Butterine:—

On May 18th, before Sheriff Barclay, James King, grocer, 124, High Street, and residing at York Place Perth, was charged, at the instance of Mr. John Welsh, superintendent of police, with selling on 22nd March last, to Sergeant Buist, city police, a pound of a compound of fat, in place of a pound of salted butter, which compound was not of the nature, substance, and quality of that demanded and paid for. Mr. Chalmers, solicitor, appeared in behalf of the accused, who pleaded not guilty to the charge. His defence he stated was, that it was "butterine" which was understood to be wanted and that it was not salt butter which was asked for. For the prosecution, Sergeant Buist, city police, was examined. He deponed that on the 22nd March he went into Mr. King's shop and asked for a lb. of salt butter. He paid 1s. for it. After buying it he told the seller, Miss King, that it was to be sent to the Public Analyst for analysis. He divided the butter into three parts, leaving a portion of it with Miss King. Cross-examined by Mr. Chalmers, witness said that he asked for one pound of salt butter. He did not ask for "a pound of their shilling butter." He did not expect to get "butterine" when he asked for salt butter. He had no reason to suspect or know that Mr. King sold "butterine." He did not know that people who made a practice of purchasing "butterine" called it shilling butter. He had frequently bought good salt butter at one shilling a pound. By Mr. Chalmers—Miss King did not tell him that it was "butterine" till after he had got and paid for the butter. By the Sheriff—After he had paid for it and told her that it was for the Public Analyst, she said it was "butterine," and that she would take it back. Witness would not agree to that. Miss King did not offer him good butter in place of the "butterine." Dr. Wallace, Public Analyst for the city of Perth and Glasgow, was examined. His analysis of the sample of butter bought by Sergeant Buist was as follows:—I am of opinion that it contains no butter fat, or at least no appreciable quantity, but is composed of fat other than that of butter, together with a small quantity of salt, a little of curdy or insoluble organic matter, and some water. No change had taken place in the constitution of the article that would interfere with the analysis. As witness my hand this 3rd day of April, 1882.—William Wallace. Dr. Wallace stated that the butter was transmitted to him in a sealed canister similar to the one produced in the Court. He considered that if a person went into a shop and asked for salt butter, and got in its stead an article such as he had analysed, he would be getting a different article altogether from what had been asked for. Cross-examined—The sample which he analysed had the same appearance as "butterine." He believed butterine was quite wholesome. It was composed of animal fat. The butterine he analysed was a good quality of "butterine." If witness had the choice he would rather take fresh "butterine" than rancid butter. The sample was opened on the day which witness received it. By the Sheriff—"Butterine" was manufactured chiefly in America. It was not worth 1s. a pound. The price of salt butter varied from about 10d. to 1s. 4d. or 1s. 5d., depending on the quality and the season. "Butterine"

was not invariably sold cheaper than butter. He supposed the dealer had a much larger profit on butterine than on butter. After evidence had been given for the defendant, Sheriff Barclay said that the only difficulty he had was in regard to the reprehensibility of the accused in having a placard in his window stating only that the price was a shilling, and not that the article was "butterine." One shilling being the price of "butterine," and not the price of salted butter, he did not think he could by any possibility convict, and therefore he dismissed the accused.

Colman's Mustard:—

At the Bedford Borough Police Court, recently, Mr. Wm. Henry Humphrey, grocer, Princes Street, was charged with selling adulterated mustard to George Steers, Sanitary Inspector of the Borough of Bedford, on April 4. Mr. Cockerell, barrister, Midland Circuit, prosecuted; Mr. Clare (Conquest and Clare, Bedford) defended. George Steers proved the purchase of the sample. Dr. Prior, Public Analyst of the borough of Bedford, sworn, said the certificate produced contained a correct account of his analysis of the mustard, sample No. 36. The certificate gave the proportion 80 per cent. of mustard flour, 19 per cent. of wheaten flour, and 1 per cent. of colouring matter. Cross-examined: I received one box of mustard from the inspector. I examined the sample with a microscope and also chemically. In testing it with iodine I found evidence of the presence of a large quantity of starch. I observed globules of oil with the microscope. I have heard of ether being employed in these analyses, but I am not aware that the ether process is in use at Somerset House. I believe the mustard in the sample was flour of the white mustard-seed. There may have been black with it. The seed is not very different, there is a slight difference in colour. I cannot perceive any difference in the smell. (A sample bottle of both white and brown mustard was produced.) I do not know the difference in the price of the brown and white seed. I do not know there is any difference in the quantity of oil produced by the two kinds of seed. I am aware that the oil varies in different qualities of seed. I am quite sure there was about 1 per cent. of colouring matter. I conceive that the sample of mustard was adulterated to render the production cheaper. I do not know whether it would be cheaper than the pure mustard. I did not know that pure mustard could be got at 10d. per lb. Mr. Clare then read an extract from *Gray's Pharmacopœia*, which stated that the mustard of commerce consists of mustard flour, wheaten flour, cayenne pepper, and is coloured with turmeric. The Witness said: I was not aware of that. The majority of samples that I have analysed have contained wheat flour and colouring ingredients, but some are pure, as one bought on the same day as this. The flour of mustard present was 80 per cent.; that was the estimate I arrived at. Re-examined: One of the samples brought to me on this day was perfectly pure. All the samples were submitted as pure. Mr. Clare having addressed the Bench, Mr. Francis Sutton, sworn, said: I am a Fellow of the Chemical Society, and also of the Chemical Institute. I was a witness before the Select Committee of the House before the Adulteration Act was passed. I am County Analyst for Norfolk, Borough Analyst for Yarmouth and also for Thetford, and I am the author of a standard work on chemical analysis. I have examined the sample of mustard left with the defendant by the inspector, and find 92·04 per cent. of the mixed flours of white and brown mustard-seed, 7·66 per cent. of wheaten flour, and ·3 of turmeric, colouring matter. About half of each kind of mustard seed was present. The brown seed is much stronger, while the white seed gives from 40 to 50 per cent. more flour. The white is the cheaper seed. The husks of the seed could be ground up and mixed with the flour, and would be simply pure mustard as required by the Act. The brown seed contains most oil. The quantity of the oil varies with the years; some years the crops are better than in others. White seeds go down to 23 or 24 per cent. of oil, and brown up to 43 per cent. That is the fixed oil from which when analysing I estimate the quality of pure mustard. I do not consider examination by the microscope and testing by iodine a complete analysis. Iodine would show the presence of starch, but not the quantity. The proper method is to take a weighed quantity of mustard, to extract the fixed oil, and to weigh that and from it calculate the quantity of real mustard. That is the acknowledged method. I consider it essential to a quantitive analysis to weigh the samples. The wheat flour mixed with the mustard absorbs the fixed oil, and prevents fermentation. The mustard I examined was of the finest quality. A grocer could not depend on keeping flour of white and brown mustard seed, unmixed with wheaten flour, good for three months. It would not keep crossing the line to the tropics, and it would not be fit for carriage. The mixture of wheaten flour improves the mustard, and removes the peculiarly bitter taste of the pure seed. The taste of pure mustard is disagreeable. The application of pure mustard to the skin would be a very powerful blister. The aromatic principle of the mustard is preserved by the mixture. The

turmeric is not injurious to health. For my own table I should prefer mustard from this sample to pure mustard. Cross-examined: The mustard is a mixture, and I should prefer that mixture to a pure mustard for table purposes. I did not find cayenne pepper present. Mr. Robert Haslewood, assistant manager of Messrs. Colman's mustard factory, Norwich, said: Wheaten flour is used in making the double superfine quality of our mustard, and it is the best quality of table mustard. The sale of this mustard greatly preponderates over the sale of the pure mustard. We cannot send the pure mustard to the tropics. If a grocer inadvertently put a few tins of pure mustard in his window in the sun it would get lumpy and ferment. It is no unfrequent occurrence for us to have tins of pure mustard returned on that account. We could not sell pure mustard except in the North, amongst miners and those sort of people. The husks could be ground up in the mustard, and it is done by some firms. We sell them from ¼d. to ½d. per lb. for manure. It would be a source of great profit to us if we did grind them in, but it would spoil our reputation and future sale. We can supply pure mustard at 10d. per lb.—that would consist entirely of the flour of white mustard seed and husks. We could not supply the mixture of mustard seed flour and wheaten flour any cheaper than the flour of pure mustard. They cost the manufacturer the same. We supply it at, I think, 1s. 5d. per lb. Prior to the passing of the Act only an infinitesimal quantity of pure mustard was sold. Mr. Charles Berwick, wholesale grocer and provision dealer, Greyfriars Walk, deposed to supplying defendant's father with Colman's mustard. At this juncture Mr. Cockerell said after the facts that had come to light during this examination he felt sure those who had instructed him would not wish to continue the case, and he therefore felt that he ought to withdraw it. The magistrates immediately took this view and dismissed the case, allowing costs of £4 4s. to defendant.

Heavy Fine for selling Butterine:—

At the Chippenham Borough Petty Session, recently, before Mr. H. Prodgers (chairman), Lord Dangan. Messrs. R. Walmesbury, A. B. Rooke, and G. L. Lopes, Mr. Clement E. Palser, grocer, of Burton-on-Nettleton, was summoned for selling to A. Barrett, superintendent of police, a certain article of food called butter which was not of the nature, substance, and quality of the article demanded. Superintendent Barrett proved that he purchased ½ lb. of butter from an assistant to the defendant, who stated that it was pure. He forwarded a portion of the article to Dr. Donkin, County Analyst, and he certified it to contain 80 per cent. of foreign fat and a little real butter. Mr. F. H. Phillips, on behalf of the defendant, admitted that the article sold was butterine, but said that the assistant was mistaken in telling Superintendent Barrett it was pure butter. The magistrates fined the defendant £10, to include costs.

Adulterated Coffee:—

At Stockport, before the Borough Bench, viz., Mr. W. Rayner, M.D., and Mr. W. Bale, surgeon, John Turner, wholesale and retail grocer, having several places of business in the town, and a member of the Town Council, was charged with having, on the 13th of April sold to the prejudice of the purchaser an article of food—viz., coffee—not of the substance, nature, and quality demanded. Mr. Dobson from the office of the Town Clerk, prosecuted on behalf of the Corporation; and Mr. F. Newton, solicitor, appeared on behalf of Mr. Turner, and pleaded not guilty. Peter Bradburn, a labouring man in the employ of the Corporation, said that on April 13th he went with Sanitary Inspectors Marshall and Craig to Mr. Turner's shop at 68, Great Portwood Street. Inspector Marshall told him to go into the shop and buy half a pound of coffee, and gave him the money to do so. The inspectors remained outside and witness went to purchase the coffee. There was a man in the shop. Witness asked the price of coffee. The shopman replied that there were different prices—1s., 1s. 6d., and 1s. 8d. per lb. Witness then asked for half a pound of coffee at 1s. The shopman gave him a parcel, and witness paid 6d. for it. There was no label pointed out to witness, and no conversation took place as to the contents of the parcel. Witness was going out of the shop when he was met at the door by Inspector Marshall, and that officer returned with him to the counter. The shopman then said he had told Bradburn it was not genuine coffee, but afterwards he admitted that he did not say so. Inspector Marshall deposed to dividing the mixture into parts as required by the Act, leaving one portion with the shopman and taking another portion to Mr. Oswald Wilkinson, the Borough Analyst. He examined the packet, and could not find anything outside to indicate that it contained a mixture. After the coffee had been taken out of

the paper, he observed near the edge a printed notice to the effect that it was a mixture. Witness produced the analyst's certificate, showing there was an admixture of 49 per cent. of chicory. Mr. Newton proceeded to cross-examine the inspector, when Dr. Rayner observed that it was the public who were prejudiced by having this mixture sold as coffee. Coffee was a very important article of diet, and it was necessary that the public should be able to get it pure. Supposing anybody wanted a strong decoction of coffee, as they sometimes did, it could not be produced from an article like this. Mr. Newton: You surely would not purchase 1s. coffee for that purpose? Dr. Rayner: If I asked for coffee I should expect to get coffee. For myself, I would take good care not to buy coffee that was ground at the shop; I would grind it myself. The paper in which the coffee was wrapped had upon it a representation of Portstown, Jamaica, with a description of the place underneath, then the name of Mr. Turner, and at the bottom this notice—"This is an admixture in which no injurious ingredient has been used—38 and 39 Vic., cap. 63, s. 3." Inspector Marshall produced a second parcel, purchased at the same shop, wrapped as was the parcel bought by Bradburn, the notice being hidden. Mr. Newton urged that the notice printed on the paper was intended to comply with the Act, and in the face of such intention he trusted that the Bench might not feel called upon to inflict a penalty. There was no allegation that Mr. Turner had increased the bulk for the purpose of obtaining a price to which he was not entitled. Mr. Dobson said there was no allegation of a felonious intent; and the magistrates also said they did not for a moment believe that Mr. Turner intended anything of the kind. Mr. Turner then gave evidence. He said the paper in which the coffee was sold he had purposely had printed in order to comply with the Act, and he was told by the printers that legal opinion had been taken upon it, and that it was sufficient. In addition to this he told his assistants to inform customers when they purchased the 1s. article, that it was not pure coffee, as it could not be bought at the price. The coffee of which this was a mixture was a fine plantation coffee—for he never bought anything which was inferior—and with the chicory it was a much better drink than coffee exclusively. Mr. Newton said he was prepared with an independent witness as to the marketable value of the article sold. The magistrate's clerk replied that evidence upon that point was unnecessary, as the marketable value was admitted. Dr. Rayner: Can you dispute the analyst's certificate? Mr. Newton: No. Dr. Rayner said that the public, in purchasing coffee, would be taken in by getting an article which was afterwards found to be half chicory. The case was clearly proved, and the defendant would be fined £3 and costs. He would advise people to buy coffee not ground, and grind it for themselves. So long as all sorts of things were put in, they did not know what they bought. Mr. Newton stated that Mr. Turner had requested him to give notice of appeal.

THE WORK DONE DURING 1881 UNDER THE SALE OF FOOD ACT.

We had hoped to have been able to publish in this number the remarks to which an examination of the accompanying tabulated statement give rise, but as some of the returns have only been received at the very last moment, we cannot do more at present than print the table, and will refer to the subject again next month.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Oil and Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record: Oil and Drug Journal; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine; London Water Supply, by Crookes, Odling and Tyid; Annular Report of the Commissioner of Agriculture for 1880, Washington; Spon's Encyclopœdia of Industrial Arts, Division V.; Journal of Society of Chemical Industry; Analysis of Potable Water, by Folkard; Catalogue of the Literature of the Chemistry of Food and Drugs, by A. L. Colby; Annular Report on the Sanitary Condition of Leicester; Report on the Temperature of Fresh Water Lakes, and Remarks on the Tastes and Odours of Surface Waters, by Professor Ripley Nichols; Public Water Supplies of West Cumberland, by A. Kitchin, F.I.C.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No. 1881	Name of Patentee.	Title of Patent.	Price.
3976	P. Jensen	Electric Arc Lamps	6d.
4133	L. T. Wright	Purification of Gas	2d.
4174	E. G. Brewer	Electric Lamps	8d.
4193	C. H. Ginningham	Electric Lamps	4d.
4195	C. J. Davidson	Compound for Coating Iron, to Prevent Rust	4d.
4201	E. A. Parnell	Manufacture of Oxide of Iron	2d.
4202	J. W. Swan	Incandescent Electric Lamps	4d.
4214	H. E. Newton	Treating Seaweed to obtain Useful Products	4d.
4241	A. W. Reddie	Manufacture and Re-burning Bone Black	6d.
4250	E. P. Alexander	Separating Gases from each other	8d.
4251	F. Versmann	Manufacture of Floorcloth	2d.
4281	F. Wirth	Production of Magnesia and Hydrochloric Acids from Chloride of Magnesium	2d.
4305	H. J. Haddan	Electric Lamps	2d.
4310	A. P. Laurie	Secondary Batteries	4d.
4311	J. H. Johnson	Electric Lamps	6d.
4360	F. N. Mackay	Manufacture of Snow	6d.
4366	W. and H. Marriott	Treating Nitrogenous Substances to obtain Ammonia Therefrom	6d.
4396	J. James and J. C. Lee	Carbons for Electric Lamps	2d.
4397	T. Twynam	Manufacture of Magnesia	4d.
4398	A. W. Reddie	Secondary Batteries, or Electrical Accumulators	2d.
4405	A. M. Clark	Producing the Electric Light	10d.
4418	R. Mackenzie	Calcining Sulphide Ores of Copper and other Metals	6d.
4139	J. Jameson	Incandescent Electric Lamps	6d.
4441	J. Deucker	Recovering Nitric, Sulphuric and Muriatic Acids from Lye Products of Manufacture of Benzole	2d.
4455	J. W. Swan	Secondary Batteries for Effecting Electrical Storage	4d.
4456	W. Black and T. Larkin	Furnaces for Extraction of Sulphur from its Ores	4d.
4478	R. Harrison	Electric Lamps	6d.
4486	J. B. Readman	Obtaining Oxides and Salts of Certain Metals	4d.
4490	D. Rae	Artificially Producing Snow	2d.
4491	J. Imray	Manufacturing Soda by the Ammonia Method	6d.
4504	J. Brockie	Electric Arc Lamps	6d.
4508	J. H. Johnson	Production, Collection, and Storage of Electricity	4d.
4553	P. Jensen	Charging and Using Secondary Batteries	6d.
4555	E. Hagen	Apparatus for Production and Application of Ozonized Oxygen	2d.
4561	J. B. Kinnear	Destroying Putrescible Matter of Sewage, Separating the Solid Matter, and Obtaining Ammonia	4d.
4632	J. S. Sellon	Secondary Batteries	2d.
4635	F. M. Lyte	Treating Ores and Metallic Compounds, or Residual Products Containing Silver, Lead, or Copper	4d.
1882.			
384	W. R. Lake	Production of Aniline and Toluidine	6d.
834	W. R. Lake	Electric Lamps	6d.

THE ANALYST.

JULY, 1882.

SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held on the 28th June at Burlington House, Piccadilly; in the absence of the President through illness, the chair was taken by Dr. Muter, Vice-President.

The following papers were read and discussed :—

"On Samples of Milk which have fallen below the Society's limit," by W. Johnstone, F.I.C., F.C.S.

"On the Relation between the Specific Gravity, the Fat, and the Solids not Fat in Milk;" and

"A New Analysis of the Sandrock Mineral Water," by O. Hehner, F.I.C., F.C.S.

"On the Work done by Public Analysts during 1881, under the Sale of Food Act," by G. W. Wigner, F.I.C., F.C.S.

"On the use of Platinic Chloride as an Indicator in the Determination of Free Iodine," by T. P. Blunt, M.A., F.C.S.

[We are compelled to hold some of these Papers over until our next number. ED. ANALYST.]

NEW ANALYSIS OF THE SANDROCK (I.W.) MINERAL WATER.

BY O. HEHNER, F.I.C., F.C.S.

Read before the Society of Public Analysts, on 28th June, 1882.

Not far from the southern point of the Isle of Wight, about 150 yards distant from the shore, issues the Sandrock Spring, which yields the water of which the analysis is given below.

It was analysed in or a little before 1811, by Dr. Marcet, who reported that "every pint or sixteen-ounce measure of the water contained the following ingredients, viz.:—

"Of carbonic acid gas, three-tenths of a cubic inch.		
"Sulphate of iron, in the state of crystallised green sulphate	41·4	grains.
'Sulphate of alumina, a quantity of which if brought to the state of "crystallised alum would amount to	31·6	,,
"Sulphate of lime, dried at 160°	10·1	,,
"Sulphate of magnesia, or Epsom salts, crystallised	3·6	,,
"Sulphate of soda, or Glauber's salt, crystallised	16·0	,,
"Muriate of soda, or common salt, crystallised	4·0	,,
"Silica	0·7	,,
	107·4	,,

For purposes of comparison I have recalculated these figures, and the results will be found below.

It is stated that the water has also been analysed by Berzelius, but I have not been able to find any record of his results. Possibly no independent analysis by Berzelius exists, as Berzelius and Marcet must have been at some time or other working together, their joint names heading a paper on a different subject.

My own results are as follows :—

Specific gravity of the water at 60° F, 1008·9. 100,000 parts contain :—

		Marcet.
Cl	19·99	34·6
HCl	2·10	—
SO_3	530·82	424·4
SiO_2	9·18	10·0
P_2O_5	0·38	—
FeO	146·34	153·0
Fe_2O_3	4·13	—
Al_2O_3	115·87	48·9
MnO	0·05	—
NiO	0·97	—
CaO	40·98	46·9
MgO	14·70	8·3
Na_2O	1·20	44·1
Na	12·95	22·4
K_2O	2·33	—
$(NH_4)_2O$	0·08	—
	902·07	792·6
Co	strong trace.	
I, Br & CO_2	absent.	
Free NH_3	0·0554	
Albuminoid NH_3	0·0132	

Combining the above substances to the salts most probably present, the results stand thus :—

NaCl	32·94	57·0
Na_2SO_4	2·75	101·0
K_2SO_4	4·30	—
$(NH_4)_2SO_4$	0·20	—
$FeSO_4$	308·94	323·0
$Fe_2 3SO_4$	9·25	—
$Al_2 3SO_4$	385·86	162·9
$Fe_2P_2O_8$	0·81	—
$CaSO_4$	99·52	113·8
$MgSO_4$	44·10	24·9
$MnSO_4$	0·11	—
$NiSO_4$	2·01	—
SiO_2	9·18	10·0
HCl (free)	2·10	—
	902·07	792·6
CO_2 (free)	—	10·8 c.c. per litre.

The water is, therefore, a remarkable one, not only for the extremely large amounts of ferrous and aluminic sulphates which it contains, but more so on account of the presence in it of a relatively very considerable quantity of nickel sulphate. I know of no water in which anything like the proportion of nickel stated above has been discovered. Nickel and

cobalt are not of unfrequent occurrence in the muds deposited by mineral springs, but in the water itself these metals are very rarely traceable.

Marcet's results are, on the whole, and considering the state of analytical chemistry in 1811, very creditable to that chemist. The main constituent, ferrous sulphate, found by him accords wonderfully near with my own figure. Probably he separated the various salts mainly by crystallization, as the terms employed in his report would indicate. I am inclined to attribute the differences in the two analyses rather to the methods of analysis than to any change in the composition of the water itself.

ON THE WORK DONE BY PUBLIC ANALYSTS DURING 1881 UNDER THE SALE OF FOOD AND DRUGS ACT.

By G. W. Wigner, F.I.C., F.C.S.

Read before the Society of Public Analysts, on 28th June, 1882.

A year ago I had the pleasure of summarising the returns made by Public Analysts as to the work done by them under the Sale of Food and Drugs Act during 1880, and of making some remarks on them; and I have now to bring before your notice another series of returns for 1881. These returns include the work of 78 Public Analysts, nearly all of whom are members of our Society; but a few who have not yet seen their way to join us, have been kind enough to favour us with the details of their work, so that the table might be made as complete as possible.

The object of this yearly summary is to point out the extent to which adulteration prevails year by year, earlier, and in a somewhat different way than it is reported in the blue books. These latter are, of course, issued at a later period of the year, and are arranged in a manner which does not enable us, as Public Analysts, to examine the facts contained in the various returns in the same way as we can in those we ourselves prepare.

Since the last paper on this subject appeared, very great steps have been taken, especially in the United States, towards the suppression of adulteration, and a number of different bills have been proposed in the various States, and most of them have been passed. The most satisfactory point in connection with them is, that nearly all contain what was originally proposed by this Society and pressed very strongly upon our own Government, viz., a distinct definition of adulteration, with limits or standards, showing what the constituents of any particular article are (according to the Act) expected to be. Had this course been followed in England, we should have been saved the annoyance which has been caused by the occasional contradiction of opinion between the Inland Revenue Chemists and the Public Analysts.

One very important publication in reference to adulteration has taken place during the past year, viz., the reports of the United States analysts who have, by the directions of the Government, examined the question of adulteration and its prevalence in almost all articles over the whole of the States. It is unnecessary to refer to that more fully, since the abstracts of the reports from the *Sanitary Engineer* (which is the official organ of the State Board of Health of New York) are being reprinted in The Analyst as rapidly as space will permit.

Several things have occurred lately to prove that the Sale of Food and Drugs Act needs further amendment; but in the present state of legislation it is, of course, quite impossible to hope for such a step this session, or even next.

Among the amendments which are essentially required, are the compulsory attendance of the referee chemists, whoever they may be, to verify their analysis on oath. It cannot be too well understood that their certificates at present *are not legal evidence*. Provision is also required for the compulsory collection of samples in larger numbers *pro rata* to the number of inhabitants.

Last year I mentioned that the probable number of samples examined was one out of every million samples purchased, and this year the number has fallen by a small fraction lower still. Taking only one illustration of the results of this imperfect examination of food supply, I may note that several of the larger dairymen supplying London absolutely reject milk, and fine the farmers who send it to them, when the standard falls down within 5 per cent. of as low as the Somerset House chemists are now passing, and if it falls within 8 per cent. of as low, the farmer receives a notice couched in somewhat unpleasant terms. It is little wonder then that they, as well as we, should look upon such a "standard," if so it can be called, as a premium upon adulteration.

Passing now from a general view of the subject to the details, we have the following results. The number of returns received of samples analysed and reported upon during the last seven years have been as follows:—

Year.	Districts.	Samples Examined.	Samples Adulterated.	Percentage Adulterated.
1875-6	109	15989	2895	18·10
1877	127	11943	2371	17·70
1878	168	15107	2505	16·58
1879	212	17574	3032	17·25
1880	237	17919	3132	17·47
1881	249	17868*	2960	16·56

It will be noted that the returns this year are from 12 more districts than we had last year, and that the number of samples has been somewhat less. 1881 shows a slight diminution in the percentage of adulteration, as compared with 1880, from 17·47 to 16·56 -- that is, after two years increase in percentage there is now a decrease—and the percentage is almost the same as it was in 1878. So far as appears from this, the good effect which the Act should have had has been, to a great extent, neutralized by its imperfect administration.

The following table shows the classification of the samples submitted to public analysts, including some few waters which, under arrangements which certain analysts have made, are included in the work they have to do under the Sale of Food Act. Dividing these articles into classes we have as follows:—

SAMPLES PURCHASED, 1879, 1880 AND 1881.

	Numbers.			Percentages.		
	1879.	1880.	1881.	1879.	1880.	1881.
Milk	6036	7251	6828	36·1	40·40	38·67
Butter	969	892	1081	5·7	4·97	5·86
Groceries	4197	3845	4328	25·0	21·48	24·17
Drugs	615	390	487	3·6	2·17	2·67
Wines, Spirits, and Beer	1615	2220	1967	9·7	12·36	10·86
Bread and Flour	1471	1326	1134	8·7	7·40	6·35
Water	1240	1604	1463	7·5	9·04	8·18
Sundries	629	391	580	3·7	2·18	3·24
	16,772	17,919	17,868	100·0	100·00	100·00

* The total in the tabulated statement is incorrectly put at 17808.

The figures in the last three columns show the percentage of samples purchased calculated upon the total.

In the following table the adulterated samples, which number 2,960 as against 3,132 last year, are classified with the corresponding figures for 1879 and 1880, the percentages being calculated upon the total number of samples found to be adulterated in each year.

SAMPLES FOUND ADULTERATED, OR IN THE CASE OF WATERS, UNFIT TO DRINK, 1879, 1880, AND 1881.

	Numbers.			Percentage.		
	1879.	1880.	1881.	1879.	1880.	1881.
Milk	1332	1595	1379	44·72	50·98	45·30
Butter	135	179	137	4·53	5·73	4·65
Groceries	492	402	420	16·52	12·90	15·27
Drugs	164	79	93	5·52	2·52	3·16
Wines, Spirits, and Beer	457	480	471	15·36	15·18	16·00
Bread and Flour	68	84	48	2·28	2·68	1·63
Waters	266	287	383	8·93	9·18	13·01
Sundries	64	26	29	2·14	·83	·98
	2978	3132	2960	100·00	100·00	100·00

In this case it appears that the percentage of milk adulteration has fallen very slightly. Groceries show an increase as against the decrease of the previous year; bread and flour a decrease. In the case of water there is a large increase in the amount of impurity found.

It is more important to examine the percentage of adulteration as compared with the number of samples of each article purchased, and for this reason I have taken five consecutive years—viz.: 1877 to 1881—and calculated the percentage of adulteration as found in each year on each class of goods.

PERCENTAGES OF ADULTERATION FOUND FROM 1877 TO 1881, CALCULATED ON THE NUMBER OF SAMPLES OF EACH CLASS ANALYSED.

	1877.	1878.	1879.	1880.	1881.
Milk	26·07	18·38	22·06	22·00	19·95
Butter	12·48	13·23	13·93	20·08	12·67
Groceries	13·03	12·89	11·73	10·43	9·70
Drugs	23·82	35·77	26·66	20·26	19·09
Wine, Spirits, and Beer	47·00	29·31	28·30	21·31	23·94
Bread and Flour	6·84	2·97	4·62	6·33	4·23
Water	21·63	14·98	21·45	17·73	26·17
Sundries			10·17	6·66	5·00

This table is really the most important in the whole series, for it shows in what way the Act is working upon the vendors of different classes of goods. We find that milk still shows a fractional decrease in adulteration: it has not fallen down to the point reached in 1878, when the Act, if not worked more energetically than now, was certainly more of a terror to dairymen than at present, but 1879, 1880, and 1881, each show a small fractional decrease.

Butter has again fallen below the high figure which was reached last year and the comparatively high figures of the two previous years, and is down again almost to the point which it reached in 1877.

Groceries show a decided improvement.

Drugs show an improvement of more than 1 per cent. to be added to the 6 per cent. gain of the previous year.

Wines, spirits, and beer show a fractional improvement, which brings them almost to the average of 1879.

Now taking the samples examined in the Metropolitan district alone we get the following results:—The total number purchased was 2806, of which 398, or 14·21 per cent., were adulterated, this being as nearly as possible 1 per cent. less than last year. These samples are divided thus:—

METROPOLITAN DISTRICTS—PERCENTAGE OF ADULTERATION, 1881.

	Examined.	Adulterated.	Percentage.
Milk	935	247	26·31
Butter	238	34	14·28
Groceries	856	68	7·94
Drugs	51	4	7·84
Wines, Spirits, and Beer	188	24	12·76
Bread and Flour	238	3	1·30
Waters	96	15	15·62
Sundries	204	3	1·47
	2,806	398	14·21

The only noticeable changes in this table from that which I gave last year are that the samples of butter show about 7 per cent. less adulteration, and those of wines, spirits, and beer about 6 per cent. more.

Next we have 153 Towns where 6,439 samples have been examined. This is about 700 less than was examined in almost the same number of towns during the previous year. The percentage of adulteration is 19·56 as against 17·87 last year.

TOWNS IN THE UNITED KINGDOM—PERCENTAGE OF ADULTERATION, 1881.

	Examined.	Adulterated.	Percentage.
Milk	3721	742	19·94
Butter	298	64	21·47
Groceries	993	165	16·61
Drugs	78	11	14·10
Wines, Spirits, and Beer	361	89	24·65
Bread and Flour	325	12	3·69
Waters	513	166	32·35
Sundries	150	11	7·33
	6,439	1,260	19·56

In this case the notable changes are a fractional improvement of nearly 2 per cent. in the case of milk, about 4½ per cent. improvement in butter, 10 per cent. in groceries, 6 per cent. in drugs, a deterioration in bread and flour, and a marked deterioration in the purity of water supplied for domestic use.

Passing from the towns to the counties we have reports from 74 counties and divisions of counties, as against 65 last year, with a total of about 500 more samples examined. The percentage of adulteration in these counties appears to have decreased from 17·84 to 15·09.

COUNTIES IN THE UNITED KINGDOM. PERCENTAGE OF ADULTERATION, 1881.

	Examined.	Adulterated.	Percentage.
Milk	2130	392	18·40
Butter	550	41	7·45
Groceries	2490	195	7·83
Drugs	364	79	28·34
Wines, Spirits and Beer	1427	355	24·87
Bread and Flour	552	29	5·24
Waters	880	208	23·63
Sundries	230	3	1·30
	8623	1302	15·09

Butter and groceries appear to be the articles to which the decrease is most due; the adulteration of the former having decreased from 15·69 to 7·45, and the latter in almost equal proportion. "Sundries" show a marked decrease, but the number analysed is so small that it scarcely tells on the total.

The relative proportion of samples purchased in London, the large towns, and counties, show as follows:—London, 15·70 per cent.; large towns, 36·04 per cent.; counties, 48·26 per cent.; and I now place before you a table which shows side by side the relative percentage of adulteration found in them.

METROPOLIS, TOWNS, AND COUNTIES. PERCENTAGE OF ADULTERATION, 1881.

	London.	Large Towns.	Counties.	Whole Country.
Milk	26·31	19·94	18·40	19·95
Butter	14·28	21·47	7·45	12·67
Groceries	7·94	16·61	7·83	9·70
Drugs	7·84	14·10	28·34	19·09
Wines, Spirits, and Beer	12·76	24·65	24·87	23·94
Bread and Flour	1·30	3·69	5·24	4·23
Waters	15·62	32·35	23·63	26·17
Sundries	1·47	7·33	1·30	5·00

I must leave these statistics to be examined, and the deductions to be drawn from them by others, except as regards one or two points. Milk adulteration remains as it always has done, one of the crying shames of the country. Probably it does not exceed the mark when I say that £100,000 a year is paid in the Metropolitan District alone for water which is sold at the price of milk. In this case the public are simply robbed, and the profit does not go to the Water Companies, but to the milkmen.

In the case of butter, which ranks almost next worse among the list of adulterations, it is, perhaps, more strictly correct to say that the public are cheated rather than robbed, because they get a "fat" of an inferior quality and slightly less palatable, but which is is still "fat" in substitution for the butter which they intended to buy.

The low figure of the alcoholic strength of the wines, spirits, and beer may be passed over as before, on the ground that the public ought to be able to take care of themselves in *this* respect, and that probably it is quite as well that they can buy spirits of low alcoholic strength at a low price as strong spirits at an increased price.

As to drugs I can say nothing. It is true that the number of samples analysed is small, as it always has been since these returns have been made—487 only were examined last year—but certainly "druggists" should be above suspicion, and it is a sad thing to see the percentage of adulteration rise as high as 19·09 per cent. In my opinion it would have been far better had I been able to say that every one of these cases had been taken into court, so that, to put it in the mildest way, errors made by trained men might have been exposed.

The usual although very unpleasant sequence to my annual report is to point out that there are seven counties and 43 towns, besides one Metropolitan District—St. Martin's —in which the Act has been absolutely ignored, and nothing whatever was examined during the year. And in addition there are four counties and 26 towns where the amount of work performed has been utterly inadequate to the number of inhabitants, so that there are 80 counties, cities, and towns in the United Kingdom, and one important Metropolitan District, where the authorities have very successfully shown how "not to do it" in the way of complying with one of the most salutary Acts that has been passed during this generation.

As illustrations of the curiosities of adulteration I may add that Mr. Gatehouse reports marmalade and jam as containing saltpetre; Mr. Stock, whisky containing capsicum; Mr. Tatlock, skim milk containing chalk: and Mr. Allen, muffins containing plaster of Paris, and oatmeal containing chalk.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in June, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	May 30	c. p. blue	none	1·91	none	·16	trace	·0037	none	·006	21 2°	5·6°	33·4	vegetable debris	Wigner & Harland.
New River	June 14	clear	none	1·20	trace	·15	·0028	·0018	·017	·041	14·0°	3·5°	19·6	satisfactory	B. Dyer.
East London	,, 9	c. yell. green	none	1·27	slight	·11	·0016	·0023	·014	·032	14·8°	3·0°	18·0	veg. deb., fibres, anml.	Wigner & Harland.
Southwark & Vauxhall	,, 5	p. y. & clear	none	1·24	trace	·12	·0014	·0070	·023	·057	15·0°	4·0°	18·9	none	John Muter.
West Middlesex	,, 21	f. yellow	none	1·08	trace	·11	·0015	·0062	·023	·042	12·5°	3·0°	18·0		O. Hehner.
Grand Junction	,,	p. yellow	none	1·02	trace	·28	·0011	·0045	·010	·081	14·4°	3·3°	21·0		A. Wynter-Blyth.
Lambeth	,, 5	p. y. & clear	none	1·24	trace	·12	·0014	·0070	·024	·062	16·0°	3·5°	18·9	none	John Muter.
Chelsea	,, 19	c. p. brn. green	none	1·22	trace	·05	none	·0048	·022	·050	16·5°	4·5°	13·4		A. Dupré.
Birmingham	June 2	turb. grnsh.	none	1·33	trace	·13	·0014		·022	·078	9·8°	7·9°	20·7	veg. debris and forms	A. Hill.
Bolton	,, 16	v. s. turb.	none	·40	none	·03	·0011	·0022	·010	·020	3·5°	3·5°	7·1	satisfactory	W. H. Watson.
Brighton	,, 8	c. p. blue	none	1·97	none	·19	·0021	·0017	none	·008	13·6°	3·1°	20·4	veg. deb., fibres, anml.	Wigner & Harland.
Bristol	,, 12	grnsh. brown	none	1·20	none	·06	·0005	·0025	·016	·025	17·5°	2·8°	22·0	sand, algæ	F. W. Stoddart.
Cambridge	,, 19	c. p. blue	none	1·40	trace	·42	none	·0020	none	·016	18·0°	5·0°	24·8	satisfactory	J. West Knights.
Croydon	,, 20	c. colourless	none	1·19	trace	·27	none	none	none	·007	15·0°	6·0°	22·4	none	C. Heisch.
Dublin	May 31	light yellow	none	·86	trace	trace	·0020	·0055	·063	·215	1·3°	·6°	4·4	satisfactory	C. A. Cameron.
Edinburgh	June 15	v. s. brown	none	·80	none	trace	·0008	·0056	·012	·038	4·2°	3·9°	4·8	none	J. Falconer King.
Exeter	,, 12	f. b. yellow		·84	trace	·13	·0018	·0059	·038	·086	2·4°	2·4°	5·6		F. P. Perkins.
Grantham	,, 21	c. p. blue	none	·81	trace	·34	·0006	·0006	none	·004	15·3°	3·3°	21·9	satisfactory	A. Ashby.
Hastings	, 15	p. grnsh. blue	none	4·50	trace	·12	·0014	·0035	·002	·008	7·5°	4·0°	22·7	v. slight	H. F. Cheshire.
King's Lynn	,, 15	dirty yell.	weedy	1·28	trace	·32	none	·0112	·093	·305	14·5°	4·5°	23·8		W. Johnstone.
Liverpool	,, 26	light green	none	1·02	trace	·03	·0014	·0049	·018	·066	3·5°	3·3°	7·2		A. Smetham.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in June, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Maidstone—															
Wtr. Company	June 14	p. green	none	2·50	trace	·71		·0042	·012	·030	18·0°	7·0°	33·7		M. A. Adams.
Public Conduit	,, 14	p. blue	none	2·30	trace	·68		·0014	·016	·031	18·5°	7·0°	32·8		M. A. Adams.
Newark	,, 19	c. p. blue	none	1·26	trace	·04	·0008	·0043	·013	·031	17·2°	13·4°	36·0	satisfactory	A. Ashby.
Newcastle-on-Tyne.....	,, 8	f. yell. s. turb	none	·94	trace	·03	·0010	·0080	·061	·100	13·4°	4·0°	16·5	satisfactory	J. Pattinson.
Nottingham ..	,, 12	c. grnsh. blue	none	1·49	trace	·65	·0034	·0022	none	·028	11·2°	6·7°	22·6	vegetable debris	Wigner & Harland.
Norwich	,, 20	p. grnsh. yell.	none	1·80	trace	·08	trace	·0070	·032	·052	11·0°	3·7°	13·2	satisfactory	W. G. Crook.
Portsmouth ..	,, 13	clear	none	1·15	trace	·18	none	·0063			12·2°	2·3°	18·5	veg. deb., diatoms	W. J. Sykes.
Rugby	,, 2	c. p. yellow	none	1·68	trace	·02	·0110	·0142	·0595	·101	18·0°	8·5°	29·1	veg. deb., diatoms	A. P. Smith.
Salford	,, 2	c. s. yellow	none	·70	none	none	·0007	·0017	·003	·027	3·0°	2·5°	4·0	none	J. Carter Bell.
Southampton ..	,, 24	c. p. yellow	none	·91	trace	·27	trace	·0110	·036		12·2°	4·4°	20·6	veg. deb., diatoms	A. Angell.
Swansea	,, 26	clear	none	1·00	trace	none	·0007	·0042	·003	·004	1·4°	1·4°	3·5	none	W. Morgan.
Whitehaven ..	,, 13	c. f. green	none	·43	trace	·007	none	·0011	·007	·015	·4°	·4°	2·2	veg. deb., diatoms	A. Kitchin.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

PRELIMINARY NOTICE ON THE COMPOSITION OF THE BLACK DEPOSIT WHICH ATTACHES ITSELF TO THE POSITIVE ELECTRODE OF THE BATTERY ON ELECTROLYSING SOLUTIONS OF ARGENTIC NITRATE.

By J. W. Gatehouse.

Read before the Society of Public Analysts on 31st May, 1882.

The composition of this substance is generally stated in our text books to be such that its formula is Ag_2O_2. The few experiments, however, which I have been able to perform indicate that its composition varies both with the battery power used and with the strength of the solution. In all cases it appears to contain a very large amount of absorbed gas, consisting principally of oxygen, but in no case free from nitrogen.

With a saturated solution of silver nitrate, or so nearly saturated as not to deposit crystals during the process of electrolysis, and a current proceeding from two pint Grove cells, the deposit at the positive pole is almost black, highly crystalline, and fairly coherent, so that, although much may have fallen to the bottom of the cell, the remainder can be withdrawn attached to the platinum electrode.

During the process a purple tint first pervades the solution, gradually turning to a deep brown; this, first appearing at the positive pole, gradually stretches through the solution till it reaches the negative electrode, which also consists of platinum.

The silver deposited on this electrode gradually stretches through the solution in a fine arborescent form till it meets the deposit on the opposite side. Although some of the black deposit adheres to the electrode, much drops to the bottom of the cell, and this, in addition to the oxygen gas given off from the positive electrode itself, yields a constant stream of gas, whether in solid connection with the electrode or not. This evolution of gas proceeds at ordinary temperature, even after all silver nitrate has been removed by washing, and the finer the state of division in which the deposit is formed the greater appears to be the amount of gas absorbed by it. After being heated to 212° F. its composition is constant. The deposit evolves oxygen freely when treated with concentrated sulphuric acid, and chlorine when treated with hydrochloric acid.

2·42 grains of the crystalline deposit obtained by using two Bunsen cells was heated for an hour to 120° F., the gas evolved was not measured with great accuracy, but consisted of about 2 c.c., of which approximately nine-tenths were oxygen and the remainder nitrogen.

These 2·42 grains raised to a white heat were reduced to pure silver, the weight of which was 1·985 grains; loss of gas, ·435 grains. On the supposition that the whole of the gas thus lost was oxygen, this gives the composition of the substance at 120° F., as silver, 82·02 per cent.; oxygen, 18·00 per cent.; and leads to the formula Ag_2O_2 being the correct one at this temperature.

With a power of four Bunsen cells, and a slightly acid solution, a fine black powder was obtained, from which volumes of gas continuously ascended as it lay at the bottom of the decomposing cell. There was no trace of adherent crystals, the platinum electrode being merely covered with a fine black powder, and the solution itself took a magnificent violet tint, soon passing to a deep brown, from all parts of which the brown deposit seemed to form; but it was difficult to distinguish whether this was actually the case or not, as the evolution of gas from the deposited powder was so rapid as to produce currents which carried particles around from bottom to the top, exactly as we see in the case of convection currents.

A portion of this brown powder was washed as rapidly as possible, transferred to a graduated tube fitted with a cork, and small tube at the bottom, but with the small tube reaching some two inches into the larger graduated one. We thus have a species of Ure's eudiometer, with the open limb small, and entering the large one.

The deposit lies at the bottom of the large tube, between it and the small one, and can be thus conveniently heated in a water-bath.

Three c.c. of gas were thus collected; of this 2·75 c.c. were absorbed by pyrogallic acid and soda, leaving ·25 c.c. of nitrogen. The total amount of solid matter remaining after expulsion of the gas was only ·23 grains, of which only ·06 grains remained as silver after being heated to redness. The amount here being very small, and the chances of error great, I do not place much reliance on the composition of the substance, as deduced from this experiment, but merely give it as showing the enormous comparative quantity of gas which may, under certain circumstances, be occluded by a small amount of this solid.

In a third experiment, where the deposit was crystalline, and the total solid weighed 6·73 grains, 4 c.c. of gas were collected, of which 3·7 were absorbed by soda and pyrogallic acid, and ·3 c.c. of nitrogen remained unabsorbed.

These experiments (which are, indeed, only preliminary work on the subject, and as such I take the liberty of placing them before the Society) do not, indeed, settle the composition of this interesting deposit, nor throw any light on that still more unknown subject of the formation of the purple colour in the solution of the nitrate during the electrolysis; yet I hope they indicate a field of interesting study which I trust may be entered into by men abler than myself, and with more time to devote to the subject.

COFFEE ADULTERATION.

With reference to the clause from the Customs and Inland Revenue Bill, which we printed in our last number, our contemporary, *The Chemist and Druggist*, thought it rather hard that if any person should really desire to have a combination of coffee and dandelion he should be prevented by law from purchasing such, and accordingly wrote to the Chancellor of the Exchequer to ask if such a mixture would be allowed to be sold provided the proportions of the ingredients were definitely stated. The following reply indicates that dandelion, or taraxacum, coffee will be allowed to be sold as heretofore:—

Inland Revenue, Somerset House, May 25th, 1882.

Sir,—The Chancellor of the Exchequer having forwarded to this department your letter of the 2nd instant, I am instructed by the Board to acquaint you, in reply, that

dandelion root will, it is understood, be considered as analogous to chicory; and, provided duty be paid accordingly as for chicory, no objection will be raised to the sale of a mixture of dandelion root and coffee. I am, &c.,

(Signed) CHARLES B. FORSEY,

The Editor of *The Chemist and Druggist*. Secretary.

Perhaps some other enterprising Trades' Journal will write asking a similar question as to turnips, figs, dates, &c., or our contemporaries in the milk line might endeavour to get equally favourable consideration for those persons who "really desire to have a combination of" milk and water sold to them by their milkmen.

PARLIAMENTARY INTELLIGENCE.

Lard Cheese.

In the House of Commons, on the 12th June, Mr. R. Paget asked the President of the Board of Trade whether his attention had been called to the manufacture, in the United States of America, of an article called cheese, compounded of a mixture of the bluest skim-milk and lard, and whether he would endeavour to ascertain if any of this spurious cheese was imported into this country; and, if so, whether he would take steps to insure that this compound, when exposed for sale, should be sold only as "lard chese," or be distinguished in such a manner as to prevent imposition on purchasers in this country.

Mr. W. Egerton also asked the President of the Board of Trade whether he had read the report of Dr. Voelcker to the Royal Agricultural Society, on the composition of lard and oleo-margarine cheese lately imported from America; and whether he would cause inquiries to be made at the ports of entry relative to the importation of such cheeses, so that they might be entered and sold under their proper designation, and not as "whole milk" cheeses.

Mr. Chamberlain: As the hon. member for Mid-Cheshire has also given notice of a question on this subject, I may, perhaps, be allowed to answer the two questions together. My attention has been directed to the manufacture of an article called "cheese," compounded of skim-milk and lard, and I am aware that this article is being imported into this country. I have made inquiries of the Custom House, but at present the import and export statistics do not make any distinction between this cheese and ordinary cheese, and I am consequently unable to give any information as to the extent of the importation; but the question of statistics is at the present time being considered by a small departmental committee, and I will refer the question of providing for a distinct classification in future to the committee. As regards the sale in this country, the Adulteration Acts impose a penalty of £20 on any person selling any article of food not of the nature, substance, or quality demanded by the purchaser, without disclosing the fact, and this enactment would, I presume, serve to prevent imposition. I have also read the report of Dr. Voelcker, alluded to by the hon. member for Mid-Cheshire, and find that he states that, as far as he can judge at present, "the lard and oleo-margarine cheeses are wholesome and nutritious articles of food, which cannot be distinguished by their appearance and general properties from ordinary cheese." I am, moreover, doubtful whether in any case it is desirable to interfere further with the production or sale of this article, even in the interests of agriculturists, as I find that Lord Vernon, who took the chair at a recent meeting of the Agricultural Society, expressed his opinion that the Society should be very careful before requesting the interference of the Board of Trade, as one of the great obstacles to butter-making was the difficulty of getting rid of the skim-milk, whereas by the introduction of lard or oleo-margarine the dairy companies would be able to work up their refuse-produce into a wholesome article of food. It appears, therefore, that the British farmer may possibly desire to enter into this manufacture.

Mr. W. Egerton, on Thursday, the 15th June, asked the President of the Board of Trade a question of which he had given him private notice—viz., whether in an answer given on Monday last he had not attributed to Lord Vernon language which had really been used by the President of the Royal Agricultural Society.

Mr. Chamberlain: I am much obliged to the hon. member for pointing out that in my answer on Monday last I attributed to Lord Vernon certain remarks that were really uttered by the President of

the Royal Agricultural Society. The report from which I derived my information put these remarks down to the President, having previously spoken of Lord Vernon as chairman, and hence my mistake. These remarks were to the effect that the introduction of lard or oleo-margarine would enable dairy companies to work up their skim-milk into a wholesome article of food; that the Council should be careful before writing to request the interference of the Board of Trade, as it was a question whether the public were not benefited by such forms of cheap and wholesome food. I am very glad to have the opinion of so eminent an authority as the President of the Royal Agricultural Society on this subject, and I may say that from all the information I have been able to get I am inclined to agree entirely with his view. These remarks were made by the President before Dr. Voelcker's report, but after a statement by Dr. Voelcker, which his subsequent report confirmed, that these cheeses were perfectly wholesome food. The letter from the Royal Agricultural Society was received on June 9.

Mr. MACFARLANE, on the 22nd June, asked the President of the Board of Trade what steps he proposed to take to protect the public from imposition in the matter of the new "wholesome and cheap" Cheddar and other cheese, which was composed of skimmed milk and various fats, and if he would compel the vendors of such substances to affix notices in their shops and upon the articles, stating plainly that they were imitations, and, if possible, what they were made of, and where they were made.

Mr. DODSON: I have undertaken to answer this question, and I do not know that the Government can take any steps to protect the public from imposition in the matter of the "wholesome and nutritious" Cheddar and other cheese referred to, nor does it seem necessary that they should be empowered to do so, as proceedings are open to every purchaser in regard to the sale of adulterated articles. If a shopkeeper sells as cheese an article which contains foreign ingredients, and the purchaser is prejudiced thereby, the shopkeeper can be proceeded against—for penalties—under the Sale of Food and Drugs' Act, and the seller can only protect himself by delivering to the purchaser, at the time of sale, a notice to the effect that the article is mixed.

Mr. MACFARLANE gave notice that he would take an early opportunity of calling attention to the inadequacy of the Sale of Food Act to protect the poor.

ALLEGED ADULTERATION OF LIQUORS IN NEW YORK.

An attempt will be made before the adjournment of the New York Legislature to supplement the new Excise bill with an act providing for the suppression of adulteration of liquors. The proposed bill is nearly completed, and, it is understood, will be forwarded to Assemblyman Alvord for introduction. To a reporter a retired wholesale liquor dealer said when questioned concerning the manner of adulterating liquors: "If I should give you the tricks of the trade, and with my name, this city would be a hot place for me. But few liquor drinkers have the faintest idea in regard to the extent of the evil of adulteration. For instance, more than two-thirds of the stuff sold for brandy in this country is the meanest kind of poison. It is manufactured from an oil of cognac. Dr. Cox, the celebrated inspector of liquors for Ohio, after examining some of these imported brandies, said that the chemical tests gave him fusil oil as a basis, with sulphuric acid, copper, chloroform, tannic acid, Guinea pepper, and a small percentage of good brandy. The same gentleman, after testing liquor from a half pipe of 'splendid Seigrette brandy,' found evidences of sulphuric acid, nitric acid, nitric ether, prussic acid, Guinea pepper, fusil oil, and common whiskey. Gin," continued the ex-liquor dealer, "is considered a safe drink by thousands, who believe it is the only liquor which escapes adulteration. They are mistaken. In most of the gin sold there will be found oil of vitroil, oil of turpentine, oil of almonds, sulphuric ether, and extract of grains of paradise. It is in the manufacture of whiskey, however, that the adulterators do their finest work. You can purchase oils and essences from which 'whiskey of any age' can be produced. This style of whiskey when tested will show sulphuric acid, caustic potassa, benzine, nux vomica, and other poisons. This is the sort of stuff that bores into the coatings of the stomach and creates ulcers. Pure whiskey, in my opinion, will hurt no one when taken in reasonable quantities, but this adulterated stuff is murderous. In porter you will find opium, henbane, capsicum, cocculus indicus, copperas, tobacco, and sulphuric acid. In beer, alum, opium, nux vomica, green copperas, vitriol, sub-carbonate of potash, and jalap are used. Of course ale of this character is dangerous to drink. If you don't believe me, drop in at any of the beer shops near the wharves of the East or North rivers and drink one of the 'schooners' that are sold for five cents. If it does not produce complete nausea it will surely cause intoxication. Cocculus indicus is used largely in this kind

of beer. It is used to give strength to the beer. It is a small berry, very bitter, and of an intoxicating character. Three grains will produce nausea and prostration; ten grains will throw a strong dog into convulsions. Now you can understand how strong men, after drinking beer dosed with this poison, lose for a time all power of locomotion. Fox-glove and henbane are used for about the same purposes as cocculus indicus. Jalap is used to offset the astringent qualities of acids. Oil of vitriol is used to increase the heating qualities of liquor. Wormwood is used for its bitter and stimulating qualities. Green copperas gives porter a frothy 'head,' and the drinker as well. Slaked lime is also to be found in adulterated porter."—*New York Times.*

THE ADULTERATION OF DRUGS.

Among manufactured pharmaceuticals there is, perhaps, no more frequent and difficultly detected method of imposing upon careless or ignorant buyers than by withholding or replacing some expensive ingredient. A case in point is the compound extract of colocynth of the Pharmacopœia, which is largely used as a cathartic in pill form. This should contain:—

Extract of colocynth	15·2 per cent.
Purified aloes	52·2 ,,
Resin of scammony	13·0 ,,
Powdered cardamoms	6·5 ,,
Powdered soap	13·0 ,,

Unfortunately, two ingredients are rather expensive, and there seems to be evidence that one (the resin of scammony) is sometimes left out entirely, while another (the purified aloes) is replaced by ordinary powdered aloes, which is much cheaper. Even this hypothesis, while it explains why some makers can furnish a so-called "compound extract of colocynth" at less than first cost for the proper ingredients, can hardly make it clear how some dealers can furnish true compound cathartic pills—in which the compound extract of colocynth should form 51·6 per cent. at the low prices which they quote. The goods furnished may be of first quality but short in weight, measure, or concentration. Instance short weight quinine pills. Among liquids, a certain specific gravity, weight per gallon, or degree according to some understood scale is accepted in the trade as evidence of proper strength. A writer has found that, as a rule, these standards are actually lived up to and not infrequently exceeded by manufacturers, while some particular brands are usually below the accepted standard; thus, some acids, otherwise good, fall short a few degrees, and the maker is paid for several per cent. of real acid which he does not furnish. In large transactions these shortages amount to a considerable sum. Among drugs, volatile oils are especially liable to be adulterated, usually with fixed oils, sometimes with other volatile oils, chloroform, alcohol, &c. Copaiba and various balsams and resins are not always as good as they look; in fact, adulterators seem sometimes to be too ingenious to be easily caught. There is great temptation to adulterate quinine and morphine, but these standard articles are tested daily and fraud is too quickly discovered to flourish. The statements here made are based on the personal knowledge and experience of the writer; they might be considerably extended should it seem necessary, but enough has been said to show the necessity for constant vigilance on the part of those to whom the State entrusts the responsibility of guarding the purity of food and drugs. It seems in this connection, that the State Board of Health is taking the safest course in first investigating thoroughly the question before proposing new legislation. It will doubtless appear that the ground that an article is prejudicial to the public health is often less secure than this—that the purchaser is not getting that for which he pays.—*Sanitary Engineer of New York.*

LAW REPORT.

Drug Adulteration.—Grocers Fined:—

Three grocers—Mr. Joseph Green, of Hyde; Mr. James Buckley, of Micklehurst; and Mr. Thomas Farrand, of Micklehurst—were summoned to the Hyde police court, on the 19th ult., the two first-named for selling sweet spirits of nitre which had been diluted to the extent of 25 per cent. with water, according to the certificate of Mr. Carter-Bell, the county analyst for Cheshire; and the latter for selling paregoric which, according to the same authority, did not contain opium. In each case the plea was that the article was sold as received, but, as the defendants had omitted to obtain a written warranty from the wholesale house, they were each ordered to pay 10s. and costs.

REPORTS ON ADULTERATION IN THE STATE OF NEW YORK,

From the *Sanitary Engineer*, New York.

(Continued from page 98.)

Group III.

Canned Meats and Animal Foods:—Meats—Fresh, Smoked, Salted, Canned; Extracts and Essences of Meat and Fish; Gelatin and Isinglass.

Report by Prof. A. H. Chester, Ph.D., of Hamilton College, Clinton, N. Y.

MEAT.

Dr. Chester commences by calling attention to the importance of meat as an article of diet. The superiority of the English over Continental nations is attributed, in a great part, to the beef and mutton which are so freely consumed in Great Britain. "It is found that, while milk, butter, and cheese will be great additions to an otherwise purely vegetable diet, meat is the great work-producing agent."

"Fresh meat is undoubtedly the most important and valuable kind of animal food, as either salting or smoking it makes it less easily digestible."

There are two contaminations to which fresh meat is subject, and with reference to which the health authorities are called upon to protect the public: the first is the putrefaction or decomposition of meat, and the second refers to the presence of parasites. So far as the putrefactive changes in meat are not checked by the presence of antiseptics, the public is able to protect itself; but where the meat becomes in any way impaired by causes the effects of which are not immediately discernible, the public need the protection of public officers.

The most common and dangerous of these contaminations is the presence of trichinæ in pork. We have two evils "to guard against—the danger to ourselves if trichinous meat is used, and the damage to our trade abroad if we do not suppress the exportation of such meat." To accomplish the latter object it will "be necessary to have every lot of bacon and ham packed for shipment abroad inspected for trichinæ by officers appointed for the purpose." "For ourselves in this country the danger is not so great, for we seldom eat our meat raw, as is so frequently the case abroad." Thorough cooking will kill trichinæ, and every part of the meat must be subjected to a temperature of at least 160° F. Merely warming the surface will not be sufficient, and no food prepared from pork should be eaten raw, unless it has been carefully examined for trichinæ.

Prof. Chester then gives an account of the development of the trichinæ and the means adopted for their detection. The *Trichina spiralis* is a minute worm, which in pork is found inclosed in a calcareous cyst. When meat containing these worms is eaten, the gastric juice dissolves the coating of lime, thus liberating the worm, which soon multiplies in myriads. The worm itself cannot be seen without the aid of a microscope or magnifying glass. Attention is called to a small instrument expressly devised for the microscopic examination of meat for trichinæ, and the use of the instrument is so simple that any one could employ it readily.

As the best and only remedy for this evil, it is suggested that the sale of trichinous meat be prohibited by law. The practice of feeding to pigs the offal of slaughtered animals is very justly condemned, and to it must be attributed, to a great extent, the spread of this parasitic contamination.

MEAT EXTRACTS.

"Since the discovery, by Baron Liebig, in 1857, of the extract which bears his name, a great number of such preparations have been put on the market, mainly for the use of invalids, their value depending on how nearly they approach the original in composition. Extract of meat, when properly

made, consists of those constituents of flesh which are soluble in hot water, the solution having been evaporated as much as possible for convenience in transportation. These soluble parts of meat include a number of obscure chemical substances—the value of which has not been accurately ascertained—and certain salts also found in the meat. The proteids, such as albumin and fibrin, are left out, not being soluble in hot water; and if the extract is well made the fat is entirely separated, having a tendency to turn rancid. The gelatin is also excluded as a useless incumbrance, carrying water, and so diluting the product."

"The materials composing the extract are not food in the ordinary sense, and ought never to be allowed to take its place, as is insisted upon by Liebig in all his articles on the subject. It is useful both as a nerve stimulant and as an adjunct to food proper. There are too many recorded cases of its usefulness in the first respect for any candid person to doubt it. It takes the place of alcoholic stimulant, and is often used in casss of extreme nervous exhaustion and prostration. It is of great value in the sick-room in cases of fever, when true food cannot be given. and yet it is necessary to stimulate the the vital forces. It is really nothing more nor less than a concentrated form of the best beef tea, and no one doubts the value of that. Yet there is a popular impression that ordinary beef tea is food, and many invalids are starved upon it when they ought to be nourished. Let it be distinctly understood that beef extracts, and equally beef tea, is not food if used alone. It is only a stimulant, and resembles tea and coffee in its effects. The nourishing parts of the meat have all been left out, and always will be when it is made with hot water. If beef juice is to be used as nourishment rather than stimulant, it should be extracted with cold water, the addition of a few drops of chlorohydric acid aiding much in the operation. Beef extracts contain part of the valuable constituents of the meat. If the muscle-producing parts were added you would then have true meat food. It is found, however, that these constituents, the albumenoids, can be added in the form of vegetable products, while the extractive matters can only be obtained from meat. This is Liebig's claim, and it seems to be borne out by all the facts. His belief was strong that the most valuable part of the meat is the extractive matter, since it cannot be obtained from any other source, hence its formula aims to leave out everything else. It is said by some, however, that an extract would be more valuable if it contained in addition the other parts of the meat and was in fact condensed meat. It is therefore claimed for some of the extracts sold that they contain all the valuable constituents of meat in a concentrated form, and are therefore true food, consequently of far greater value than Liebig's extract—much greater, in fact, than the amount of meat they are said to represent."

The following table gives the results of the analysis of several of these extracts:

	Water.	Organic Matter.	Ash.	Soluble Albumin.	Alcoholic Extract.
1. Liebig's Extract	18·27	58·48	23.25	0·05	44·11
2. Berger's Extract of Beef	40·65	39·85	19·50	1·11	13·18
3. Starr's Extract of Beef	37·00	55·65	7·35	1·10	10·13
4. Johnston's Fluid Beef	41·20	50·40	8·4	1·17	15·93
5. Grant's Beef Peptone	37·15	54·92	7·93	0·00	20·16
6. Valentine's Meat Juice	54·40	31·85	13·75	0·44	26·32
7. London Co.'s Extract of Beef	81·90	16·80	1·30	....	....
8. London Co.'s Essence of Mutton	78·00	19·50	2·50	....	....
9. London Co.'s Essence of Chicken	71·60	27·10	1·30	....	....

"Numbers two and three contain a larger amount of gelatin; number four contains a considerable amount of meat fibre in a very finely divided condition. Numbers seven, eight and nine are evidently just what they claim to be, extracts in hot water, much less concentrated than the others, and containing nothing to preserve them."

"From these analyses it will be seen that the principal difference between them is the amount of water that they contain; and in some cases there is a large amount of gelatin, useful in making soup, but not considered of great value as food. It is evident that the claim of making an extract equal in all

respects to fresh meat has not been carried out, and to use any of them as the sole food of an invalid would be a great mistake."

These extracts are free from adulteration, "unless the presence of gelatin and an undue amount of water can be so considered."

"Besides the various extracts of meat, there are in the market many extracts of fish, some of which are of considerable value." They are similar to meat extracts, but are not so pleasant in taste or of as great value.

Meat biscuit, composed of the extract, and albuminous and starchy matters, are manufactured to some extent, and are of considerable value.

MEAT PRESERVES.

"There are three principal methods of preserving meat, by salting, smoking and canning. The first two methods do not add anything of a dangerous character to the meat, neither do they efficiently destroy any danger that may be hidden in it. Meat, unwholesome before, will not be wholesome after such treatment. Trichinæ will not be killed, and it is in meat so prepared that we will most often find this pest. But in canned meat there is the added chance that poisonous metallic impurities may get in by accident, as well as that other substances may be put in by design as adulterations."

Among the canned meats largely used in this country are beef, mutton, ham, tongue, turkey, chicken and corned beef, the last more than all the rest put together.

The danger of poisoning by metallic salts derived from the cans is considered to be generally overrated. To avoid the contamination in part, some manufacturers do not use lead solder. The use of what is called terne plate, containing lead, instead of pure tin plate, should be avoided.

Referring to the statement recently made by an English chemist, that nearly all canned meats and vegetables dissolve tin from the cans, and are dangerous to use in consequence, Prof. Chester questions the accuracy of these observations, and cites cases where canned foods are articles of every-day consumption without any injurious results following. Prof. Chester gives an instance of the placing of several cans of corned beef under a stump in the woods of Minnesota, as a temporary storehouse. They remained there five years, and when taken out the meat was found to be in perfect condition.

ISINGLASS AND GELATIN.

These substances are "identical in composition and uses, but the isinglass is decidedly the finer and more expensive product, and therefore gelatin is often substituted for it in whole or in part. Isinglass is more soluble in water than gelatin, and makes a cleaner and better jelly, and is said not to be so apt to disagree with the delicate stomach of an invalid. It has a slightly fishy smell, though not an unpleasant one, while gelatin has more or less the smell of glue." Four samples were examined, two of them being sold as isinglass and two as gelatin, but all proved to be samples of gelatin, those sold as such being of better quality and rather more expensive than those called isinglass.

(To be continued).

MILK ADULTERATION IN NEW JERSEY.

The following "Act to prevent the adulteration, and to regulate the sale of milk" (Chapter 82, Laws of 1882,) has recently been passed by the State of New Jersey.

1. BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That every person who shall sell, or who shall offer or expose for sale, or who shall transport or carry, or who shall have in possession with intent to sell or offer for sale, any milk from which the cream or any part thereof has been removed, shall distinctly, durably and permanently solder a label or tag of metal in a conspicuous place upon the outside and not more than six inches from the top of every can, vessel or package containing such milk, and such metal label or tag shall have the words "skimmed milk" stamped, indented or engraved thereon in letters not less than two inches in height, and such milk shall only be sold or shipped in, or retailed out of a can, vessel or package so marked.

2. *And be it enacted*, That every person who shall sell or who shall offer for sale, or who shall transport or carry for the purpose of sale, or who shall have in possession with intent to sell or offer for sale, any impure, adulterated or unwholesome milk, and every person who shall adulterate milk, or who shall keep cows for the production of milk in a crowded or unhealthy condition, or feed the same on food that produces impure, diseased or unwholesome milk, or shall feed cows on distillery waste, usually called swill, or upon any substance in a state of putrefaction or rottenness, or upon any substance of an unwholesome nature, shall be liable to the penalties hereinafter provided for in this act.

3. *And be it enacted*, That the addition of water or any other substance or thing is hereby declared an adulteration, and milk that is obtained from animals that are fed on distillery waste, usually called "swill," or upon any substance in a state of putrefaction or rottenness, or upon any substance of an unhealthful nature, or milk that has been exposed to or contaminated by the emanations, discharges or exhalation from persons sick with any contagious disease by which the health or life of any person may be endangered or compromised, is hereby declared to be impure and unwholesome.

4. *And be it enacted*, That in all prosecutions under this act, if the milk shall be shown, upon analysis by a member of the council of public analysts of this state, or the chemist of the state experiment station, to contain more than eighty-eight per centum of watery fluids, or to contain less than twelve per centum of milk solids, such milk shall be deemed for the purpose of this act to be adulterated.

5. *And be it enacted*, That every person who shall violate any of the provisions of this act shall be liable to a penalty of fifty dollars for the first offence and one hundred dollars for a second or subsequent offence.

6. *And be it enacted*, That justices of the peace and recorders shall have jurisdiction to try and punish all persons for violating the provisions of this act, and the penalties prescribed in section five of this act, for the violation of any of the provisions of this act, may be enforced before any justice of the peace or recorder in any county where the offence is committed, or where the offender is first apprehended.

7. *And be it enacted*, That said justice of the peace or recorder, upon receiving due proof, made before him by the affidavit of one or more persons, of the violation of any of the provisions of said act, by any person or persons, is hereby authorized and required by his warrant, under his hand and seal, directed to any constable or police officer of his county, to cause such person or persons to be arrested and brought before said justice or recorder, who shall hear and determine the guilt or innocence of the person or persons so charged, and upon conviction of said person or persons, the said justice or recorder is hereby authorized and required to impose upon the offender so convicted before him the penalties prescribed for such offences; and if any person so convicted shall fail to pay the penalty so imposed, together with the costs of the prosecution, the said justice or recorder is hereby authorized and required to commit such offender to the common jail of the said county for a period of not less than ten nor more than sixty days; *provided, however*, that an analysis of condemned milk shall be made by a member of the council of public analysts of this state, or the chemist of the state experiment station.

8. *And be it enacted*, That the certificate of any member of the council of public analysts or chemist of the state experiment station, given under his hand and seal, and sworn to and subscribed before any justice of the peace or notary public in this state, shall be taken and accepted as prima faciæ evidence.

9. *And be it enacted*, That the state board of health is hereby empowered and directed to appoint, each year, a competent person, who shall act as a state inspector of milk, at a salary of eight hundred dollars per annum, payable by the treasurer of this state, by warrant of the comptroller, in quarterly payments, for the purposes of this act, and in addition thereto said inspector shall be paid his actual travelling expenses while in the performance of his duties, and actual expenses of suits and costs of analyses brought by him under this act, payable by the treasurer of this state by warrant of the comptroller; said inspector shall act until removed by said board, or until his successor is appointed, and shall make such reports to said board, at such time as it may direct; said inspector, having reason to believe the provisions of this act are being violated, shall have power to open any can, vessel or package containing milk, whether sealed, locked or otherwise, or whether in transit or otherwise; and if, upon inspection, he shall find such can, vessel or package to contain any milk which has been adulterated, or from which the cream or any part thereof, has been removed, or which is sold, offered or exposed for sale, or held in possession with intent to sell or offer for sale, in violation of any section of this act said inspector is empowered and directed to take a sample of the same for analysis and put into a can, vessel or package, to be sealed in the presence of one or more witnesses, and sent to any member of council of public analysts or the chemist of the state experimental station, and also to condemn the same and pour

the contents of such can, vessel or package upon the ground or return the same to the consignor, and, if upon analysis such milk shall prove to be adulterated, shall bring suit against the person or party so violating the law; *provided, however*, that if upon analysis it is proved that the condemned milk is unadulterated, the state shall be liable for the value of the article destroyed, which shall be paid by the treasurer of this state, by warrant of the comptroller; and said inspector is empowered to employ one or more assistants, who shall have power to inspect milk as provided by this act, said assistants to be paid not less than five dollars per day for each and every day of actual service in performance of their duties, as provided by this act, payable by the treasurer of this state, by warrant of the comptroller.

10. *And be it enacted*, That all penalties imposed shall be paid into the treasury of this state, except in case the local board of health of any city, borough, town or township, shall prosecute the offender, in which case, the penalties shall be paid to the treasury of the city, borough, town or township so prosecuting; *provided*, that in prosecutions by the executive officer of any local board of health no expense shall be incurred to the state.

11. *And be it enacted*, That an act entitled "An act to prevent the adulteration of milk and to regulate the sale of milk," approved March twenty-second, one thousand eight hundred and eighty-one, and all other acts or parts of acts inconsistent with this act, be and the same are hereby repealed.

12. *And be it enacted*, That this act shall take effect immediately. Approved March fourteenth, one thousand eight hundred and eighty two.

ANALYST'S REPORT.

Dr. W. H. Ellis, public analyst for the district of Toronto, Canada, has issued his annual report on the adulteration of food. The largest proportion of adulteration was found in coffee and spices. Nine samples of the former article were examined, and three of them, including a sample obtained from a co-operative store, were pure; the remaining six contained chicory from 40 to 60 per cent. Eighteen samples of spices were tested, of which nine were pure. These were one sample of ginger, three of allspice, two of cloves, and three of pepper. One sample of cloves contained clove stalks, and another was adulterated with fifty per cent. of flour or turmeric. A sample of allspice was obtained by the analyst which contained 50 per cent. of peas. The three samples of cinnamon examined consisted of cassia or cassia and flour. Two samples of pepper which were adulterated contained flour from 10 to 15, and one 30 to 40 per cent. of wheat and peas, and 15 per cent. of sand. Of six samples of milk, two were watered, the others were unadulterated. Butter was found to be unadulterated. The candies were generally pure. Two specimens of aniseed berries were coloured with ferruginous pigments. Six samples of sugars were found to contain from 1·5 to 8·5 per cent. of glucose, four are described as pure with only a trace of glucose. Every sample of tea was "faced," but contained no foreign leaves. The samples of bread were unadulterated.

SAMPLES OF MILK WHICH HAVE FALLEN BELOW THE SOCIETY'S LIMIT.

In reference to the paper by Mr. W. Johnstone, F.I.C., F.C.S., which was read before the Society of Public Analysts on the 15th February, and was published in the March number of the Analyst, the Publication Committee think it desirable to state that it appears from some remarks made by Mr. Johnstone on the reading of his second paper on the same subject on the 28th June, that the analyses were made by coagulating the milk with acetic acid and, after drying the residue, extracting the fat in the Soxhlet apparatus. The statement of this process having been used, was omitted from the paper in question, and may possibly cause the results obtained to differ from the Society's limit.

ANOTHER LARD ADULTERANT.

A correspondent of a contemporary, writing from New York says:—It leaked out the other day that cocoanut oil is being used to debase lard. It can be used to the extent of 10 to 12 per cent. A French chemist in this city claims to be able to deodorise it, but the best sample he submitted, your correspondent examined without knowing what it was, but, supposing it to be lard, he readily detected the flavour of cocoanut oil. Several thousand pounds were a part of the assets of a lard refining firm that failed not long since. We doubt if it is extensively used, for we find that very few of the dealers on the Produce Exchange were aware of this new adulterant.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No. 1881	Name of Patentee.	Title of Patent.	Price
4571	E. G. Brewer	Measurement of Electricity in Distribution Systems	6d.
4577	P. Jensen	Treatment of Iron for Removal of Phosphorous, Sulphur, &c...	6d.
4664	J. Imray	Electrometers	2d.
4654	C. G. André	Electric Incandescent Lamps	6d.
4702	J. Young	Manufacture of Sulphate of Lime	2d.
4719	A. and M. Conroy	Treatment of Malt to Produce an Article of Diet to be Used as a Substitute for Coffee	2d.
4775	H. A. Bonneville	Electric Lamps	4d.
4743	E. G. Brewer	Preservation of Milk	6d.
4744	E. Edwards	Extracting Grease and Fat from Bones	6d.
4777	E. R. Prentice	Electric Lamps	2d.
4778	F. Wright	Electric Lamps	2d.
4792	W. E. Hubble	Apparatus for Closing the Circuit on the Extinction of an Electric Lamp	6d.
4854	J. B. Rogers	Production, &c. for Electricity for Lighting Purposes	2d.
4857	J. B. Rogers	Electric Lamps	6d.
4888	T. Richters	Manufacture of Sulphuric Acid	4d.
4915	E. Edwards	Preparation of Farinaceous Food to be Used as a Substitute for Coffee	2d.
4936	W. R. Lake	Extracting Glycerine, Oileine, &c. from Various Substances	4d.
4942	S. Pitt	Applying Electric Currents in the Production of Light	6d.
5185	E. G. Brewer	Electric Lamps	1s.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Oil and Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record: Oil and Drug Journal; The Canade Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine; London Water Supply, by Crookes, Odling and Tyid; Catalogue of Massachusetts College of Pharmacy, 1882-3; Chicago Chemical Review; Manual of Colours and Dye Wares, by J. W. Slater; Report of the Smithsonian Institution, Washington 1880; New York Shoe and Leather Manufacturer.

*** We regret that want of space has compelled us to defer until next month notices of several books we have now before us for review.—ED. ANALYST.

THE ANALYST.

AUGUST, 1882.

ON THE RELATION BETWEEN THE SPECIFIC GRAVITY, THE FAT, AND THE SOLIDS NOT FAT IN MILK.

By Otto Hehner, F.C.S., F.I.C.

Read before the Society of Public Analysts on 28th June, 1882.

The specific gravity of milk is in the main a function of two factors: namely, of the percentage of solids not fat and of that of the fat. Whilst the former raises the specific gravity of milk above that of water, the latter, being lighter than water, acts in the opposite direction.

Taken by itself, the specific gravity affords but very little indication of the composition of any given sample of milk, for an infinite number of mixtures of solids not fat and of fat can be imagined giving the same specific gravity; but if any other item in the analysis be furnished, such as the amount of fat, of solids not fat, or of total solids, it should be possible to find by calculation the other unknown quantities, provided always that the specific gravity due to fat and to solids not fat is in direct proportion to the percentage of these constituents. For the fat this is well known to be the case, for we utilise the comparative constancy in the specific gravity of butter fat in judging of the purity of butter, but for the solids not fat this is by no means a matter of course, for they themselves are made up of a number of different constituents in fluctuating relative proportions and of different gravities. It was the object of the investigation forming the matter of this paper to ascertain whether the specific gravity of the solids not fat was sufficiently constant to be capable of being utilised in milk analysis.

If each percentage of solids not fat, S, raise the specific gravity, G, of milk above 1,000 to the amount s, and if each percentage of fat F depress the gravity by the quantity f, then

(1) $S\,s - F\,f = G$. We have also

(2) $F + S = T$ (Total Solids).

Substituting in the first equation for F its value T — S (obtained from 2) we obtain $S\,s-(T - S)\,f = G$, from which

$$S\,s - T\,f + S\,f = G, \text{ and}$$

$$S\,s + S\,f = G + T\,f, \text{ and lastly}$$

$$S = \frac{G + T\,f}{s + f}$$

That is to say, we would obtain the percentage of solids not fat by adding to the specific gravity of the milk—by which term throughout this paper I understand that figure by which 1,000 volumes of milk are heavier than an equal bulk of water—the percentage of total solids multiplied by the gravity of each percentage of fat, the sum being divided by the sum of the gravities of one per cent. of solids not fat and of fat.

If we determined, then, the specific gravity and the percentage of total solids, the above formula would furnish us with the percentage of solids not fat, and by difference, of the fat, provided the factors s and f be known. Milk analysis, for the purposes of the Public Analyst would then be reduced to two very simple operations, the extraction of the fat being entirely avoided. Or we would at least have a most valuable check upon our analytical results, even if the ordinary determinations were made as heretofore.

Behrend and Morgen *(Journal fur Landwirthschaft*, 1879*)* have published a table which purports to give the percentage of total solids for the specific gravities from 1025 to 1040, the percentage of fat being known. The fundamental analyses were, however, made by these authors by means of methods very different from those employed by English Public Analysts, and their results are generally very far off the figures obtained by our usual method of milk analysis, as will be seen from instances given further on. Their whole method of operating being different from our own, the results are hardly comparable.

Clausnitzer and Mayer *(Forschungen auf dem Gebiete der Viehaltung* 1879, 265*)* have worked out a formula very similar to the one given above. They state that the amount of fat is obtained by multiplying the percentage of total solids by 0·789, and subtracting from the product the specific gravity minus one, divided by 0·00475. The factors used in this formula are based upon the supposition that each per cent. of fat decreases the specific gravity by 1·0, whilst each per cent. of solids not fat increases it by 3·75.

Now if the specific gravity of butter fat at 15·5° C. were 900, one per cent. of butter fat would cause a depression in the gravity of 1·0. But we know most certainly that the specific gravity of butter fat at 15·5° *is not* 900, but about 927·5. This is the figure found by Mr. Wynter Blyth (ANALYST, Vol. V., p. 76) as the result of direct experiment, and in close agreement with it, namely 928·3 is the gravity which can be calculated from Mr. Wigner's Table on the Ratio of Expansion of Butter Fat (ANALYST, 1879, p. 184). The depression in specific gravity is therefore not 1, but only 0·725 for each per cent. of fat. The difference between these two figures is a serious one, and Clausnitzer and Mayer's formula must therefore be rejected as incapable of giving reliable results.

As Clausnitzer and Mayer's factors are calculated from the results of numerous analyses, it follows, as their factor for the minus gravity of the fat is too high, that their figure for the plus gravity of the solids not fat is also too high. These two errors may, and as will be seen from the results given below, frequently do, counterbalance each other, yet when the ordinary balance between the different milk constituents is disturbed, the calculated results differ materially from those found by experiment.

To ascertain the factor s, I have made a series of analyses of milk, bestowing the utmost care upon every step. In all cases about 5 grammes were evaporated, the residue dried for *at least* four hours in the water oven, and after weighing extracted for *at least* two hours in a Soxhlett tube with pure ether, the exhausted residue being again dried at 100° for one hour. I have previously shown that under these conditions variations in the results are reduced to a minimum.

The specific gravity was also determined with the greatest possible accuracy. I found that much better results were obtained by means of a Sprengel tube *(Chem. Soc. Journ.* [2] 11, p. 577*)* holding about ten grms., than by the use of the specific gravity bottle. Extremely minute air bubbles remain suspended in milk for a considerable time after its being shaken, and these are hardly visible in a specific gravity bottle, but readily so in the capillaries of the Sprengel tube, from which they can be removed without difficulty. A constant temperature can much more rapidly be obtained by suspending the tube in a beaker of water kept at 15·5°C. than in a bottle, and hence fat globules have much less chance to rise during the experiment. I found it best to operate as follows. The sample is well shaken and poured out into a shallow dish. The wider end of the Sprengel tube is then inserted to the very bottom of the basin, and is filled by sucking at the narrower capillary. When full, a few drops of the milk are again blown out and the tube is again completely filled, this alternate blowing and filling being repeated, any air bubbles which may be in the tube being thus removed. The tube is then suspended in a large beaker filled with water at 15·5°, and allowed to remain for two or three minutes. The meniscus of the milk in the wider capillary will then be found to be absolutely constant; the excess of fluid is then removed to the mark on the tube. Weighings thus obtained never differ more, and generally less than one milligram from each other.

The Sprengel specific gravity tube has hardly been employed by analysts as frequently as it deserves to be. It is altogether an instrument vastly superior in every respect to the ordinary specific gravity bottle.

The following results were in this manner arrived at; they are from successive analyses and taken without selection.

p. Gr.	Tot. Sol.	Fat.	Sol. n. f. found.	S. n. f. calc.	S. n. f. C. & M.	S. n. f. B. & M.
31·91	13·03	3·62	9·41	9·55	9·46	8·8
29·35	11·11	2·49	8·62	8·64	8·52	—
30·34	13·24	4·12	9·12	9·22	9·17	—
31·14	13·65	3·90	9·75	9·48	9·43	—
31·04	11·19	2·17	9·02	9·04	8·89	8·4
32·06	13·07	3·68	9·39	9·59	9·50	—
32·25	12·58	2·82	9·76	9·56	9·44	—
28·68	10·57	2·14	8·43	8·38	8·25	—
28·76	15·39	6·32	9·07	9·22	9·29	—
33·89	11·59	1·60	9·99	9·77	9·57	9·1
30·59	11·15	2·03	9·12	8·93	8·79	—
28·71	11·13	2·54	8·59	8·49	8·38	—
29·54	10·63	1·89	8·74	8·60	8·25	—
24·12	11·03	2·72	8·31	7·41	7·04	—
28·98	10·83	2·14	8·69	8·50	8·38	7·9
36·20	10·79	0·73	10·06	10·17	9·88	—
30·50	13·74	4·53	9·21	9·34	9·31	—
31·84	12·37	3·02	9·35	9·42	9·30	—
29·61	10·64	2·07	8·57	8·62	8·47	7·9
20·42	15·45	8·31	7·24	7·30	7·55	—
29·44	11·97	3·25	8·72	8·80	8·72	—
30·15	11·16	2·35	8·81	8·83	8·69	8·2
			AVERAGE.			
29·98	12·10	3·15	8·95			

Taking the average of the above 22 analyses we get $29·98+3·15\cdot 0·725=8·95$ s or $s=3·605$, that is to say, each per cent. of solids not fat raises on the average the gravity of the milk by 3·605.

From this factor I have calculated from the specific gravity and the percentage of total solids the theoretical amount of solids not fat which will be found in column 5, and in juxtaposition with it the theoretical amounts calculated from Clausnitzer and Mayer's formula. I also give, in column 7, a few of the results obtained from Behrend and Morgen's table.

It will be seen that the agreement between the figures of columns 4 and 5 is throughout very fairly satisfactory. In 14 cases is the calculated amount above that found, the greatest difference being 0·20 per cent., and the average *plus* error 0·09 per cent. In 8 cases are the calculated results lower than the experimental ones, the highest minus error being 0·27.

While, therefore, it follows that the specific gravity of the solids not fat is not an absolutely constant quantity, it is yet conclusively established that any variations are very inconsiderable and without material influence upon the calculated results. Even in samples most widely differing from each other, such as skim milk, and in milk extraordinarily rich in fat, the factor 3·605 holds good, proof being by that circumstance furnished of the accuracy of both the fat factor and of that for the solids not fat.

If Mayer and Clausnitzer's calculated results are now examined it is seen that in many cases the agreement is very good, but that in others the differences are very considerable. In one case the results entirely coincide; in 6 there is a *plus* error, the greatest being 0·31, and the average *plus* error 0·12. In 15 cases the calculated result is too low, the difference varying between 0·05 and 0·49 per cent., the average *minus* error being 0·24 per cent. As was to be expected, the greatest discrepancies occur with the samples poorest in fat, because in these the error is chiefly in one direction, the divisor in the formula being too large, and hence the results too low.

Lastly, Behrend and Morgan's table always gives results much too low and quite useless for analytical purposes.

I think then, that I have established the fact, *that by multiplying the total solids by* 0·725, *adding the product to the specific gravity, and dividing the same by* 4·33 *(s+f), we obtain the percentage of solids not fat with a satisfactory approach to accuracy, provided the exact conditions as to drying the solids and taking the gravity are observed, which were followed in the fundamental analyses.* A difference of 0·1 in the gravity causes a difference in the calculated results of 0·023 per cent., and a difference of 0·1 per cent. of total solids, 0·017 per cent. in the solids not fat. With care, therefore, the error should not be greater than + 0·04 per cent.

If, from the specific gravity and the total solids, calculation furnishes a satisfactory amount of fat and of solids not fat, I think the usual extraction with ether may safely be dispensed with, the only further determination desirable being that of the ash. But, if the calculated results are below the limits of genuine milk, I would extract with ether, thus obtaining definite and final information as to the quality of the sample. As the majority of the samples analysed is genuine, much labour and time will be saved without loss in accuracy. In adulterated samples, on the other hand, we would have a valuable and desirable check upon the analytical figures obtained.

From the formula above given, the following tables are calculated. They show for the ordinary range of specific gravity and total solids the percentage of solids not fat.

SOLIDS NOT FAT, CALCULATED FROM SPECIFIC GRAVITY AND TOTAL SOLIDS.

	11·0	·2	·4	·6	·8	12·0	·2	·4	·6	·8	13·0	·2	·4	·6	·8	14·0	·2	·4	·6	·8
1029·0	8·54	8·57	8·61	8·64	8·67	8·70	8·74	8·77	8·80	8·84	8·87	8·90	8·94	8·97	9·00	9·03	9·07	9·10	9·13	9·17
2	8·59	8·62	8·66	8·69	8·70	8·73	8·77	8·80	8·83	8·87	8·90	8·93	8·97	9·00	9·03	9·06	9·10	9·13	9·16	9·20
4	8·63	8·66	8·70	8·73	8·76	8·79	8·83	8·86	8·89	8·93	8·96	8·99	9·03	9·06	9·09	9·12	9·16	9·19	9·22	9·26
6	8·68	8·71	8·75	8·78	8·81	8·85	8·89	8·91	8·94	8·98	9·01	9·04	9·08	9·11	9·14	9·17	9·21	9·24	9·27	9·31
8	8·72	8·75	8·79	8·82	8·85	8·88	8·92	8·95	8·98	9·02	9·05	9·08	9·12	9·15	9·18	9·21	9·25	9·28	9·31	9·35
1030·0	8·77	8·80	8·84	8·87	8·90	8·93	8·97	9·00	9·03	9·07	9·10	9·13	9·17	9·20	9·23	9·26	9·30	9·33	9·36	9·39
2	8·82	8·85	8·89	8·92	8·95	8·98	9·02	9·05	9·08	9·12	9·15	9·18	9·22	9·25	9·28	9·31	9·35	9·38	9·41	9·45
4	8·86	8·89	8·93	8·96	8·99	9·02	9·06	9·09	9·12	9·16	9·19	9·22	9·26	9·29	9·32	9·35	9·39	9·42	9·45	9·49
6	8·91	8·94	8·98	9·01	9·04	9·07	9·11	9·14	9·17	9·21	9·24	9·27	9·31	9·34	9·37	9·40	9·44	9·47	9·50	9·54
8	8·95	8·98	9·02	9·05	9·08	9·11	9·15	9·18	9·21	9·25	9·28	9·31	9·35	9·38	9·41	9·44	9·48	9·51	9·54	9·58
1031·0	9·00	9·04	9·07	9·10	9·13	9·16	9·20	9·23	9·26	9·30	9·33	9·36	9·40	9·43	9·46	9.49	9·53	9·56	9·59	9·63
2	9·05	9·09	9·12	9·15	9·18	9·21	9·25	9·28	9·31	9.35	9·38	9·41	9·45	9·48	9·51	9·54	9·58	9·61	9·64	9·68
4	9·09	9·13	9·16	9·19	9·22	9·25	9·29	9·32	9·35	9·39	9·42	9·45	9·49	9·52	9·55	9·58	9·62	9·65	9·68	9.72
6	9·14	9·18	9·21	9·24	9·27	9·30	9·34	9·37	9·40	9·44	9·47	9·50	9·54	9·57	9·60	9·63	9·67	9·70	9·73	9·77
8	9·18	9·22	9·25	9·28	9·31	9·34	9·38	9·41	9·44	9·48	9·51	9·54	9·58	9·61	9·64	9·67	9·71	9·74	9·77	9·81
1032·0	9·23	9·27	9·30	9·33	9·36	9·39	9·43	9·46	9·49	9·53	9·56	9·59	9·63	9·66	9·69	9·72	9·76	9·79	9·82	9·86
2	9·28	9·32	9·35	9·38	9·41	9·44	9·48	9·51	9·54	9·58	9·61	9·64	9·68	9·71	9·74	9·77	9·81	9·84	9·87	9·91
4	9·33	9·37	9·40	9·43	9·46	9·49	9·53	9·56	9·59	9·63	9·66	9·69	9·73	9·76	9·79	9·82	9·86	9·89	9·92	9·96
6	9·37	9·41	9·44	9·47	9·50	9·53	9·57	9·60	9·63	9·67	9·70	9·73	9·77	9·80	9·83	9·86	9·90	9·93	9·96	10·00
8	9·42	9·45	9·49	9·52	9·55	9·58	9·62	9·65	9·68	9·72	9·75	9·78	9·82	9·85	9·88	9·91	9·95	9·98	10·01	10·05
1033·0	9·47	9·50	9·54	9·57	9·60	9·63	9·67	9·70	9·73	9·77	9·80	9·83	9·87	9·90	9·93	9·96	10·00	10·03	10·06	10·10
2	9·51	9·54	9·58	9·61	9·64	9·67	9·71	9·74	9·77	9·81	9·84	9·87	9·91	9·94	9·97	10·00	10·04	10·07	10·10	10·14
4	9·56	9·59	9·63	9·66	9·69	9·72	9·76	9·79	9·82	9·86	9·90	9·92	9·96	9·99	10·02	10·05	10·09	10·12	10.15	10·19
6	9·60	9·63	9·67	9·70	9·73	9·76	9·80	9·83	9·86	9·90	9·94	9·96	10·00	10·03	10·06	10·09	10·13	10·16	10·19	10·23
8	9·65	9·68	9·72	9·75	9·78	9·81	9·85	9·88	9·91	9·95	9·99	10·01	10·05	10·08	10·11	10·14	10·18	10·21	10·24	10·28

Dr. Muter said that Mr. Hehner's paper was a most interesting research, and would be very useful, besides being of scientific interest in enabling an analyst to check the work of his assistants, because it seemed to him that if the sp. gr. and the total solids were obtained, one got very nearly what the other figures ought to be.

Dr. Vieth said he quite agreed there was a great relation between the sp. gr. and the total solids and the fat. He had calculated very many samples by the table drawn up by Behrend and Morgan, but very seldom found that the difference was more than ·2 per cent. In about 80 per cent. of all the analyses the difference was less than ·2 per cent. He did not think it would be advisable to do away altogether with extracting the fat, but it was very important to have such a check upon the analysis, and to be able to calculate the fat before extracting it. For merely controlling the milk such a calculation would suffice, and ether—the most expensive reagent in milk analysis—saved; and thus, by saving time and expense, it might perhaps be possible to charge for a milk analysis less than two guineas, a price which is charged by some Public Analysts in London.

Dr. Dupré said that many years ago he worked out a process for estimating the solids in wine, and found that, although the solids varied very widely, the influence they exerted on the sp. gr. did not vary much except in the case of the ash, and he found it necessary, in order to get a close agreement, that he should always estimate the ash, and make a special allowance for that, taking the sp. gr., calculating the total solids, and subtracting the amount of ash, because the ash always influenced the sp. gr. about twice as much as the rest. In the case of milk, Dr. Dupré said he thought it must be somewhat similar. With regard to butter fat it did not at all follow that the sp. gr. of that was the same before as after it had been extracted. He might say that he invariably rejected a milk if there was not some very close relation between the sp. gr., total solids, and the fat taken into consideration.

Mr. Wynter Blyth was pleased to hear this paper read. At a recent meeting he had said he had made a great number of determinations, and had found the calculated amount of fat remarkably accurate, on which Mr. Hehner said that he had used a wrong formula for the fat, but he thought as Dr. Dupré had just put it, that they had no proof that the sp. gr. of the milk fat in the milk, was the same as when it was in the form of butter. He remembered a paper by Mr. Wanklyn, which appeared in the *Philosophical Magazine*, in which it was stated that there might be two or three sp. grs. of the same milk under different conditions. He was not yet convinced of the truth of these factors. They must all work at this subject. He had the sp. gr. taken of every milk that he analysed, and compared the amount of fat and the total solids. His general results agreed with Mr. Hehner's, but a very rich milk gave results which did not agree, and so did a very poor milk. For ordinary milks, however, he found them agree pretty closely. He supported it as a technical process as being a very useful thing for them to adopt. In the case of milks, which from their total solids were certain not to be adulterated, he merely took the sp. gr., total solids, and ash, but did not trouble to take the fat; if the milks were not genuine he took the fat accurately, and checked the results by means of a table; he found this table very useful indeed, and worth while to be worked out in a great many laboratories in order to get at the real truth of it. In some cases the calculated results would be inaccurate, but still if they were accurate in the majority of instances, it would be something. They must, however, be careful not to

shirk their work, as it were, by a sort of analytical dodge, and should only use the formula in those cases where it was impossible from the analytical data that the samples could be other than genuine milks.

Mr. Hehner, in reply, pointed out that a milk, when adulterated with sugar or glycerine, would show a considerable difference between the solids not fat calculated and found, and if such a difference were observed, the analyst would at once be put on the alert and search for the cause. As regarded the correction for the ash, the amount of ash in milk was so constant that he did not think it worth while to make the correction. In wine it was no doubt an object of importance, but in milk it was not so. As to the sp. gr. of fat liquid and solid it was, of course, quite possible that there was such a difference as that stated, but it could certainly be only small. In conclusion, Mr. Hehner said that he could not insist upon it too strongly—that if analysts were going to judge of the merits of his proposal at all, the processes must be carried out exactly as he had described.

NOTE ON THE USE OF PLATINIC CHLORIDE AS AN INDICATOR IN THE DETERMINATION OF FREE IODINE.

By T. P. Blunt. M.A., F.C.S.

Read before the Society of Public Analysts, on 28th June, 1882.

It is well known that on adding solution of platinic chloride to potassium iodide, an intense red-brown colour is produced, this is instantly destroyed by an excess of sodium hyposulphite, and the reaction may be used with advantage in the place of the blue colour of filtered starch solution in the determination of iodine with hyposulphite.

The following has been found to be the best method of procedure in the case of the determination of oxygen absorbed in course of a water analysis :—A 1 per cent. solution of platinic chloride is prepared, and three measured grains of it are added to the usual quantity of potassium iodide used for destroying the excess of permanganate, a little of the standard hyposulphite is added from the burette until the colour is just destroyed, leaving only the clear yellow of the platinum salt; the operation is conveniently conducted in a test-tube, the mixture is now added to the water containing the permanganate, and the titration carried out as usual. The colour at first is a warm purplish-brown, but as the reaction approaches its conclusion the tint changes to purple, which at last disappears entirely with perfect sharpness, leaving only a very faint yellow tinge, which it is impossible to confuse with the characteristic colour of the iodine compound. I think anyone who gives this modification a fair trial will use it in preference to the common one, with filtered starch solution, a reagent somewhat troublesome to prepare and exceedingly unstable. One very annoying characteristic of the starch solution is that after a short time it acquires the property of itself liberating iodine, and turning blue immediately on the mere addition of pure potassium iodide and sulphuric acid. The change does not appear to be due to organisms, for it occurs when the solution has been plugged with cotton wool while boiling, and after prolonged ebullition, in a test-tube.

PREPARATION OF NITRO-GLYCERINE.

Boutmy & Foucher have recently been awarded by the French Academy of Sciences the prize of 2,500 francs for their new and safe method of the preparation of nitro-glycerine. The process consists in combining the glycerine with the sulphuric acid so as to form the glycero-sulphuric acid, and decomposing the latter, slowly, by means of nitric acid. Two solutions are thus prepared: the glycero-sulphuric acid and the sulpho-nitric acid, the latter being formed by the mixture of equal parts of sulphuric and nitric acid. These mixtures give rise to the emission of a large amount of heat, which necessitates the employment of refrigerating mixtures. In finally mixing these acids in convenient proportions, a reaction is produced which continues about twenty minutes. The nitro-glycerine is deposited at the bottom of the vessel, and may be readily collected and washed. According to the old process, the reaction was rapidly accomplished, and a portion of the nitro-glycerine arose to the surface, which rendered the operation of washing difficult.—*Oil and Drug News.*

NOTE ON THE ESTIMATION OF FAT BY CLAUSNIZER AND MAYER'S FORMULA.

By A. Wynter Blyth, M.R.C.S.

In 41 samples of milk derived from various sources, and fairly representing the average supply, the formula was tested by the following procedure:—10 grammes of milk were evaporated in the usual way by exposure on the water-bath for from three to four hours; afte weighing the residue, the dish was treated with dry ether, and the fat weighed directly and also estimated by difference. The specific gravity was taken in an ordinary 50 gramme specific gravity bottle; from the specific gravity and from the total solids, the amount of fat was calculated by the formula and the results compared. The following is a summary:—

In 3 out of the 41 cases, correct to the second decimal place.

In 19 or 46·3 per cent., correct to the first place.

In 13 out of the 38 cases, the error was plus; that is, the fat was over-estimated and ranged from ·01 to ·38, the mean being ·11.

In 25 out of the 38 cases, the error was minus; that is, the fat was returned too low. The range was from ·01 to ·39, the mean being ·13.

I trust that other analysts will follow the matter up and publish abstracts of their results, for it seems that the method is likely to be very useful; and at all events, sufficiently accurate in a majority of instances for technical work.

As to the correctness of the formula, that formula will survive which gives the best results.

ANALYSTS OF THE NEW YORK STATE BOARD OF HEALTH.

At the meeting of the New York State Board of Health, held in Albany on the 9th of May, the following-named gentlemen were elected Analysts for the ensuing year. Samuel A. Lattimore, Ph.D., Rochester; Willis G. Tucker, Ph.D., Albany; Drs. Frederick Hoffman and J. G. Love, of New York.

AMERICAN CHEESE.

By P. Vieth, Ph.D., F.C.S.

Some weeks ago I had the opportunity of analysing two specimens of American cheese. This cheese was stated to have been made of skim milk with addition of foreign fat, the one containing lard, the other oleomargarin. The appearance of both cheeses was that of Cheddar, one was very high coloured; they were very well prepared and tasted not at all bad, the lard cheese, however, having a somewhat peculiar flavour.

The result of the analyses were as follows:—

CHEESE CONTAINING LARD.

Water	38·26 per cent.
Fatty Matters	21·07 ,, ,,
Casein, &c.	35·55 ,, ,,
Mineral Matters	5·12 ,, ,,
	100·00

CHEESE CONTAINING OLEO-MARGARIN.

Water	37·99 per cent.
Fatty Matters	23·70 ,, ,,
Casein, &c.	34·65 ,, ,,
Mineral Matters	3·66 ,, ,,
	100·00

I extracted the fat from a large quantity of cheese and determined the insoluble fatty acids with the following results:—

FAT OF CHEESE CONTAINING LARD.

Insoluble Fatty Acids	90·46 per cent.
Butter Fat	·63 ,, ,,
Foreign Fat	·37 ,, ,,

FAT OF CHEESE CONTAINING OLEOMARGARIN.

Insoluble Fatty Acids	91·82 per cent.
Butter Fat	·46 ,, ,,
Foreign Fat	·54 ,, ,,

There was about 1·25 and 1 per cent. of butter fat left in the skim milk used for making the cheeses.

As the butter fat takes the highest price if sold in the form of butter, and as it can be replaced in cheese without prejudice to a certain extent; as further, such a cheese, if carefully prepared, is very little more expensive and much better than cheese made entirely of skim milk, I do not see any objection against those artificial fat cheeses. Of course, they must be sold as what they really are, and security ought to be given that only the fat of sound animals is used, and that it is prepared for the purpose in a clean and unobjectionable way.

POISONING FROM CANNED FOOD.

At a recent meeting of the Chicago Medical Society, Dr. S. I. Avery reported several cases of poisoning in a family from eating of canned sardines. Dr. Bartlett reported similar cases from eating pressed corned beef. Dr. Tilley reported cases of poisoning from eating bluefish. Dr. W. H. Curtis attributed the poisoning in such cases to the presence of a peculiar ferment in the food eaten. Dr. Ingals considered that the fault might lie with the food before canning.—*Chicago Medical Review.*

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in July, 1883. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.....	July 12	c. green blue	none	1·85	none	·13	·0041	·0062	none	·006	20·0°	4·4°	32·2	satisfactory	Wigner & Harland.
New River	,, 17	clear	none	1·15	trace	·16	·0014	·0014	·008	·018	13·5°	3·0°	18·2	satisfactory	B. Dyer.
East London ..	,, 8	c. yell. green	none	1·35	none	·08	·0010	·0012	none	·014	13·6°	3·2°	23·0	vegetable debris	Wigner & Harland.
Southwark & Vauxhall ..	,, 12	c. pale yell.	none	1·24	trace	·13	·0007	·0070	·048	·087	15·0°	4·0°	18·9	satisfactory	John Muter.
West Middlesex	,, 25	yell. green	none	1·01	trace	·12	·0021	·0097	·046	·095	12·0°	3·5°	18·5	satisfactory	O. Hehner.
Grand Junction	,,	p. yellow		1·04	trace	·20	·0002	·0058	·008	·094	14·1°	3·5°	20·3		A. Wynter-Blyth.
Lambeth	,, 12	c. pale yell.	none	1·24	trace	·13	·0007	·0070	·046	·087	15·0°	4·0°	21·0	satisfactory	John Muter.
Chelsea	,, 28	v. p. brown	none	1·19	trace	·11	none	·0036	·031	·070	14·5°	5·0°	19·4		A. Dupré.
Birmingham ..	July 11	v. turb. grnsh.	none	1·19	trace	·03	·0014		·063	·159	11·9°	5·4°	16·5	veg. & animal organisms	A. Hill.
Bolton.....	,, 14	clear	none	·48	none	·03	·0014	·0058	·003	·020	3·6°	3·4°	7·7	satisfactory	W. H. Watson.
Brighton.....	,, 9	c. p. blue	none	1·91	none	·25	·0016	·0019	none	none	12·4°	3·9°	20·6	vegetable debris	Wigner & Harland.
Bristol.....	,, 3	p. green brown	none	·80	trace	·23	·0010	·0050	·027	·080	13·0°	3·6°	16·8	sand, algæ	F. W. Stoddart.
Broadstairs....	,, 25	p. blue clear	none	8·07	trace	·34	·0043	·0068	·008	·010	18·4°	5·9°	34·8	satisfactory	Wigner & Harland.
Cambridge	,, 18	c. p. blue	none	1·40	trace	·38	·0005	·0020	none	·013	17·5°	5·5°	25·0	satisfactory	J. West Knights.
Croydon	,, 20	colourless	none	1·19	trace	·29	none	·0040	none	·010	15·5°	6·0°	22·8	satisfactory	C. Heisch.
Edinburgh	,, 15	s. brown	none	·88	none	trace	·0024	·0072	·016	·022	3·9°	3·7°	5·2	none	J. Falconer King.
Exeter, unfiltrd.	,, 6	f. green yell.		·84	trace	·23	·0007	·0058	·051	·014	2·5°	2·5°	6·3		F. P. Perkins.
Exeter, filtered	,, 6	f. green yell.		·84	trace	·21	none	·0039	·019	·039	2·7°	2·7°	5·6		F. P. Perkins.
Liverpool	,, 10	s. green	none	1·15	trace	·06	·0007	·0021	·019	·061	4·2°	4·0°	10·0		A. Smetham.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in July, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Maidstone—															
Wtr. Company	July 14	p. green	none	2·60	trace	·75		·0014	·030	·061	23·4°	7·0°	34·0	none	M. A. Adams.
Public Conduit	,, 14	p. blue		2·30	trace	·71		·0009	·020	·027	22·2°	6·7°	33·0	none	M. A. Adams.
Manchester	,, 11	c. f. yellow	none	·73	none	none	·0024	·0056	·041	·072	1·7°	1·6°	5·0	vegetable mtr.	W. Thomson.
Norwich	,, 6	p. grnsh. yell.	none	1·90	trace	·06	traces	·0076	·049	·054	12·5°	3·9°	16·0	satisfactory	W. G. Crook.
Nottingham ..	,, 9	c. grnsh. blue	none	1·27	none	1·45	traces	·0017	·008	·012	11·2°	6·6°	22·2	trace veg. matter	Wigner & Harland.
Portsmouth ..	,, 12	clear	none	1·20	trace	·16	trace	·0056			13·0°	2·0°	18·2	veg. deb., diatoms	W. J. Sykes.
Rugby	,, 4	c. p. yellow	none	1·04	h. trace	·12	·008	·0132	·051	·100	16·0°	7·5°	20·0	veg. deb., diatoms	A. P. Smith.
Salford	,, 19	s. cloudy	none	·70	none	none	·0007	·0017	·002	·024	2·5°	2·0°	4·5		J. Carter Bell.
Shrewsbury ..	,, 8	c. colourless	none	1·45	none	·33	·0010	·0025	·007	·007	21·0°	6·0°	26·0	none	W. Morgan.
Swansea	,, 21	clear	none	1·00	trace	none	·0010	·0049	·003	·004	1·4°	1·4°	4·2	none	T. P. Blunt.
Whitehaven ..	,, 21	c. f. green	none	·43	trace	·01	none	·0008	·010	·024	·4°	·4°	2·3	veg. deb., diatoms	A. Kitchin.

Abbreviations:—c., clear; f., faint h., heavy; p., pale; v. h., very heavy v. s., very slight.

SAMPLES RECEIVED AND ANALYSED IN THE MUNICIPAL LABORATORY, PARIS, DURING THE MONTH OF JUNE, 1882.

We have been favoured with the following from a Paris correspondent, and print it for the information of our readers.

SAMPLES.	Bought by Public.		Bought by Official Inspectors.	Total.	Good.	Passable.	Bad.		Total.
	Qualitative.	Quantitative.					Not Injurious.	Injurious.	
Wine	366	22	125	513	78	149	152	58	437
Vinegar	4	5		8	2	3	3		8
Beer	12		6	18	7	2	11	1	21
Cider	4		13	17	10	1	6		17
Spirits of Wine			1	1		1			1
Syrups	1		4	5	1		3	1	5
Water	13	4	1	18	9	1		11	21
Milk	11		149	160	69	68	93		230
Butter	4		7	11	14	2			16
Oil	1	1	2	4	1		2		3
Flour	3	1		4	1	2	1		4
Bread	3	1	1	5			1		1
Sugar		1		1				3	3
Preserved Food	4			4	2		2		4
Preserves	1			1		1			1
Salt	4	2	68	74	37		23		60
Coffee	3			3	1	1	1		3
Chocolate	3		1	4	2		1		3
Confections	1			1	1				1
Colouring Matter and Coloured Toys	32	2	14	48	6			24	30
Paper					1			1	2
Pharmaceutical Preparations	9			9				2	2
Perfumery		2		2	7				7
Sundries	13		91	104	11		28	68	107
Total	492	41	483	1015	260	231	327	169	987

THE CUSTOM HOUSE AND ADULTERATION.

Under the Sale of Food Act a laboratory was established at the Custom House for the purpose of testing the quality of tea imported of a doubtful character, and the department appears, after ten years' experience, to be exhibiting considerable activity. It is satisfactory that the number of samples of tea condemned form, after all, but a small proportion of those tested. Out of 1,242 samples sent into the Commisioners' analyst in the course of last year, 16 lots only were declared unfit for human food. The goods which were in consequence absolutely refused admittance into this country were varieties of tea, or pretended tea, numbering in all 1,153 packages, of which 500 consisted of "faced" green teas, and 500 of leaves other than tea cunningly made up to imitate a green tea well known in our markets under the name of "Imperial." The remainder were decaying congous and "fannings."

THE POISONING BY HOT-CROSS BUNS AT INVERNESS.

The report of the analyst employed by the Crown in the above case has been sent to the Crown office. No arsenic was found in the buns nor in any of the ingredients from which they were made, nor any trace of metallic poison. There was found, however, an alkaloid possessing irritating qualities, but its exact nature has not been determined. It appears from the evidence collected by the authorities, that loaves and buns were both made from one lot of dough, spice being added for the latter. The loaves turned out perfectly good, the buns bad. The natural inference is that the poison, whatever its nature, was in the spice.

REPORTS ON ADULTERATION IN THE STATE OF NEW YORK,

From the *Sanitary Engineer*, New York.

(Continued from page 125.*)*

VEGETABLE FOOD.

Group IV.

Cereals, and the products and accessories of Flour, and Bread Foods; Wheat; Rye; Barley and Rice; Oat-meal; Corn-meal; Sago; Tapioca and Leguminous preparations; Special Artificial Foods for Infants and Invalids; Baking Powders; Cream Tartars; Bicarbonate of Soda; Bicarbonate of Ammonia; Alum Powders and the "Alum Question."

Report by E. G. Love, Ph.D., of New York.

As the specified object of these examinations was to obtain information relative to the extent and nature of the adulteration of foods and drugs sold in the State, attention was principally directed to those articles most liable to adulteration. For this reason, and because the time for the investigation was necessarily limited, the subject of "Infant Foods" is not considered in the report. Previous examinations had shown that these articles of food were not adulterated; and the nature of any investigation in this direction would concern their dietetic value alone. While the subject of infant foods is of great importance, it was considered better to leave it for separate study, rather than to commence an examination, which under the circumstances, must have been more or less superficial.

As to methods of examination, the microscope was mainly depended upon for the detection of foreign matter of a purely vegetable nature, while for the inorganic adulterants the simple methods of the laboratory were employed. The detection of the different starches is readily effected by the microscope, in which polarized light is employed with advantage. A little practice in the examination of starches of known origin enables one to distinguish them without much difficulty.

Dr. Love has considered the "Alum Question," at some length, "inasmuch as the very general use of alum baking powders in this country made it desirable to ascertain the prevalent opinion of chemists and physiologists, regarding the wholesomeness of such preparations."

BAKERS' CHEMICALS.

The most important of these are saleratus, baking soda, cream of tartar, and baking powders.

Saleratus.—This term was originally applied to bicarbonate of potash, which was used in connection with cream of tartar to obtain carbonic acid gas for leavening purposes.

The greater cost of this salt has led, however, to the substitution of the cheaper compound, bicarbonate of soda; and at present none of the potash salt is sold by grocers. "This substitution cannot be considered as an adulteration, inasmuch as there is nothing necessarily restricting the name 'saleratus' to the bicarbonate of potash, and so long as the commercial article is sold at the price of the soda compound, there is no evidence of intention to defraud."

Twenty samples of saleratus were examined, and, in every case, the salt was the bicarbonate of soda. No adulteration was detected. The samples were put up in paper packages, and in most cases bore the manufacturer's name. The practice of selling such articles in bulk is objectionable as offering greater facilities for adulteration.

Baking Soda.—This is the commercial bicarbonate of soda, which as such is employed in cooking, and also forms one of the active ingredients of baking powder. Of twenty-three samples examined, only three were adulterated; one with ground gypsum, to the extent of 25 per cent.; another with gypsum and starch; and the third with sulphate of soda, and about 17 per cent. of carbonate of lime.

The low cost of baking soda offers little temptation to adulterate it. Small quantities of the sulphate and chloride of sodium are always present in the commercial article as natural impurities in its manufacture, but they are in no way injurious, and, if removed, would very greatly increase its cost. From determinations made in the case of eight of the samples submitted, it appears that the amount of sulphate of soda present varied from 0·88 to 2·22 per cent. of the anhydrous salt.

Cream of Tartar.—The comparatively high price of this salt maks it an article of frequent adulteration. Of twenty-seven samples examined, 16 were adulterated, and, in some cases, not a particle of cream of tartar could be found. The adulterants used were terra alba, starch, phosphate of calcium, and tartaric acid. Six samples were adulterated with terra alba alone, seven with terra alba and starch, one with starch alone, and two with starch, terra alba, and acid phosphate of calcium. In six samples tartaric acid had been substituted for cream of tartar, and in each case the sample was otherwise adulterated. In eight samples the amount of terra alba was determined, and found to range from 3·27 to 93 per cent. Five samples contained over 70 per cent. of this adulterant. Commercial cream of tartar contains a certain amount of tartrate of lime, as an impurity; and although this salt is not injurious, its presence diminishes the value of the article. No limit has been fixed to the amount of tartrate of lime allowable in cream of tartar, and yet there is no reason for not fixing some limit. In twelve of the samples examined the amount of tartrate of lime was determined, and found to vary from 3·54 to 10·59 per cent., the average being 8·2 per cent. Some of the samples were purchased of druggists, and the results show that the amount of lime tartrate in these was fully as large as in the samples bought of grocers.

Baking Powders.—These are artificial preparations employed as substitutes for yeast. They consist of bicarbonate of soda, and some acid or acid salt, which on the addition of water, react upon each other with the liberation of carbonic acid gas. There are four kinds of baking powders in use, the difference consisting in the nature of the acid compound used.. In the first, cream of tartar is employed; in the second, tartaric acid; in the third, acid phosphate of lime; and in the fourth, potash or ammonia alum. Moreever, many powders contain a salt of ammonia, generally the sesquicarbonate. The pungent odour of this salt prevents its use in any but the the smallest quantities, and as so used it cannot be considered as in any way injurious.

To prevent a natural deterioration in the powder, most manufacturers add flour or starch, which, within certain limits, is not considered as an adulteration, although its excessive use might become such. Eighty-four baking powders were submitted for examination, which may be classified as follows: cream of tartar powders, 49; tartaric acid powders, 3; alum powders, 20; phosphate powders, 3; besides which, eight were mixtures of cream of tartar, and alum, and one of phosphate and alum. Seventy-three powders contained flour or starch, and thirty-five contained ammonia. Eight of the powders were found to be adulterated; six with terra alba, one with insoluble phosphate of lime, and one with tartrate of lime, doubtless as an adulteration of the cream of tartar employed.

FLOUR AND BREAD.

The term flour, in its more restricted sense, is applied to the powder obtained by grinding the various cereals used as food.

Wheat Flour.—Thirty-five samples of wheat products were submitted for examination, including eight samples of "gluten flour," and three of "farina." There are quite a number of "gluten flours" in the market, which are supposed to contain a special addition of gluten. The samples submitted were found to be free from adulteration; and while some can honestly claim to be gluten flours, others are ordinary wheat flours. As to the other samples of wheaten flour, no adulteration was detected. Mention is made of the adulterants which are sometimes added to wheat and other cereal products. The use of alum, so far as it acts injuriously upon the human system, is considered elsewhere in the report, "but its addition to damaged flour should be emphatically condemned, aside from the question of its wholesomeness." In damaged flour the gluten has undergone a partial decomposition, or fermentation, giving a dark appearance to the flour. The alum acts as an antiseptic, checking this

decomposition, and giving a bread much whiter than could otherwise be obtained. In this way the unscrupulous are able to make a bread possessing the appearance of a first-class article, from material unfit for human food.

Of the animal and vegetable parasites of grain, the most important are smut, mildew, darnel, rust and ergot. There seems to be sufficient ground for the statement that some of the ill effects generally attributed to other causes are in reality due to a vegetable parasite.

Flour of Rye, Barley, Corn, &c.—Of these little need be said here. As a rule they were found free from adulteration. The following shows the number of samples examined: of oat-meal, 12 samples; barley, 7; rye, 7; corn-meal, 10; corn-starch, 2; rice, 5; buck-wheat, 8; sago, 5; and tapioca, 7. One sample of rye-flour was adulterated with wheaten flour of an inferior quality.

Arrowroot.—Genuine arrowroot is the starch obtained from the tubers of *maranta arundinacea*. The term, however, is applied to a number of other starches obtained both from tubers and cereals; and there is, consequently, much confusion with regard to the use of this word. It is a common practice to affix the name of the place where the starch was supposed to have been produced; but this gives no information as to the exact nature of the product. The only remedy for this evil consists in requiring all dealers to mark the arrowroot with the name of the plant from which it was obtained; and also, that mixtures of different starches be marked as such. Of twenty-three samples of "arrowroot" examined, seventeen consisted entirely of Maranta starch, and six of substitutions. One was a mixture of Maranta and tapioca starches, two were Maranta, tapioca and potato, and three consisted of tapioca and potato.

Bread.—Ten samples of wheaten bread were submitted and subsequently examined both chemically and microscopically. Special attention was paid to the detection of copper, alum, &c., and in no case were these substances found. The percentage of moisture in the breads varied from 41·5 to 43·9; and the amount of ash varied from 0·915 to 1·134 grams in 100 grams of bread.

Methods of Examination.—The microscope must be relied upon almost exclusively for the detection of the various starches and abnormal vegetable growths. The detection and estimation of mineral adulterations is readily accomplished by ordinary analytical methods. The determination of alumina, however, for the purpose of deciding the presence of alum, requires considerable care, inasmuch as the amount of alumina, even in an alumed flour or bread is very small, and, under some circumstances might be mistaken for that naturally present in the ash of the flour itself. It is customary to make some allowance for the alumina of the ash, but no fixed amount has been agreed upon by analysts. Of the various methods for the determination of the alumina, preference is given to that suggested by Mr. Dupré and modified by Mr. Wanklyn. It depends upon the insolubility of the phosphate of alumina and the solubility of the phosphates of calcium and magnesium in acetic acid.

THE ALUM QUESTION.

"In the making of bread and foods of a similar nature, alum is sometimes added to the flour for one of two reasons—either to disguise the inferior quality of a damaged flour, or as a constituent of baking-powder used as a substitute for yeast." In the former case the use of alum must be considered as a very objectionable form of adulteration, not necessarily in itself, but as permitting the use in articles of food of material having little or no value.

The alum question, as it has been discussed in England and France, has had reference more to the use of alum in flour, in which case there was greater probability of its entering the system in its natural condition. In this country, however, the question of more immediate importance has reference to the use of alum in baking-powders where the alum suffers decomposition before the food is eaten. The objections urged against the use of alum have been based more upon theoretical than upon practical or experimental grounds. Many have argued the question upon the physiological effect of alum as described in works on Materia Medica, concluding that its effects as usually taken in food are necessarily the same. The advocates of alum powders, whilst recognising the effect of alum taken medicinally, claim that in baking the powder undergoes decomposition with the formation of the hydrate or of the phosphate of alumina. Moreover, that the amount of alum is small, and consequently without injurious effect.

Our space will not allow of our following this paper through; but we may state that Dr. Love cites a number of authorities for the purpose of establishing two points, viz.—is the phosphate of alumina formed? and if so, is it soluble in the digestive fluids? The testimony on these points is so conflicting that no positive conclusions can be drawn from it.

Numerous opinions are then quoted as to the injurious effect of alum upon the human system.

The legislation on this subject in England and France does not especially prohibit the use of alum. In the former the Adulteration Act of 1821 did prohibit its use, but later Acts do not mention it; and under the present law, before convictions can be obtained it is necessary to establish the fact that alum is injurious. In France its use is indirectly prohibited; while in Germany the use both of sulphate of copper and alum is forbidden.

It is stated in conclusion, "that at the present time there does not seem sufficient evidence as to the injurious effects of alum upon the human system to warrant legislation against it."

Groups V. and VII.

V.—Canned Fruits and Vegetables; Preserves; Vinegar; Pickles; Mustard; Ginger; Spices; Antiseptics employed in preserving; Glazing and Enamel, as affecting Food Articles.

VII.—Tea; Coffee; Cocoa.

Report by Prof. S. A. Lattimore, Ph.D., of Rochester University, Rochester, N.Y.

CANNED FRUITS AND VEGETABLES.

Nine samples of canned fruits were examined, including peaches, plums, grapes, strawberries, cherries, blackberries and olives; and the same number of canned vegetables, including mushrooms, corn, beans, peas, succotash, tomatoes and pumpkin. No indication of adulteration was found in any of these foods. "Attention was given to the possibility of the chemical reaction of the fruit acids upon the inner surface of the cans, whereby salts of tin and lead might be produced, rendering the contents in some degree poisonous."

VINEGAR AND PICKLES.

Four samples of vinegar and nine of pickles were submitted for examination. The vinegars "were all of inferior quality, being deficient in acetic acid, but free from mineral acids, and must be classed as unadulterated unless an excess of water may be considered an adulteration." The samples of pickles "gave no evidence of the presence of copper or other metal. The only sample which possessed a suspiciously green appearance was found to contain alum."

SPICES.

Prof. Lattimore's report furnishes abundant proof in support of the common impression regarding the adulteration of spices. The following table shows the number of samples examined, and the extent of their adulteration:

	Number of samples examined.	Number Adulterated.	Percentage of Adulteration.
Mustard	18	12	66·6
Ginger	15	9	60·0
Allspice	27	19	70·4
Cinnamon	22	18	81·8
Cassia	7	4	57·1
Cloves	21	16	76·2
Pepper—black	40	28	70·0
" white	7	5	71·4
" red	10	5	50·0
Mace	8	4	50·0
Nutmeg	5	2	40·0

"As the above table shows, a large proportion of them are adulterated, and that with substances presenting a certain uniformity. The spices present an inviting field for the exercise of fraudulent arts. They are almost universally sold in the form of fine powder and in opaque packages, which do not admit of easy examination on the part of the purchaser. Consequently, any cheap substance which may be easily pulverised to a similar degree of fineness, and which possesses little distinctive taste or odour of its own, answers the purpose; so that the list of adulterants for this class of articles is naturally very large. The adulterations found in the samples now under consideration may be classed into four groups. First, integuments of grains or seeds, such as bran of wheat and buck-wheat, hulls of mustard seed, flax seed, &c. Second, farinaceous substances of low price, such as are damaged by the accidents of transportation or long storage—such as middlings of various kinds, corn-meal, and stale ship's bread. Third, leguminous seeds, as peas and beans, which contribute largely to the profit of the spice mixer. Fourth, various articles, chosen with reference to their suitableness for bringing up the mixture as nearly as possible to the required standard of colour of the genuine article. Various shades, from light colours to dark browns, may be obtained by the skilful roasting of farinaceous and leguminous substances. A little turmeric goes a great way in imparting the rich yellow hue of real mustard to a pale counterfeit of wheat flour and terra alba, or the defective paleness of artificial black pepper is brought up to the desired tone by the judicious sifting in of a little finely pulverised charcoal. Enough has been already given to show that the field for sophistications of this sort is a wide one, and offers large scope for the development of inventive genius; so that each manufacturer of articles of this class would be likely to possess his own trade secrets. It will be observed that the adulterating materials just mentioned all belong to the class claimed to be harmless. In no instance has any poisonous substance been discovered. The proportion of foreign and genuine substances in the spices varies between wide limits, in some instances the former being slight; in others, the latter seemingly present in just sufficient quantity to impart faintly the requisite taste or odour. Even this small proportion of the professed article is occasionally farther diminished by the substitution of other substances; as for example, in imparting to corn-meal finely ground a pungency suggested by real ginger by the addition of a little salt and red pepper."

COFFEES.

Thirty-five samples of unroasted coffee were examined. "In five packages a few grains were discovered which had been slightly coloured or faced. A minute quantity of blue pigment adhered to the more prominent parts of the bean, giving a somewhat brighter colour to the coffee when viewed *en masse*. It was apparently Prussian blue, the quantity obtained being too minute to permit satisfactory chemical tests. No lead chromate could be recognized." The coloured coffee was inferior in quality, and it was thought that the colouring matter would separate in the process of roasting. The three samples of roasted, unground coffee examined were free from adulteration. Twenty-one samples of ground coffee were examined, and in nineteen of them foreign substances were discovered. These substances were chicory, beans, and occasionally wheat or other grain coarsely ground. One sample consisted entirely of roasted hominy. Three samples of coffee extract were composed chiefly of caramel and liquorice, and contained no coffee.

TEAS.

Forty-three samples of green tea and eighteen of black tea were submitted for examination. "Many of these are of the cheapest and most inferior quality, some of them mere tea-rubbish, yet no leaf or fragment of a leaf which has been examined could be considered anything but tea." No mineral matter was found which could not be "fairly credited to the rude and careless manner in which it is banded by the rough employés of the tea-farm." Neither have any positive evidences been discovered of the admixture of exhausted leaves. If they are present, the admixture is too slight to render detection possible by the determination of the percentage of extract or tannin.

(To be continued).

ANALYSTS' REPORTS.

Mr. James Baynes, junr., has reported to the magistrates for the East Riding of Yorkshire, that during the quarter he had analysed seven samples of milk, two of bread, one of white pepper, one of coffee, one of sweet nitre, one of coarse sugar, and one of black tea, all of which were pure. One sample of sweet nitre was adulterated with 14 per cent. of water, one of coffee with 75 per cent. of chicory, one of milk with 7 per cent. and another with 15 per cent. of water.

Mr. T. Fairley, analyst for the North Riding of Yorkshire, presented the following report at the Sessions:—"I beg to submit the following report on analyses made for the North Riding, under the Sale of Food and Drugs Act, during the quarter ending June 30, 1882:—The samples received have been—Two each of milk, lard, and pepper, and one each of flour, sago, tapioca, baking-powder, whiskey, and vinegar; total, twelve samples. None of these samples were found to be adulterated. It is desirable, when few samples are taken, that they should be such as are consumed most largely, such as bread, butter, tea, coffee, &c., and other articles but little used should be sent where special suspicion has arisen or complaints been made."

In Wilts during the past quarter Mr. Donkin has analysed seven samples of food, beer, and spirits, but only one person was proceeded against, a penalty of £10 being recovered.

In Somerset no less than 146 samples were analysed, and of these one of mustard, one of cocoa, two of milk, and one of gin were adulterated—none, however being prejudicial to health.

At Herefordshire Quarter Sessions, Sir Richard Harrington, the chairman, read a letter from Mr. Horsley, the County Analyst, who said that at the last two or three quarter sessions some rather disparaging remarks having been made reflecting upon him and his appointment, he went to Hereford and saw the new Clerk of the Peace, and promised to send him copies of all the correspondence the committee had with him on the matter, which dated as far back as 1877. The enclosures referred to by Mr. Horsley referred to his appointment, salary and duties. The Chairman remarked that he answered the letter stating that no one had any intention to disparage Mr. Horsley, but that certain members of the Court were of opinion—and he could not say without reason—that the appointment of a gentleman out of the county was an improvident one. The Court endorsed the Chairman's action. Mr. Horsley lives at Cheltenham.

At a special meeting of the Marlborough Town Council, the Town Clerk, as the Council had some time since instructed the police to take proceedings under the Sale of Food Act, reported that it had been pointed out by the chief constable that the borough had not the intrinsic authority to order this work to be done by the police. Those only who had the power to instruct the police were the county authority. The Council, under these circumstances, decided to instruct its own medical officer of health and inspector of nuisances to carry out the duties under the Act.

LAW REPORTS.

Dandelion Coffee—Conviction:—

At the Bakewell Petty Sessions, on Saturday, before Mr. R. W. M. Nesfield and Mr. F. Craven, Mr. Richard Robinson, grocer, Chelmorton, charged with selling coffee adulterated with the root of dandelion to the extent of 15 or 20 per cent., was fined £1 and 10s. costs.

Butter and Beef Fat:—

At the Liverpool City Police Court, recently, Mr. John Jones, grocer, 8, Great George's Place, was summoned for selling butter which was found to be adulterated with 30 per cent. of beef fat, and he was fined 20s. and costs.

At the Leicester County Police Office lately, Mr. Henry Chapman, grocer, of Markfield, was charged with selling adulterated coffee. Deputy Chief Constable Moore said on the 9th May he visited the defendant's shop, and purchased from his wife half a pound of coffee. He told her he had bought the coffee for the purpose of having it analysed and divided it into three portions, one of which he himself kept, another he gave to the defendant's wife, and the third he forwarded to Dr. Emmerson, the County Analyst, for examination. On May 22 he received a certificate from the analyst, stating that the coffee was adulterated to the extent of 33 per cent. with chicory. About an hour and a half after he had made the purchase, defendant's wife came to him, and said she had made a mistake, having given him chicory-and-coffee, instead of coffee. Defendant admitted the offence, and was fined 20s. and costs or ten days' imprisonment.

Lard and Water:—

At the Eddisbury (Cheshire) Police Court, recently, John Bleaze, shopkeeper, of Kingsley, was ordered to pay 16s. costs for having sold to Police Superintendent Naylor half a pound of lard which was certified to have been adulterated with 18 per cent. of water.

At the Wallasey (Cheshire) Petty Sessions, lately, Mr. Daniel Cunningham, provision dealer, Wallasley Village, was summoned for selling 1lb. of butter which was not of the nature, substance, and quality required. Inspector Dutton, of the Cheshire Constabulary, went to the defendant's shop and asked for 1lb. of butter, which he paid for and handed over to Mr. Carter Bell, of Manchester, the County Analyst. Superintendent Egerton produced a certificate from that gentleman, stating that there was only 25 per cent. of genuine butter in the sample, the remaining 75 per cent. being made up of fat, &c., The magistrates imposed a fine of 5s. and £2 13s. costs.

"Special" Butter:—

At the Hull Police Court. on June 21, Mr. F. Hodgson, grocer, Hessle Road, was summoned for selling half a pound of butter which was not of the nature, substance, and quality demanded by the purchaser. Mr. Wilson, Deputy Town Clerk, prosecuted on behalf of the Urban Sanitary Authority of the Hull Corporation. Mr. J. Osborne, the inspector under the Food and Drugs Act, visited defendant's shop on May 13, and asked for half a pound of butter, which was sold to him for 7d. He told defendant he had purchased it for analysis, and Hodgson said he had bought it for butter, and he was selling it as such. The butter, on being analysed, was found to contain 75 per cent. of foreign fat. Defendant now said he bought the butter as per sample, and paid 108s. per cwt. for it. Mr. Twiss: If you can prove that you bought it as pure butter it will relieve you. Defendant produced an invoice, which, however, simply specified "five casks, special." His Worship said he could not take this into consideration. The defendant was further summoned for selling a quarter of a pound of adulterated coffee. On the same day the inspector asked for pure coffee, and was served with a quarter of pound of an article which upon analysis was found to contain 20 per cent. of chicory. Defendant said that when the inspector asked him for this article he asked the lad which coffee he had ground last, and the wrong tin was pointed out to him. The sanitary inspector corroborated this statement, and further stated that he bought both the butter and the coffee before he said they were for analysis. Mr. Twiss fined defendant 60s. and costs for selling adulterated butter. He said it was possible there might have been some mistake about the coffee, and in that case judgment would be respited on payment of costs.—Mr. John Hunter, grocer, 44 and 46, Great Passage Street, Hull, was also summoned for selling one pound of butter which on analysis was also found to contain 75 per cent. of foreign fat. There was little or no excuse in this case, and the defendant was fined 50s. and costs.

Orleans Butter:—

At the Cardiff Police Court, before Mr. R. O. Jones and Alderman Evans, J. Rees Evans, grocer, of Star Street, was summoned for selling as butter a substance not of the nature asked for. Mr. Thorpe, Deputy Town Clerk, prosecuted. It appeared that Police Constable Crocker went to the defendant's shop and purchased from an assistant three-quarters of a pound of butter. He saw the defendant, and told him that he purchased the butter for the purpose of having it analysed. The defendant replied "All right." Witness left the shop, but the defendant ran after him and told him that it was Orleans butter. He asked the assistant for three-quarters of a pound of butter, and the assistant said they had been selling that butter at fourteenpence a pound, but that it had "gone off a little." Mr. Thomas, the Borough Analyst, said that it was an article got up to resemble butter. It was known as butterine, and contained a quantity of fat, but no appreciable quantity of butter fat. The defendant said he had bought it as Orleans butter. The magistrates fined the defendant 40s. and 18s. costs.

"Real" or "Mixed" Mustard.

Sarah Rowland, provision dealer, of Tattenhall, Cheshire, was summoned before the county justice at Broxton, recently, for selling mustard which the certificate of Mr. Carter Bell, the Public Analyst, showed to have been adulterated to the extent of 5 per cent. with farinaceous matter. Defendant said that she procured the mustard from a firm in Chester, the executors of the late Mr. John Fleet. She ordered "real" mustard, and the article was sent to her as "real" mustard, and not "mixed mustard." She bought it as pure mustard. In ordering defendant to pay the costs, the chairman of the Bench imformed her that she might enter an action against the parties from whom the article was procured. The costs amounted to £1 6s. 8½d.

BEER ADULTERATION BILL IN THE HOUSE OF COMMONS.

On Tuesday, July 4th, Mr. Hicks moved the second reading of the Beer Adulteration Bill, upon which the House was counted out, and the Bill became a "dropped order."

Mr. J. C. Thresh, pharmaceutical chemist, Buxton, obtained the degree of Doctor of Science in the University of London at the recent examinations.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No 1881	Name of Patentee.	Title of Patent.	Price
4948	G. André	Electric Lamps	1s.
5024	E. Carey & H. Gaskell, &c.	Manufacture of Bichromate of Soda	6d.
5198	C. H. Biggs & W. Beaumont	Secondary Batteries	6d.
5216	J. E. Liardet and T. Donnithorne	Hydraulic Motors	8d.
5229	W. R. Lake	Utilization of Electricity for Lighting	4d.
5233	Ditto	Utilization of Electricity for Lighting	1s.
5261	H. E. Newton	Secondary Batteries	6d.
5262	C. D. Abel	Manufacture of Chromate of Soda	4d.
5264	Ditto	Manufacture of Chromate of Soda and Chromic Acid	2d.
5278	J. B. Spence & J. Desvignes	Purification of Coal Gas	2d.
5291	W. Spence	Preparing Chrome Yellow and Chrome Red	4d.
5296	F. Worth	Manufacture of Sulpho Acids	4d.
5312	H. W. Deacon and H. Gaskell	Purification of Alkaline Solutions	4d.
5322	J. Imray	Electric Accumulators	2d.
5348	W. Clark	Distillation of Glycerine, &c.	6d.
5338	D. G. Fitzgerald and C. H. W. Biggs, Junr.	Secondary Batteries	6d.
5390	F. Petri	Purifying or Disinfecting Sewage	6d.
5396	C. F. & F. H. Varley	Electric Lamps	6d.
5406	J. G. Williams	Decomposing Common Salt and other Chlorides	2d.
5481	D. G. Fitzgerald	Secondary Batteries	4d.
5490	W. R. Lake	Electric Lamps	4d.
5499	J. W. Swan	Measuring and Recording Electric Currents	4d.
5521	G. Grant and W. H. Jones	Secondary Batteries	4d.
5523	G. Chapman	Apparatus for Separating Ammonia from Gases	6d.
5544	J. Simpson and E. W. Parnell	Treating Alkaline Lime Mud	6d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Oil and Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record; Oil and Drug Journal; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine; London Water Supply, by Crookes, Odling and Tidy.

THE ANALYST.

SEPTEMBER, 1882.

ON THE MANUFACTURE OF SUGAR FROM MAIZE.

By R. H. Harland, F.C.S., F.I.C.

The development of this industry has of late years taken rapid strides, the manufactured article having come into use mainly, in this country, for brewing purposes. In America this class of sugar is largely in demand, and is used most extensively for mixing with cane sugar and cane syrups, whereby the sweetening power of the former is considerably reduced, but a sugar is produced of a much whiter and pleasanter appearance, which commends itself to the consumer.

By far the larger portion of solid grape sugar imported into this country comes from America, but up to the present time its consumption has been restricted to the brewer, and more recently for confectionery and preserving purposes. The quantities imported during the last few years are as follows:—

1879	817,763	cwts.
1880	405,760	,,
1881	399,648	,,

This proves that its use is widely extending, and although the figures do not show such a marked increase as might perhaps have been expected, yet the imports of the present year will probably be far in excess of any previous quantity.

In the Colonies this article is already attracting attention, and the time is, probably, not far distant when the districts suitable for the cultivation of maize and other starchy plants will be turned to account for the production of glucose and spirit.

In England there are several manufactories turning out a considerable quantity of liquid glucose (and I may here mention that the term glucose, or grape sugar, is applied to both the liquid and solid article, although, as will presently be shown, they differ materially in composition), but up to the present English manufacturers have been unable to produce an article equal to American, and this is, no doubt, due to the greater demand for the substance in America, which has caused a greater amount of attention to be directed to this industry.

In the manufacture of grape sugar a grain is selected which is rich in starch, and, for this reason, it is the starch which is converted into sugar, so that the larger the percentage of starch the greater is the yield of sugar, providing always that nothing is present in the grain which will cause loss of sugar or deterioration of the product during the operations incidental to its manufacture.

Starch is one of the most widely disseminated substances in the vegetable world. It is contained in the root, bulbs, leaves, bark, blossoms, fruit, and seeds of the most varied species of plants in various proportions, in some cases amounting to within ten to twenty per cent. of the entire weight of the plant. Of course, the quantity of starch varies with the species of plant, the country in which it is grown, and also the mode of treatment during cultivation. The following table will give an idea of the proportion contained in various species of corn and grain:—

	Starch.	Moisture.	Oil.	Albuminoids.	Gum Sugar, &c.	Cellulose.	Ash.	Nitrogen.
Wheat	63·30	14·50	1·90	14·40	—	4·20	1·70	—
Saigon Rice	77·07	12·54	·64	7·86	1·00	·28	·61	(1·17)
European Maize	76·48	12·35	1·58	8·05	—	1·08	·16	(1·28)
White American Maize	71·41	11·88	4·19	7·00	—	4·16	1·36	(1·12)
Red American Maize	74·91	12·05	2·09	5·69	—	4·00	1·26	(·91)
Potatoes	20·0	76·0	—	—	—	—	—	—

Starch belongs to that class of neutral bodies which are termed carbohydrates; its composition is expressed by the formula $C_6H_{10}O_5$ in common with dextrine, cellulose, and other allied bodies which, on being submitted to ultimate analysis, are shown to contain exactly the same number of equivalents of carbon, hydrogen and oxygen, so that the formula $C_6H_{10}O_5$ represents the composition of the class of carbohydrates which includes substances differing materially in appearance and physical properties. Starch is insoluble in cold water, but on being heated with water to a temperature of 60° C. it gelatinizes, and if sufficiently strong is transformed into a jelly or stiff paste; the same result takes place at higher temperatures, the starch granules bursting and dissolving in water.

On heating starch to a temperature of 200° C., it is gradually transformed into soluble starch and dextrine.

On boiling with dilute acids—hydrochloric or sulphuric—dextrine and maltose are formed, which by prolonged boiling are converted into dextrose. It is on this reaction that the manufacture of dextrose, or starch sugar is founded. Represented by chemical equation the action is—

Starch.		Water.		Maltose.		Dextrine.
$3C_6H_{10}O_5$	+	OH_2	=	$C_{12}H_{22}O_{11}$	+	$C_6H_{10}O_5$.

After the lapse of some time and continued heating, the dextrine is entirely converted into dextrose.

The part which the acid plays in this reaction is not thoroughly understood, it causes the starch, however, to combine with the necessary quantity of water for its conversion into sugar, remaining unacted upon itself.

Maltose, an isomer of cane sugar, is probably identical with the sugar produced by the action of malt extract on soluble starch, and is always present in properly prepared brewers' worts.

Starch may also be converted into sugar by the action of diastase, a peculiar substance contained in malt. This operation is carried on by the brewer in the preparation

of malt worts, and the action of the diastase on the starch of the grain is, according to the researches of Payen and others, to first convert two-thirds into maltose, and the remaining one-third into dextrose, the maltose undergoing gradual transformation into dextrose, as the dextrose is converted into alcohol and carbonic acid by the action of the ferment.

Conversion of Starch into Sugar.—It is well known that by the action of acids on starch, substances are formed varying in character and composition with the time during which the action of the acid is allowed to take place in a boiling solution. In the preparation of glucose on a manufacturing scale, it is not unusual to employ pressure and an excess of acid over and above the quantity necessary for converting the starch, in order to accelerate the formation of dextrose; numerous patents have been taken out for machinery in order to either more rapidly effect the conversion or to subject the grain after mixing with water to a considerable temperature and pressure in closed vessels, previous to the treatment with acid; but in all cases the whole grain is treated, and the matters left undissolved by the acid are removed by filtration at a subsequent stage.

The quality of the article produced depends in great measure upon the quantity of acid used and the time allowed for the operation. To produce a white starch sugar it is necessary to prolong the treatment until all the dextrine has disappeared, and the resulting solution of sugar is refined with animal charcoal previous to concentration. When a liquid glucose is required, the presence of the dextrine is necessary to preserve the substances in a liquid form, as otherwise partial solidification would result from the dextrose crystallizing out.

In America where large quantities of grain are continually being converted into sugar, the best results both as to quality and price are obtained by first subjecting the grain—generally maize—to a process for the removal of the greater part of the oil and albuminoid materials. This is readily effected by first steeping in cold water for some hours, cracking it either in a disintegrator or between mill stones, and delivering the broken-up maize with water into a centrifugal machine provided with a number of steel beaters revolving in a reverse direction to the machine. This effectually removes the greater part of the starch which is carried away suspended in the water and afterwards allowed to settle out on suitable starch tables. The germ, containing a large proportion of oil and albuminoids, together with the greater proportion of the outer skin or rind is retained in the machine, while the portion which finds its way through with the starch can be readily removed during the process of settlement or by sieves. The starch thus produced is stirred with water to a milk and run slowly into a vat containing boiling dilute sulphuric acid varying in strength from 1 to 5 per cent. The boiling is continued until the whole of the starch is converted into sugar: the time of course varies greatly with the strength of the acid and the quality of the sugar required to be made, but with open converters it is necessary to boil for from four to eight hours, using 2 per cent. acid. It is essential to keep the concentration of the liquid as great as possible so long as the formation of sugar is not impeded, in order to avoid the cost of evaporation. The liquid is carefully neutralized and the resulting precipitated calcium sulphate removed by filtering under pressure from a monte-jus or pump, through a filter press. When solid sugar or dextrose is being manufactured the liquid will have a

density of from 22° to 27° B. and contain from 4·5 to 5·5 lbs. dextrose per gallon, it requires refining by means of animal charcoal exactly in a similar way to cane sugar, and afterwards concentrating in a vacuum pan.

In the treatment of the whole grain a similar plan is adopted, preference being given to shortening the time of conversion by increasing the pressure on the surface of the boiling liquor to 90 lbs. or thereabouts on the square inch, the liquor being neutralized with chalk and the calcium sulphate together with the undecomposed portions of the grain removed by filtration. There are decided objections to be urged against this method which do not apply with equal force when the American mode of manufacture by first removing the impurities is employed.

The valuable nitrogenous portions of the grain are so admixed with calcium sulphate as to render what would otherwise be a valuable feeding material for cattle almost worthless, whereas—as is shown by the following analysis—the American residue contains all the feeding qualities of the grain in a fairly concentrated form.

	Residue when whole Grain is treated.	Residue when Starch is treated.
Moisture	9·00	10·86
Oil	10·00	6·09
*Albuminoids	20·30	13·69
Uncrystallizable Sugar	7·10	—
Starch Mucilage, &c.	—	54·54
Mucilage, &c.	18·50	—
Cellulose	6·80	14·04
Ash	28·30	·78
	100·00	100·00
*Containing Nitrogen	3·25%	2·19%

Further, it is well known that various organic combinations are formed by the action of the acid on the oily and non-starchy portions of the grain, which not unfrequently impart to the sugar an unpleasant taste and smell, requiring an increased quantity of animal charcoal to remove and absorb them—in fact, it is doubtful whether they are ever entirely removed, but probably small traces remain to the detriment of the finished article, and may be the cause of unsuccessful fermentations when used for brewing, and if required for the manufacture and distillation of alcohol would produce a spirit inferior in flavour to that obtained from sugar prepared from nearly pure starch. It is therefore questionable whether the superior quality of the sugar and the higher value of the residue as cattle food does not more than compensate for the increased cost—about 13s. per ton on the raw grain—in removing the albuminoid substances, and the loss of starch in the food which would otherwise have probably been converted into sugar.

THE SOMERSET HOUSE LABORATORY.

We take the following from the "Report of the Principal of the Laboratory" comprised in the twenty-fifth Report of the Commissioners of Her Majesty's Inland Revenue:—

"The work of the Laboratory has very largely increased during the past year (to 31st March, 1882). The number of samples examined amounts to 26,201, which is an increase of 8,187 on the preceding year.

The increase in the number of samples is principally due to the beer duty, and to the new regulations for determining the obscuration of foreign spirits on importation. The strain on the department was very great; but by great industry on the part of the staff the work has been satisfactorily performed.

Thirty-seven examiners have received instruction in the department during the year.

Eight students have attended the usual course of practical chemistry in this laboratory, and the two courses of lectures on inorganic and organic chemistry at South Kensington.

On the examination of these students by Dr. Frankland, seven obtained first-class certificates, and one a second-class. Three succeeded in securing very high positions in the list, and one of the three obtained 99 out of the maximum number of 100 marks.

REFERENCES UNDER THE "SALE OF FOOD AND DRUGS" ACT.

Forty-one samples were referred to us for analysis by the magistrates under the 22nd section of the "Sale of Food and Drugs Act." These samples consisted of milk, butter, coffee, bread, oatmeal, beer, mustard, and whiskey, and in fifteen instances we were unable to support the certificates of the public analysts.

Certain samples of milk were received from Dundee, the cases being remarkable from the fact that the prosecution did not charge the defendants either with adding water or abstracting cream, but based their claim for a conviction on the ground that the milk was of inferior quality. The "total solids" amounted in each case to between 11 and 12 per cent., and although the proportion of fat was low in each of these samples, yet it was not lower than is found in genuine milk of poor quality, and we reported accordingly.

The cases being novel, the Procurator-Fiscal asked my opinion as to the liability of persons selling milk of low quality, and in my reply I pointed out that the Act of 1875 was silent on the question of standards, or uniformity of quality, and that as I understood, the Act was intended to ensure the supply of such an article as milk in a genuine state, and that no penalty was incurred for a sale of milk in the state in which it was yielded by a cow in a healthy condition, under the usual changes of food and season.

We received from the sanitary authority at Chester a sample of milk for analysis of a somewhat remarkable character on account of the exceptionally low amount of "solids not fat" which it contained. The cow was reported to be healthy and well fed, and she was milked in the presence of the analyst. The ash or mineral matter was abnormally high, and contained an excessive quantity of chlorides, and there was an absence of the usual relation existing between the constituents of a normal milk. We reported that the sample was so abnormal that the results of the analysis would at once suggest an enquiry before recommending proceedings, and that the fact of such a milk having been met with, should exercise little or no influence in dealing with samples of milk obviously reduced in quality by the addition of water.

The samples of coffee referred were all alleged to be adulterated with chicory. In two cases we confirmed the certificates of the analysts, but in two instances the samples were absolutely free from chicory. In one of these cases, the coffee was stated to contain 10 per cent., and in the other 27 per cent. of chicory.

A case in which a sample of bread, alleged to be adulterated with alum, was referred to us for analysis, obtained some notoriety owing to an impression having been produced

at the adjourned hearing on the mind of the magistrate that we might have employed an old process of analysis for the detection of the alum and have failed to discover it. Considering our entirely unbiassed position, and the extreme care which we exercise both in the analysis, and the selection of the analytical processes we employ, it is a matter of regret that, in the interests of justice, our certificate should be made the subject of unfair criticism in our absence. In the case in question there was no ground whatever for such an allegation, the analytical process we employed being thoroughly reliable.

One sample of beer only was included in the reference samples. The allegation was an adulteration with salt, but the result of the analysis showed that the beer contained 11·9 grains only of common salt per gallon. The analyst had ascertained the amount of chlorine and calculated its equivalent in common salt, but failed to determine the actual quantity of chloride of sodium present. A prosecution under the "Sale of Food and Drugs Act" is essentially a criminal proceeding, and the specific charge requires to be fully sustained by the result of the analysis. It is clearly not sufficient on a charge of adding salt to affirm that the chlorine was equivalent to a certain number of grains of chloride of sodium per gallon, without establishing that the equivalent proportion of sodium is actually present."

ADULTERATED BUTTER AND MILK.

In the House of Commons, on Thursday, August 3rd, Viscount Folkestone asked the President of the Board of Trade, when the Statistical Inquiry Committee that was examining into the subject of the better classification of butter, oleomargarine, and other butter substitutes, was likely to issue its report; and whether he would communicate the result of that inquiry to the House.

Mr. Chamberlain said he was informed that the Committee was now considering its report, which would probably be ready in a few days. It dealt with a great many matters besides those referred to in the question. The Committee had been appointed by the Treasury, which would have to decide whether the report was of sufficient public interest to have it presented to the House.

Lord E. Cecil asked the President of the Local Government Board whether his attention had been drawn to the report of Mr. Blyth, analyst under the Adulteration of Food Act, to the Devonshire Court of Quarter Sessions, dated June 13, 1882, in which, speaking of the adulteration of butter and milk, he compared the difference of limit between the Public Analysts of 1874 and that of the Somerset House certificate at the present time; and whether he proposed to take steps in the interest of the public to raise the standard of purity in both those articles.

Mr. Dodson: Mr. Blyth, in his report, speaking of the adulteration of butter and milk, compared the difference of limit between the Public Analysts of 1874 and that of the Somerset House certificate at the present time. There is no doubt as to the difference in limit between the two bodies. The Somerset House analysts, however, are not alone in their opinion, and I am now in communication with them on the subject, but at present I am not prepared to say whether it would be practicable to define any such standard of purity as would effectually protect the public from adulteration on the one hand, and the honest dealer from prosecution on the other, simply because the natural products in which the latter deals may happen to fall below some arbitrary standard of quality.

In reference to this subject the following letter has appeared in *The Times*:—

To the Editor of *The Times*.

Sir,—The answer of Mr. Dodson to the question of Lord E. Cecil, reported under the above heading in the Parliamentary Intelligence in *The Times* of this day, omits some very important facts.

It is quite correct that the chemists at Somerset House have not accepted the limit of purity of milk adopted by the Society of Public Analysts in 1874, although this limit was fixed after the examination of thousands of samples. But Mr. Dodson omitted to state that this "limit" is still in use by the Society, and that, despite repeated discussions as to figures adopted by the Somerset House chemists, no

proposal has ever been brought forward to alter it. Further, the New York State Board of Health have just completed an independent investigation into the matter, and, as the result, have accepted and confirmed the standard of the Society, which now becomes the law of the State. It is understood that several other States have done the same. The Municipal Laboratory at Paris is working on the same basis.

Some of the largest dairy companies in London insist upon their supply being above the Society's limit, and fine the farmers who supply them if it is not. In short, the Public Analysts' limit is all but universally accepted, because it is the carefully considered result of the largest experience, and simply demands that the public should have milk of (at least) low average quality, as proved not only in England, but in America and the Continent.

On the other hand, the chemists at Somerset House, who hardly find an outside supporter, are working on figures which allow the milk of underfed and diseased cows to be sold as genuine. Large milk dealers will not buy on these figures. Why should they be allowed to sell on them?

The public are most concerned in the matter. If they are content with the poor milk so well, let them claim a return to the old price. The dealers will dilute it scientifically, and under chemical guidance, exactly to the proper extent. Milk adulteration is now a science and a success. The reason is not far to seek. Your obedient servant,

G. W. WIGNER, F.C.S., F.I.C.,

37, Lombard St., E.C., Aug. 4. Hon. Secretary of the Society of Public Analysts.

EXAMINATION OF WINE WITH CATGUT.

The determination of the astringent matters contained in wine is considered a most delicate operation. These matters are various; the principal is a tannic compound called *œnotannin*, and there are several colouring matters closely related to it. The ordinary methods of determination are rather uncertain, especially where there is little astringent matter. M. Girard has lately devised a method of a very simple nature, which has proved to be superior in precision to the others. It depends on the tendency of the matters in question to combine with animal tissues. Long ago Pelouze used skin to separate tannin from gallic acid; others have analysed bark by a process based on absorption of tannin by skin. Some chemists seem to have even tried ordinary skin in the analysis of wines, but it is not well suited for this. M. Girard finds in catgut a pure animal tissue, of definite chemical species, a much better means of determination. He takes some of the fine white violin cords prepared by M. Thibouville-Lamy, the last process of polishing with oil having been omitted. Four or five of these are put together. A certain quantity is soaked in water for four or five hours (one grain having previously been detached to ascertain the water in it); then these swollen portions are put in a known quantity of the wine to be analysed. This is quickly altered in consequence in 24 hours generally, or 48 at most, all colour has disappeared. The tanned and dyed portions of cord are then dried, first in a flat dish, then in a closed vessel at higher temperature. A comparison then made of the original cord (free from water) with the same cord tanned, coloured, and dried, affords a correct estimate of the *œnotannin* and colouring matters of the wine.—*Times*.

COFFEE MIXTURES.

THE Regulations issued by the Inland Revenue Commissioners as to the new stamp duty on coffee mixtures, which we print in this number, are, as will be seen, rather vague, if not contradictory, in character: for whereas by clause (*e*) every packet containing coffee mixed "with any article or substance" is to have an excise label setting forth what the mixture is composed of, yet the last sentence in the regulations states that no excise label will be necessary on a mixture of chicory and coffee, but only a label as already required by the Adulteration of Food Acts for this or other mixtures of coffee and adulterants.

GATESHEAD WATER SUPPLY.

Much dissatisfaction has recently been expressed with regard to the quality of the water supplied to the borough of Gateshead by the Water Company. It had a "fishy" taste and unsavoury smell, giving the impression that a large quantity of fish had been washed in it, or that a considerable amount of cod-liver oil had been mixed with it. Latterly the water has become so unpalatable that many of the inhabitants have discarded its use for domestic purposes, and had recourse again to the springs to be found in the neighbourhood, to supply their daily wants.—*Sanitary Record*.

THE COFFEE QUESTION IN PARLIAMENT.

THE consideration of the Customs and Inland Revenue Bill was resumed in Committee in the House o Commons on Monday, July 31st.

On the question that Clause 2 stand part of the Bill,

Mr. Macfarlane complained that while the Indian Government had abandoned the import duty on Manchester manufactured goods, which brought in a revenue of £1,500,000 a year, the Home Government had not removed the duty on Indian tea. He need scarcely ask what, in such circumstances, would have been the course of the Indian Government if it had been independent and not under the control of the Secretary of State. The extent of the injustice inflicted on India would be perceived when it was remembered that in 1860 only about 1,000,000 lbs. of Indian tea was imported into this country, while last year the amount was 46,000,000 lbs. He contended that, subject to the necessities of the revenue, English ports ought to be no less free than Indian.

Sir G. Campbell pointed out the difficulties in the way of the change desired by the hon. member.

Mr. Gladstone said that there was no connection between the free import of manufactured cotton into India and of Indian tea into this country. He agreed with the hon. member, however, as to the importance of the Indian tea trade, which had certainly developed in a surprising manner. So far as regarded the abolition of the Customs duties of India which had taken place while the present Administration was in office, that abolition was not owing to any pressure whatever from the Government at home. It had been done by the free and spontaneous action of the Indian Government itself. Although at other times there had been pressure upon the Lancashire cotton districts, yet he believed that great advantages were combined in the action the Indian Government had taken simply by the abolition of the duties. When the Indian revenues admitted of the abolition, the measure was quite a proper one, altogether independent of the abolition of duties upon articles imported into this country from India.

The clause was agreed to. Clauses 3 and 4 were also agreed to.

On Clause 5, Mr. Magniac moved, in page 2, line 14, to leave out the words "called by any name of coffee, or chicory, or."

Mr. Cavendish Bentinck said that the Committee ought to have explanations from the Government as to the extraordinary position into which this question had got. From the words of the right hon. gentleman on a former occasion it appeared that he proposed to do one thing and the Bill proposed to do another. He asked this question, not as being connected with the coffee trade, but because he was strongly opposed to adulteration in every shape and form. He recollected some years ago hearing the late Chancellor of the Duchy, when President of the Board of Trade, make a very strong speech in favour of adulteration, and he believed that was the only thing the right hon. gentleman did while he was at the Board of Trade. And it was under the right hon. gentleman who was now President of the Board of Trade that we had the extraordinary change in the policy of Her Majesty's Government now proposed. As one of the public he was most desirous of obtaining pure coffee for the poorer classes instead of the abominable mixtures now sold in coffee-palaces. He had been astonished and horrified at what he had seen sold in those places.

Mr. Courtney explained that really no change whatever had been made, as would be seen by referring to the Budget speech of his right hon. friend. As it had been found that some untaxed beverage resembling coffee was sold as coffee, they proposed to prevent that by taxing the untaxed substitute.

Mr. Magniac said he believed the amendment would meet the case.

Mr. Warton remarked that it appeared to be all a question of money with the Financial Secretary of the Treasury, who had not said anything about the health of the people.

The amendment was agreed to.

In reply to Mr. Dillwyn,

Mr. Courtney promised to consider whether it might not be right to allow the sale of quarter-pound packets of the mixtures in question, instead of half-pound packets. If consumers really desired that they should so be sold, the Government would be ready to fall in with their wishes. He explained that the clause did not apply to coffee and chicory, which would still be sold under the same conditions as at present.

The clause was then agreed to.

On Clause 6,

Mr. Magniac moved an amendment providing that on packets purporting to contain coffee with other articles mixed therewith there must be a label giving the names of the articles composing the mixture. The object of his amendment was to insure that everybody buying a packet of coffee mixture should know exactly what he was purchasing. He observed that in the recently presented report of the Agricultural Commission, a recommendation was made that steps should be taken to insure that all agricultural products for consumption by the public should be sold under such descriptions as would indicate their true composition.

After a few words from Mr. Cavendish Bentinck, Mr. Arnold, and Mr. Labouchere, the amendment was agreed to.

Mr. Cavendish Bentinck proposed to add the words "and in the case of coffee the percentage therein contained."

Mr. Dodson said it appeared to him that the amendment of the hon. member for Bedford provided sufficient security for the public without the proposed addition. He did not think it was fair to require a statement of the percentage of coffee. The addition proposed would simply lead to a good many prosecutions.

Mr. Magniac said his amendment was fully considered by the Government, and they were of opinion that it contained all that was necessary for the protection of the public.

Mr. Warton said hon. members cared nothing for any bargain between the Government and the hon. member for Bedford; they cared for the public. Unless the words proposed by the hon. member for Whitehaven were added there might be offered to the public for coffee something containing not 1 per cent. of coffee. The public bought by weight, and therefore he proposed to add the words "in weight" to the amendment.

Mr. Alderman Lawrence thought it was a consumers' question, and that the Government ought to protect the consumers. No substance ought to be sold as coffee unless it contained 50 per cent., or at least 30 per cent. of coffee.

Mr. Courtney said that the hon. member for Bridport, who had found so much fault with the Government for grandmotherly legislation, had been advocating great-grandmotherly legislation in supporting the amendment. Were the people of this country to be treated as so absolutely deficient in the powers of self-management as not to know or be able to test what they were buying? He was surprised that gentlemen on the Liberal benches who had accepted Mr. Cobden's doctrines should be found supporting the amendment.

Mr. Colman thought the amendment would create difficulty in practice, because of the different qualities of the raw material.

Mr. Alderman Cotton supported the amendment.

Mr. Labouchere objected to hon. members proposing amendments, and then agreeing with the Government to emasculate them. He was as thorough a free-trader as any man; but if Mr. Cobden's principles were against the amendment, he differed from Mr. Cobden. It was a question of protecting the poor against the grocer. The grocer only gained 1d. or 2d. a pound on genuine coffee; whereas on the spurious article, in which there might be a fractional part of the best article, and a large proportion of fig-dust, or beans, or chicory, he gained 5d. or 6d. a pound. If the Secretary to the Treasury objected to the amendment, he wondered why he insisted on the statement that the article sold was not really coffee, but a mixture of coffee and this or that substance. If the adulterating substance were stated, why not also the amount of such substance? He hoped the right hon. gentleman would stick to his amendment.

Mr. Macfarlane thought the poor ought to be protected. Under the Adulteration Act they had no protection, because as a first step they had to pay the prohibitory charge of 10s. to the Public Analyst.

Mr. Dodson wished to point out that the Government proposal, instead of tending to facilitate adulteration, as some hon. members seemed to think, was really an extension with respect to that one article of the Adulteration Act.

Mr. Baring hoped that as the Government had made up their minds to take a step in the right direction, they would not object to go a little further.

Mr. Buxton remarked that out of twenty-one samples of so-called coffee obtained at random in London, one was found to be pure coffee, eighteen were more or less adulterated, and two contained no coffee at all. In these circumstances, it could not be a matter of surprise that the consumption of coffee had very much diminished.

Sir G. Campbell thought that the protection given to purchasers should not be a sham, and that the percentage of coffee should be stated.

Mr. Onslow considered that it was incumbent on the [Legislature to see that the public were not cheated in this matter.

Mr. Slagg objected to the amendment because it would set up an entirely new principle with regard to trade.

Mr. Cavendish Bentinck was of opinion that the House ought to do its best, by grandmotherly legislation or otherwise, to protect the poor people who were consumers of coffee. At present they had no guarantee that they would get coffee at all, for there was not that distinction between coffee and chicory which ought to exist. He had been an anti-chicorist all his life. These mixtures might contain no coffee at all, and malt-chicory might be a more correct designation than malt-coffee. For these reasons he thought there ought to be a specification, and he could not see why there need be any difficulty about giving the estimated percentage upon the labels. If admixtures were sold it ought to be at the peril of the seller, and the buyer ought to be protected.

Mr. Alderman Lawrence said it was a new principle to levy a tax upon an adulterated article. If coffee were the first thing named that very fact would give the impression that it was the principal ingredient in the mixture. The rich could protect themselves, but the poor could not. The progress of temperance was involved, for if a man were induced to try a cup of coffee instead of a glass of ale, and in lieu of coffee he had one of these miserable mixtures, he might decline to substitute coffee for intoxicating drinks.

Mr. Whitley thought there would be difficulty in giving the exact proportions of these compounds.

The amendment of Mr. Warton was withdrawn, and the question then put was the addition of the words " and in the case of coffee the percentage thereof therein contained."

The committee divided, and the numbers were:—

For the amendment	73
Against	114
Majority	—41

The clause was then agreed to, as were also Clauses 7 and 8.

Clauses 9 and 10 were omitted.

In the House of Commons, on Wednesday, (Aug. 2nd) on the report of amendments in the Customs and Inland Revenue Bill being considered,

Mr. Courtney moved an amendment in regard to coffee mixtures, enabling those articles to be sold in quarter-pound packages, duly labelled, instead of a minimum of half-pound packages, the smaller quantity being required to meet the convenience of the humbler classes.

The amendment was agreed to.

The Bill was then ordered to be read a third time on Thursday (3rd), when it was accordingly passed.

CHICORY.

Year ending 31st March.	Quantity charged with Duty.
1881	2,365 cwts.
1882	2,869 ,,
Increase	504 ,,

The growth of this article in the United Kingdom has been gradually diminishing since 1871, and the slight increase shown in the last year is rather due to casual circumstances than any revival in the cultivation of this root. The quantity in bond at the end of the year was about three-fourths of the year's produce. The acreage planted is now probably less than 100 acres.—*Inland Revenue Commissioners' Report.*

Mr. Stoddart, of Bristol, has been unanimously re-elected analyst for Salisbury at an annual salary of £25. The samples submitted for analysis last year from Salisbury were numerous, and there was little, if any, adulteration.

TABULATED STATEMENT SHOWING THE WORK DONE BY PUBLIC ANALYSTS, UNDER THE SALE OF FOOD AND DRUGS ACT, DURING THE YEAR 1881.

Compiled specially for THE ANALYST.

		Milk, Butter-milk and Cream.		Butter.		Groceries.		Drugs, &c.		Wines, Spirits, and Beer.		Bread and Flour.		Waters.		Sundries.		Total.	
	ANALYST FOR	No. Analysed.	No. Adulterated.	No. Analysed.	No. Adulterated.	No. Analysed.	No. Adulterated.	No. Analysed.	No. Adulterated.	No. Analysed.	No. Adulterated.	No. Analysed.	No. Adulterated.	No. Analysed.	No. Condemned.	No. Analysed.	No. Adulterated.	No. Analysed.	No. Adulterated.
M. A. Adams	Broadstairs	7	2	..	..	..	..	..	..	..	..	3	..	..	..	..	..	10	2
,,	Kent	8	2	16	1	36	5	..	..	29	9	13	1	..	..	..	..	102	18
H. Alford	Somerset	137	1	193	7	344	22	40	..	153	24	5	..	188	109	14	..	1074	163
A. H. Allen	Barnsley	22	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	22	3
,,	Batley	18	1	4	1	2	..	..	..	..	..	..	..	..	..	..	..	24	3
,,	Derbyshire, N.	16	3	6	1	8	2	17	6	10	3	..	..	..	..	2	..	59	15
,,	Doncaster	3	1	3	2	..	..	..	..	2	2	1	..	..	..	..	..	9	5
,,	Rotherham	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	..
,,	Sheffield	64	7	1	..	19	12	..	..	..	..	15	1	..	..	..	..	99	20
,,	Yorkshire, W. Riding	76	11	2	..	34	2	10	3	19	11	77	3	..	..	..	..	218	30
A. Angell	Andover	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Guildford	3	..	1	..	9	2	..	..	3	..	..	..	..	..	..	..	16	2
,,	Hampshire	34	6	6	..	1	..	..	..	19	4	3	..	..	..	..	..	63	10
,,	Newport, I. W.	..	..	..	..	1	..	1	..	1	..	..	..	..	..	..	..	3	..
A. Ashby	Grantham	17	5	..	..	3	..	..	..	1	..	14	1	..	..	..	..	35	6
J. J. Bancroft	Denbighshire	1	..	..	..	3	..	2	1	1	1	..	..	6	5	1	..	14	7
A. W. Barclay	Chelsea	40	17	4	..	222	31	18	..	3	2	22	..	10	..	..	..	319	50
J. Baynes	Beverley	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Boston	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Grimsby	17	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17	6
,,	Hanley	12	3	6	..	..	..	..	..	12	3	..	..	..	..	..	..	30	6
,,	Hull	13	3	..	..	..	..	..	..	..	..	..	..	12	1	..	..	25	4
,,	Louth	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Scarborough	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	York (City)	10	2	..	..	..	..	..	..	..	..	..	..	8	2	2	2	20	6
,,	Yorkshire, E. Riding	23	1	..	..	11	1	3	2	7	2	1	..	..	..	1	..	46	6
J. Carter Bell	Cheshire	179	34	18	5	129	16	4	1	166	34	34	..	62	..	1	..	593	90
,,	Congleton	..	..	..	..	..	..	..	..	40	13	..	..	2	..	..	..	42	13
,,	Glossop	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Salford	452	101	10	1	86	5	..	..	10	3	11	1	24	..	15	..	608	111
,,	Stalybridge	7	2	..	..	..	..	..	..	..	..	..	..	1	..	..	..	8	2
J. W. Biggart	Greenock	60	11	2	..	..	..	..	..	14	4	..	..	..	..	..	..	76	15
,,	Buteshire	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Dunoon	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..
,,	Port Glasgow	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Rothesay	20	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20	4
T. P. Blunt	Merionethshire	4	3	..	..	10	2	5	4	35	23	5	..	1	..	1	..	61	32
,,	Montgomeryshire	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
,,	Shropshire	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Wenlock	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
A. Wynter-Blyth	Bideford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Devon	14	4	..	..	28	..	..	..	3	..	..	..	..	..	1	..	46	4
,,	Marylebone	42	5	16	3	25	..	1	..	17	9	8	2	..	..	..	..	109	19
,,	South Molton	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Totnes	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
J. Brierley	Southampton	16	6	23	8	25	16	..	..	9	8	2	..	..	..	..	..	75	38
J. Campbell Brown	Blackburn	12	1	9	1	..	..	..	..	..	..	..	..	several		1	..	22	2
,,	Lancaster, (Boro')	4	..	1	1	3	..	..	..	2	..	1	..	..	..	..	..	11	1
,,	,, (County)	304	38	45	6	134	17	45	..	268	88	52	..	120	..	14	2	982	151
,,	Liverpool	199	44	26	13	6	..	..	..	26	1	..	..	30	..	10	6	297	64
,,	Preston	6	..	2	..	..	..	..	..	7	..	2	..	several		2	..	19	..
C. A. Cameron	Carlow (County)	..	..	..	..	1	..	..	..	..	..	..	..	14	..	5	..	20	..
,,	Cavan ,,	9	3	..	..	..	..	..	..	2	..	..	..	5	..	..	..	16	3
,,	Clare ,,	3	3	..	..	74	..	..	..	13	2	2	1	15	..	..	..	107	5
,,	Down ,,	18	10	..	..	67	4	4	..	81	15	32	..	25	..	..	..	227	29
,,	Drogheda ,,	36	6	..	..	..	..	..	..	..	..	..	..	2	..	..	..	38	6
,,	Dublin (City and County)	550	106	16	4	92	12	4	..	5	1	2	1	16	..	4	..	697	124
,,	Fermanagh	8	4	..	..	..	..	..	..	..	..	3	..	6	..	..	..	17	4
,,	Galway (Town & County)	4	..	..	..	3	..	1	1	..	..	..	..	12	..	13	..	33	1
,,	Kerry (County)	1	..	..	..	4	..	..	..	..	3	..	..	21	..	..	..	29	..
,,	Kildare ,,	31	8	5	1	..	..	..	..	20	4	..	..	10	..	11	..	77	13
,,	Kilkenny ,,	11	..	..	..	..	..	..	..	5	1	..	..	5	..	..	..	21	1
,,	Leitrim ,,	..	..	..	..	..	..	..	..	..	..	..	..	5	..	2	..	7	..
,,	Limerick (City & County)	22	12	..	..	22	..	..	..	..	..	3	..	23	..	10	..	80	12
,,	Mayo (County)	1	1	..	..	..	..	..	..	..	..	..	..	8	..	10	..	19	1
,,	Meath ,,	1	..	..	..	..	..	..	..	..	..	..	..	10	..	4	..	15	..
,,	Monaghan (County)	..	..	..	..	..	..	3	..	..	..	..	..	10	..	2	..	15	..
,,	Queen's ,,	..	..	..	..	..	..	..	..	2	1	..	..	7	..	12	..	21	1
,,	Roscommon ,,	1	..	..	..	..	..	..	..	..	..	1	..	5	..	5	..	12	..
,,	Sligo ,,	21	1	..	..	10	1	..	..	10	..	1	..	7	..	..	..	49	2
,,	Tipperary ,,	5	3	..	..	..	..	..	..	..	..	..	..	2	..	4	..	11	3
,,	Waterford (City & Cnty.)	3	..	..	..	..	..	..	..	4	2	..	..	22	..	..	..	34	2
,,	Westmeath (County)	10	1	..	..	..	..	..	..	..	..	..	..	12	..	9	..	31	1
,,	Wexford ,,	6	2	..	..	2	..	2	..	..	..	..	..	8	..	4	..	22	2
,,	Wicklow ,,	1	..	..	..	2	..	..	..	..	..	..	..	9	..	..	..	12	..
J. Clark	Dumbarton	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Helensburgh	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Paisley	10	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	4
T. A. Collinge	Rochdale	24	3	..	..	5	2	..	..	8	1	2	1	20	..	..	..	59	7
W. G. Crook	Norwich	27	5	..	..	..	..	..	..	..	..	..	..	44	20	..	..	71	25
A. Dupre	Westminster	30	4	1	1	..	..	..	..	..	..	9	..	..	..	12	..	52	5
W. L. Emmerson	Leicestershire, Northamptonshire, Rutlandshire	37	4	12	..	42	3	..	..	59	10	69	13	..	..	14	1	233	31
C. Estcourt	Manchester	161	40	..	..	43	3	..	..	4	..	23	1	..	..	7	1	238	45
,,	Oldham	67	7	13	..	13	1	..	..	7	2	..	..	..	..	..	..	100	10
T. Fairley	Leeds	31	5	7	5	2	..	..	..	..	..	1	..	..	..	2	..	43	10
,,	Pontefract	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Richmond, Yorks.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Ripon Liberty	2	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	4	..
,,	Ripon City	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
,,	Yorkshire, N. Riding	6	..	1	..	11	1	1	..	3	1	..	..	..	..	..	..	22	2
J. W. Gatehouse	Bath	98	10	14	1	8	..	..	..	21	1	10	..	..	..	3	1	154	13
J. H. Gosnall	Warrington	37	4	..	..	..	..	..	..	..	..	1	..	7	3	..	..	45	7
C. Harrison	Lincoln	15	..	..	..	20	4	..	..	..	..	..	..	..	..	..	..	35	4
S. Harvey	Canterbury	13	4	..	..	..	..	..	..	1	..	..	..	19	19	..	..	33	23
,,	Deal	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Dover	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Faversham	2	..	..	..	..	..	..	..	..	..	..	..	8	5	..	..	10	5
,,	Folkestone	4	3	..	..	..	..	..	..	..	..	..	..	8	6	..	..	12	9
,,	Margate	26	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	26	3
,,	Ramsgate	7	5	..	..	..	..	..	..	..	..	10	2	..	..	..	..	17	7
,,	Sandwich	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
C. W. Heaton	St. Martin's	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
O. Hehner	Derbyshire, S.	4	..	..	..	3	..	..	..	12	4	6	..	..	..	..	..	*25	4
,,	Ryde (I. W.) & I. of Wight	23	3	4	..	7	..	..	..	10	..	2	..	..	..	4	..	50	3
,,	Derby (Borough)	14	3	..	..	3	..	..	..	..	..	3	..	..	..	..	..	20	3
C. Heisch	St. John's, Hampstead	10	..	13	1	33	1	4	..	..	..	10	..	..	..	..	..	70	2
,,	Hertfordshire	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Lewisham	14	1	5	1	..	..	..	..	..	..	..	..	..	..	..	..	19	2
A. Hill	Birmingham	59	32	11	4	94	7	5	..	10	2	12	..	..	..	6	..	197	45
A. Bostock Hill	Leamington	..	..	2	..	..	..	..	..	2	..	..	..	39	..	..	..	43	..
,,	Stratford-on-Avon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Warwick (Borough)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	,, (County)	206	65	7	3	21	4	..	..	3	..	..	..	..	..	..	..	237	72
J. F. Hodges	Antrim	29	12	..	..	108	11	6	..	57	..	11	..	13	..	5	..	229	23
,,	Belfast	178	38	1	..	26	13	1	..	..	..	..	..	..	..	17	2	223	53
J. Horsley	Gloucester (City)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	,, (County)	54	..	2	..	349	..	..	..	39	..	73	..	..	..	..	..	517	11
,,	Hereford (City)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	,, (County)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
G. Jarmain	Huddersfield	103	22	..	..	19	7	..	..	..	..	6	..	..	..	1	..	129	29
W. Johnstone	King's Lynn	21	..	3	..	6	..	..	..	..	..	22	2	..	..	1	..	53	2
E. W. T. Jones	Kidderminster	3	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	5	..
,,	Lichfield	4	..	..	..	9	3	..	..	..	..	..	..	..	..	..	..	13	3
,,	Staffordshire	175	34	83	8	589	58	5	1	9	3	14	..	..	..	..	..	875	104
,,	Walsall	7	1	5	1	..	..	1	..	..	..	5	..	..	..	..	..	18	2
,,	Wolverhampton	29	3	2	..	17	2	..	..	..	..	..	..	..	..	..	..	48	5
J. Falconer King	Edinburgh	27	8	2	..	11	6	1	1	..	..	2	..	5	5	..	..	48	20
,,	Galashiels	2	..	2	..	10	2	..	..	1	..	1	..	1	..	..	..	17	2
,,	Hawick	12	2	..	..	11	3	3	..	..	..	2	..	9	5	..	..	37	10
,,	Jedburgh	..	..	..	..	5	1	1	1	..	..	1	..	..	..	..	..	7	2
,,	Kelso	..	..	..	..	4	1	..	..	..	..	1	..	1	1	..	..	6	2
,,	Leith	2	..	..	..	2	1	..	..	..	..	..	..	2	..	..	..	6	1
,,	Musselburgh	2	..	2	..	..	..	..	..	..	..	2	..	11	9	..	..	17	9
,,	Roxburgh	..	..	2	..	59	16	1	1	..	..	6	..	2	2	2	..	72	19
,,	Selkirk (Town)	..	..	..	..	5	1	..	..	..	..	5	..	..	..	..	..	10	1
,,	,, (County)	..	..	..	..	12	2	3	..	4	..	1	..	3	..	..	..	23	2
J. West-Knights	Cambridge	5	..	3	..	3	..	..	..	..	..	3	1	..	..	..	..	14	1
,,	Cambridgeshire	..	..	2	..	9	..	..	..	..	..	3	..	..	..	..	..	14	..
,,	Ely	..	..	..	..	1	1	3	..	1	..	12	1	..	..	..	..	17	2
,,	Huntingdonshire	5	2	3	..	11	1	..	..	..	..	10	2	..	..	..	..	29	5
,,	Saffron Walden	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Wisbech	3	..	..	..	3	..	1	..	..	..	2	..	..	..	..	..	9	..
J. Comyns Leach	Blandford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Dorset	1	1	..	..	..	..	..	..	2	..	..	..	15	..	..	..	18	1
,,	Poole	1	1	..	..	2	..	..	..	3	2	..	..	..	..	..	..	6	3
,,	Shaftesbury	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Weymouth	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
J. R. Leebody	Londonderry (City)	15	..	2	..	4	..	..	..	3	1	2	..	19	5	7	4	52	10
,,	,, (County)	..	..	..	..	1	..	..	..	2	..	..	..	13	3	7	..	23	3
W. F. Lowe	Carnarvonshire	4	3	2	..	..	..	..	..	..	..	5	..	..	..	5	..	16	3
,,	Chester City	4	..	3	2	..	..	..	..	..	..	..	..	4	2	1	..	12	4
,,	Flintshire	..	..	..	..	3	1	..	..	28	12	1	..	18	17	..	..	50	30
R. McAlley	Falkirk	4	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	2
,,	Stirling	3	3	1	1	..	..	..	..	..	..	..	..	..	..	..	..	4	4
H. Meadows	Leicester (Borough)	53	8	4	..	25	2	..	..	9	2	29	2	76	25	..	..	196	39
J. Milne	Fife	1	1	..	..	..	..	1	..	27	2	..	..	..	..	..	..	29	3
J. W. Montgomery	Cumberland	25	3	1	..	37	2	..	..	35	14	6	..	..	..	..	..	104	19
W. Morgan	Brecon (Boro')	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	,, (County)	..	..	..	..	..	..	..	..	11	5	..	..	..	..	..	..	11	5
,,	Cardigan	9	1	..	..	..	..	..	..	9	6	2	..	..	..	..	..	20	7
,,	Carmarthen (Boro')	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	,, (County)	8	1	..	..	4	..	..	..	1	1	2	..	..	..	..	..	15	2
,,	Glamorgan	2	..	..	..	..	..	..	..	11	9	..	..	..	..	..	..	13	9
,,	Haverfordwest	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Neath	3	..	..	..	3	2	..	..	..	..	..	..	..	..	..	..	6	2
,,	Pembroke	5	3	..	..	..	..	..	..	20	4	..	..	..	..	..	..	25	7
,,	Swansea	209	8	6	1	86	3	..	..	16	5	9	..	..	..	4	..	330	17
,,	Tenby	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
E. H. Moore	Arundel	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..
,,	Brighton	130	23	18	2	42	3	18	..	24	5	28	..	14	..	5	..	279	33
,,	Chichester	4	..	..	..	..	..	..	..	..	..	..	..	7	..	..	..	11	..
,,	Sussex, E. & W.	40	13	25	4	21	..	3	1	18	3	10	..	62	..	3	..	182	21
J. Muter	Bermondsey	30	16	13	7	26	12	..	..	..	..	13	..	..	..	..	5	87	35
,,	Lambeth	152	17	8	6	49	2	1	..	17	2	18	..	10	3	34	2	289	32
,,	Newington	9	2	..	..	..	..	..	..	..	..	1	..	1	..	..	..	11	2
,,	St. George's, Southwark	20	8	11	2	4	2	..	..	7	2	12	1	..	..	3	..	57	15
,,	Tenterden	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Wandsworth	108	11	38	2	105	4	11	..	12	..	54	..	10	10	58	..	396	27
J. Napier	Bury St. Edmunds	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Ipswich	3	1	3	1	..	..	..	..	..	..	..	..	..	..	..	..	6	2
,,	Southwold	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Sudbury	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Suffolk	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..
B. Oxland	Devonport	7	5	6	3	..	..	13	3	9	1	..	..	..	..	..	..	35	12
,,	Plymouth	4	1	5	4	2	1	..	..	..	..	4	..	..	..	..	..	15	6
J. Parry	Penryn	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
J. Pattinson	Berwick-on-Tweed	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	1
,,	Durham	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Gateshead	15	1	4	..	6	3	..	..	8	3	17	..	..	..	14	..	64	7
,,	Newcastle-on-Tyne	45	7	8	..	6	1	1	..	24	9	25	..	..	..	..	..	109	17
,,	Northumberland	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	3	..
,,	Tynemouth	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
,,	South Shields	7	2	..	..	..	..	..	..	..	..	..	..	..	..	2	..	9	2
W. Pearce	Maidenhead	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
F. P. Perkins	Exeter (City and County)	14	6	7	2	4	..	1	1	1	..	8	..	12	8	1	1	48	18
T. A. Pooley	Essex	54	21	31	1	130	13	6	..	51	12	24	2	1	..	2	..	299	49
C. H. Piesse	Strand	28	3	12	1	153	1	4	..	..	..	22	..	..	..	57	..	276	5
F. M. Rimmington	Bradford	27	6	..	..	6	6	..	..	..	..	..	..	..	..	..	..	33	12
,,	Bradford and Dewsbury	86	13	4	..	12	1	..	..	2	..	2	..	..	..	3	..	109	14
W. S. Saunders	City of London	71	30	6	2	25	3	..	..	4	..	..	..	55	2	1	1	162	36
E. Sergeant	Bolton	27	8	4	2	..	..	..	..	..	..	7	..	..	..	5	..	43	10
J. Shea	Newbury	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Reading	9	..	2	..	13	..	..	..	8	2	3	..	..	..	..	..	35	2
J. E. Stead	Middlesborough	8	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	9	1
T. Stevenson	Godalming	2	..	2	..	4	..	..	..	4	1	..	..	..	..	..	..	12	1
,,	Bedfordshire	8	1	29	1	49	5	9	1	51	8	41	2	..	..	60	..	247	18
,,	Reigate	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	St. Pancras, Middlesex	87	35	33	3	17	2	..	..	33	5	17	..	..	..	8	..	195	45
,,	St. Leonard, Shoreditch	7	5	15	4	5	..	..	..	7	1	12	..	..	..	..	..	46	10
,,	Surrey	157	36	36	1	90	10	149	39	3	1	..	..	..	..	5	..	440	87
W. F. K. Stock	Durham, County	195	24	23	2	76	8	44	19	86	33	21	..	55	29	1	..	501	115
F. W. Stoddart	Bristol	195	44	4	..	19	2	3	..	5	1	7	..	..	..	1	..	234	47
,,	Salisbury	9	..	4	..	4	..	..	..	11	4	..	..	..	..	..	..	28	4
A. W. Stokes	Bethnal Green	3	3	..	..	..	..	..	..	18	..	..	..	..	..	..	..	21	3
,,	Paddington	59	15	4	..	34	..	..	..	25	..	8	..	..	..	15	..	145	15
F. Sutton	Norfolk	33	5	..	..	11	..	..	..	..	..	23	5	27	24	..	..	94	34
,,	Thetford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Yarmouth	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. Swete	Bewdley	..	..	..	..	..	..	..	..	..	..	..	..	10	2	..	..	10	2
,,	Coventry	..	..	..	..	..	..	..	..	..	..	..	..	7	3	..	..	7	3
,,	Droitwich	..	..	..	..	..	..	..	..	..	..	..	..	5	5	..	..	5	5
,,	Northampton	..	..	..	..	..	..	..	..	..	..	..	..	10	6	1	..	11	7
,,	Radnor, New	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..
,,	Radnorshire	4	2	..	..	..	..	..	..	6	..	..	..	2	..	..	..	12	2
,,	Worcester (City)	3	..	2	..	3	..	..	..	1	..	..	..	10	3	..	..	19	3
,,	Worcester (County)	87	10	2	..	18	4	1	..	33	3	..	..	57	21	..	..	198	38
W. J. Sykes	Portsmouth	98	19	9	1	22	3	2	1	1	..	3	..	..	..	..	..	135	24
R. R. Tatlock	Govan	7	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	5
J. W. Thomas	Cardiff	59	7	9	..	31	1	..	..	3	3	6	..	..	..	10	..	118	11
,,	Glamorgan	6	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	1
,,	Monmouth	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	2	..
,,	Newport, Mon.	46	2	2	..	5	1	..	..	2	..	1	..	..	..	2	..	58	3
C. R. C. Tichborne	Longford	4	2	2	..	1	..	..	..	9	5	..	..	17	12	..	..	33	19
J. Tripe	Hackney	73	17	5	..	21	3	5	2	8	..	2	..	..	..	6	..	120	22
F. Vacher	Birkenhead	38	10	1	..	2	1	..	..	1	..	..	..	13	5	1	..	56	16
T. H. Walker	Carlisle	4	1	..	..	4	2	4	1	3	..	..	..	8	6	..	..	23	10
W. Wallace	Ayr	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Perth	21	9	3	..	..	..	..	..	..	..	..	..	..	..	..	..	24	9
Wallace, Tatlock, and Clark	Glasgow	18	7	..	..	12	4	8	1	7	1	3	..	..	..	12	1	60	14
,,	Johnstone	4	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	1
,,	Kilmarnock	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Lanark (County)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Renfrew ,,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Rutherglen	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,,	Sutherland (County)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
G. W. Wigner	Greenwich	41	16	14	1	89	6	2	..	24	3	18	2	..	..	4	..	192	28
,,	Plumstead	65	9	34	..	17	..	..	..	3	..	8	..	..	..	..	..	127	9
,,	Woolwich	46	32	6	..	31	1	5	2	10	..	4	..	..	..	1	..	103	35
T. Woods	Parsonstown	..	..	..	..	..	..	..	..	..	..	..	..	5	..	4	..	9	..
	TOTAL	6821	1361	1081	137	4328	420	487	93	1967	471	1134	48	1463	383	580	29	17808	2960

* Second half of year.

THE NEW COFFEE AND CHICORY REGULATIONS.

THE Inland Revenue Commissioners, to whom the act of carrying out the new Budget Bill is entrusted, have just drafted the following important set of regulations dealing with the matter :—

GENERAL ORDER.

Inland Revenue Office, Somerset House, London, W.C., August 14th, 1882.

Ordered.—That notice be taken by the Officers of this Revenue, and by every person who shall sell or prepare chicory or other articles, in imitation of, or for use as, coffee or chicory, of the following changes made in the law by the Customs and Inland Revenue Act, 1882, 45 and 46 Vic., cap. 41. The duties of Customs or Excise hitherto chargeable on vegetable substances, other than coffee or chicory, intended to be used as coffee or chicory, have been repealed. And in lieu thereof, an Excise duty of one halfpenny on every quarter of a pound is now chargeable on every article made in imitation of, or prepared for, the purpose of being used as coffee or chicory, and on all mixtures of coffee or chicory with such articles. This duty is to be paid by means of adhesive Excise labels, and such labels are deemed to be stamps within the provisions of the Stamp Duties Management Act of 1870, which imposes severe penalties upon any person who shall make or use any forged stamp, or shall deal in, hawk, or sell any stamps, without being duly licensed to do so. No article, substance, or mixture, as aforesaid, shall be sold or exposed for sale, or offered or kept ready for sale, or delivered out of the custody of, or possession of, any preparer, manufacturer, or importer thereof, except under the following conditions :— (*a*) The article, substance, or mixture shall be placed in packets, each containing a quarter of a pound, or any number of quarters of pounds. (*b*) Each packet shall have affixed thereto a label or labels, which shall not have been before used, denoting the proper amount of duty payable according to the weight thereof. (*c*) Such label or labels shall be affixed so that the whole shall adhere to the packet, and so that the packet cannot be opened without tearing or destroying the label or labels. (*d*) When more than one label is affixed to any packet, they shall be so affixed that every label shall be wholly or partially visible. (*e*) Every packet containing, or purporting to contain, coffee with any other article or substance mixed therewith, shall have affixed thereto a label denoting in letters of not less size than the largest letters affixed to, or imprinted on, such label, the proper names of the several articles of which such mixture is composed. The label denoting the ingredients of the mixture must be provided by the trader himself. Any person who shall sell, or expose for sale, or offer or keep ready for sale, or deliver out of his custody or possession any such article or mixture as aforesaid, otherwise than in conformity with the above conditions, shall forfeit the same, and incur a fine of £20. If any person who shall prepare, manufacture, sell, keep for sale, or import any article, or substance, or mixture, upon which the above-named Excise duty is imposed, shall buy, receive, or have in his possession any Excise label provided under the Act, which shall have been before used, or any portion of such a label, whether loose or affixed to a Packet, he shall incur a penalty of £100, and such label or portion of a label shall be seized. In any proceedings for the recovery of the fine, proof that any label had not been before used shall lie upon the defendant. The Excise duty labels will be provided by the Commissioners of Inland Revenue, and will be supplied on application and payment of the duty, by the Comptroller of Stamps and Stores, Somerset House, London, and by Collectors of Inland Revenue in the country. The labels will be of two denominations, viz., one halfpenny and one penny each, aud will be issued in sheets containing forty in each sheet. Wholesale coffee or chicory dealers, roasters of chicory or coffee, chicory dryers, and persons making any substitute for coffee or chicory, or mixing therewith, must be furnished with a copy of this Order, and officers must prepare schemes in the Store and General Register, in which they must enter the names of such traders, and the date of furnishing them with a copy of this Order. It will be observed that the Customs and Excise duties on chicory, as imported or as grown in the United Kingdom, remain as at present. Chicory dryers will, therefore, be liable to duty as hitherto, but such traders must understand that if any admixture of other articles occurs in the process of drying or roasting, they will not be entitled to sell such mixture without the required Excise duty label being affixed upon the package. Pure coffee or pure chicory may be sold without labels as hitherto; a mixture of coffee and chicory must, however, be labelled as required by the Adulteration of Food Acts, but no Excise label will be necessary. By the Board. CHARLES B. FORSEY.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in August, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Aug. 15	c. blue	none	1·43	none	·16	·0012	·0023	·002	·016	20 2°	5·3°	33·2	satisfactory	Wigner & Harland.
New River	,, 15	clear	none	1·12	trace	·12	·0015	·0027	·010	·020	13·5°	3·0°	18·0	satisfactory	B. Dyer.
East London	,, 15	c. yell. green	none	1·20	none	·08	·0031	·0047	·012	·040	13·6°	3·3°	20·4	veg. deb. mycel. fib. anim.	Wigner & Harland.
Southwark & Vauxhall	,, 15	c. pale yell.	none	1·24	trace	·14	none	·0056	·039	·062	14·0°	3·0°	19·6	satisfactory	John Muter.
West Middlesex	,, 24	yellow	none	1·12	trace	·10	·0027	·0058	·025	·045	12·0°	3·0°	17·7	none	O. Hehner.
Grand Junction	,,	p. straw		1·14	trace	·18	·0004	·0071	·008	·089	13·7°	3·6°	20·2		A. Wynter-Blyth.
Lambeth	,, 15	c. pale yell.	none	·96	trace	·13	none	·0056	·038	·060	15·0°	3·0°	19·6	satisfactory	John Muter.
Chelsea*	,,														A. Dupré.
Birmingham	Aug. 3	s. turb. grnsh.	none	1·33	traces	·21	·1014		·020	·061	8·8°	7·7°	16·8		A. Hill.
Brighton	,, 9	yel. green clear	none	1·91	none	·20	·0014	·0011	none	·008	12·4°	5·6°	24·8	veg. deb. mycel. anim.	Wigner & Harland.
Bristol	,, 13	grnsh. yell.	none	·79	none	·18	·0003	·0090	·063	·117	6·5°	2·2°	10·6	sand, algæ, &c.	F. W. Stoddart.
Broadstairs	,, 15	p. blue clear	veg. mtr.	7·59	trace	·37	trace	·0040	·008	·012	17·2°	5·0°	39·0	veg. deb. mycel. fib. anim.	R. H. Harland.
Cambridge	,, 24	c. p. blue	none	1·40	traces	·41	none	·0028	none	·018	17·0°	5·0°	24·7	satisfactory	J. West Knights.
Croydon	,, 19	f. green	none	1·19	traces	·38	none	·0050	none	·007	15·5°	6·0°	23·0	none	C. Heisch.
Edinburgh	,, 17	s. brown	none	·80	none	trace	trace	·0040	·012	·075	4·4°	4·2°	5·5	none	J. Falconer King.
Exeter	,, 15	f. green yell.	none	·84	trace	·28	none	·0056	·025	·040	2·8°	2·8°	6·3	satisfactory	F. P. Perkins.
Hastings	,, 15	greenish	none	4·80	trace	·12	·0021	·0042	·004	·010	7·0°	4·0°	21·6°	satisfactory	H. F. Cheshire.
Dublin	July 31	clear	none	·89	trace	traces	·0016	·0050	·0600	·2300	1·3°	·6°	4·5	satisfactory	C. A. Cameron.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in August, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Liverpool	Aug. 23	yell. green	v. slight	1·15	traces	·04	·0014	·0011	.014	·050	4·5°	4·0°	8·5		A. Smetham.
Maidstone—															
Wtr. Company	,, 15	p. grnsh. blue	none	2·60	trace	·51		·0014	·023	·032	18·8°	7·1°	32·3	none	M. A. Adams.
Public Conduit	,, 15	p. blue	none	2·80	trace	·54		·0010	·014	·023	18·4°	6·9°	32·8	none	M. A. Adams.
Manchester ..	,, 21	s. turb. f. yell.	none	·73	none	none	·002	·0065	·059	·109	2·0°	1·9°	5·0	satisfactory	W. Thomson.
Margate	,, 18	yell. green	none	26·41	none	·43	·0066	·0094	·020	·036	20·8°	7·4°	80·1	veg. deb.	G. W. Wigner.
Northwich	,, 8	grn. yell. s. turb.	none	2·70	h. traces	·10	·0007	·0016	·019	·031	14·0°	11·0°	21·0	veg. deb., diat., movg. org.	C. M. Blades.
Norwich	,, 10	p. grnsh. yell.	none	2·00	traces	·07	traces	·0054	·053	·070	11·2°	3·9°	16·5		W. G. Crook.
Nottingham ..	,, 15	green blue clear	none	1·26	none	·46	·0014	·0029	·010	·020	10·0°	7·4°	17·2	veg. deb., mycel. fib. anim.	Wigner & Harland.
Portsmouth ..	,, 12	clear	none	1·25	traces	·23	traces	·0032			11·3°	2·1°	18·5	veg. deb., diatoms	W. J. Sykes.
Rugby	,, 19	c. p. yellow	none	1·24	h. trace	·02	·0070	·0210	·028	·100	17·5°	7·5°	28·1	veg. deb., diatoms infus.	A. P. Smith.
Salford	,, 15	c. s. yellow	none	·60	none	trace	·0009	·0010	·001	·015	3·0°	2·5°	4·0	none	J. Carter Bell.
Swansea	,, 22	v. s. turb.	none	·80	s. trace	none	·0003	·0042	·003	·004	1·0°	1·0°	3·3	none	W. Morgan.
Whitehaven ..	,, 4	c. f. green	none	·42	none	·01	none	·0007	·007	·021	·4°	·4°	2·1	veg. deb., diatoms	A. Kitchin.
Worcester	,, 9	p. yellow	slight	3·75	trace	·17	·0010	·0072	·105	·145	13·9°	6·6°	20·3	veg. deb.	W. E. Porter.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

ERRATA.—In the August Table, Exeter Water unfiltered, the figures for Oxygen absorbed in 4 hours should be ·114 instead of ·011.

* As the Chelsea Analysis has not reached us up to the time of going to press, it will be inserted in the October number.

REPORTS ON ADULTERATION IN THE STATE OF NEW YORK,

From the *Sanitary Engineer*, New York.

(Continued from page 145.)

CHOCOLATE AND CHICORY.

Five samples of chocolate were examined, but none of them were considered as adulterated, because the commercial article is sold as a mixed preparation containing chocolate. Of three samples of chicory, one was found to contain caramel.

METHODS OF EXAMINATION.

No detailed description of the methods employed was considered necessary, inasmuch as they were those well known to chemists and microscopists. "The search for foreign vegetable substances in the spices, coffee and tea can depend only in a limited degree on chemical analysis, since many of these substances, however widely different in general appearance, and even in origin, are but slightly differentiated in their chemical properties." There is great variety, however, in the structure of the tissues, and practice in the recognition of structural characters of the genuine article enables a ready detection of foreign substances. In detecting the adulterations of coffee, the presence of leguminous and farinaceous substances may often be recognised by their softening more readily in water.

SPICE MIXTURES.

In addition to the samples of food articles already mentioned, a considerable number of the so-called spice mixtures were examined. "It is probably not so widely known as it should be that the demand for the materials for adulteration has called into existence a branch of manufacturing industry of no insignificant magnitude, having for its sole object the production of articles known as 'spice mixtures,' or 'pepper dust.' The use of 'pepper dust,' or as the article is commonly designated in the technical language of the trade by its abbreviation, 'P.D.,' is a venerable fraud."

"The manufacture of 'P.D.' is now a regular branch of business, and the original and specific term 'pepper dust' has expanded with the progress of inventive art to generic proportions, until now we have as well-known articles sold by the barrel 'P. D. pepper,' 'P. D. ginger,' 'P. D. cloves,' and so on through the whole aromatic list. When it is considered that these imitations, lacking only such flavouring with the genuine article as the dealer thinks necessary to make his goods sell, are sold at from three to four cents a pound, and the retail price paid by the consumer is compared with it, the strength of the temptation to engage in such practices is clearly seen. When manufacturers openly advertise themselves as assorters and renovators of merchandise, and openly propose to cleanse musty and damaged beans by a new and patented process, it is full time that its significance should be considered by the public."

MANUFACTURED FOOD ARTICLES.

In the progress of this investigation, the subject of permitting the manufacture and sale of certain articles deprived of some of their natural constituents, or with the addition of certain substances, has frequently occurred. For example, mustard is deprived of its fixed oil in the process of manufacture, and is improved for all ordinary uses thereby. A similar practice is now extensively applied to cloves, which are not likewise improved, but robbed of the very constituent on which their value depends. It is proposed to sell mixtures of chicory and coffee as such, stating the proportions of each on the package, so that no one shall be deceived.* To this, and in fact to all similar propositions, it is to be objected that advantage would immediately be taken of the fact that it would generally be difficult in the extreme, and in some cases absolutely impossible, to establish the fact in a court of justice whether a fixed proportion had been exceeded or not. Bearing in mind the wide difference between the ease of demonstrating, often by diverse methods, the fact of the presence of a foreign body, and the difficulty of

[*As to this we may refer our readers to the new Regulations on p. 159.—Ed. ANALYST.]

demonstrating its percentage by weight, it will be plain how greatly the administration of the law would be simplified which should prohibit the manufacture and sale of all mixtures, leaving to the individual the task and pleasure of suiting his own tastes. Protection and even endorsement is claimed for some of these most worthless mixtures on the ground that they are not poisonous, that they are harmless, while the fact that they are counterfeits, as really as is a fictitious bank-bill, is studiously concealed. The simple way and the best way is to require things to be called by their right names.

Group VI.

Sugars; Syrups; Molasses; Glucose; Confectionery; Honey, and Soda Water Syrups.

Report by W. H. Pitt, M.D., of Buffalo, N.Y.

GLUCOSE.

The larger part of this report is devoted to the subject of glucose, or starch sugar. Although this substance has been manufactured in the countries of Europe for the past thirty or forty years, it is only within a comparatively short time that it has found a market in the United States. "Physiologically considered, glucose, pure and uncontaminated with other compounds, is certainly a good and wholesome food." In 1811 a Russian chemist discovered that if starch is boiled with dilute sulphuric acid a part of it is converted into sugar; "and from that time to the present, notably in Austria and Germany, the manufacture of glucose has been carried on with varied success." An idea of the extent of this industry is gained when we learn that two factories in the city of Buffalo consume 14,500 bushels of coal daily, and give employment to 1,200 men. There are also large factories in Chicago, St. Louis, and Peoria.

In the manufacture of glucose, only a part of the starch is converted into sugar, the remainder becoming dextrine, or starch gum. It is therefore hardly possible to make two samples of glucose containing a like amount of saccharine matter. After the removal of the glucose from the solution, the dextrine can be converted into sugar; but the expense of separating the two substances makes the operation very unprofitable.

The process of manufacturing glucose consists in steeping the corn for 50 or 60 hours in water until it is soft, after which it is ground and passed through sieves to separate the coarser material. It is then treated with caustic soda to remove nitrogenous substances, and washed to remove the alkali. The conversion of the starch into glucose is effected by heating the material to about 212° F. and adding from 1½ to 2 per cent. of sulphuric acid; after three hours of boiling the operation is finished. Chalk is then added to neutralize the acid, and after the sulphate of lime has settled, the sweet liquor is drawn off, filtered, and evaporated to 40° B. This is mixed with 5 to 25 per cent. of cane syrup and sold by grocers. By analysis, it was found to contain 18·8 per cent. of water, 34·6 per cent. of dextrine, 7·8 of cane sugar, and 37·8 of glucose. The confectioners' glucose is made in the same way, but with additional purification. The solid glucose is made in copper converters under pressure. One sample contained 68 per cent. of glucose and 14 per cent. of dextrine.

SUGAR.

Fifteen samples of sugar purchased in New York city, were submitted for examination. Water, ash, glucose, and cane sugar were determined, but no attempt was made to ascertain whether artificial glucose had been added. The result of these analyses are given in tabular form. The percentage of water varied from ·8 to 5·1; that of the ash from ·036 to 1·1; and that of the glucose from ·89 to 7·7. The cane sugar was calculated by difference. One sample of sugar contained no glucose whatever; and from the low percentage of this substance in the other samples, it is inferred that none of them had been adulterated.

MAPLE SYRUP.

Three samples were examined, two of them were found to be pure, while the third, which is manufactured in Chicago and largely sold in this state in cans, marked "Pure Vermont Maple Syrup," contained 35 per cent. of artificial glucose.

HONEY.

Three samples of honey were examined. Two were found to be pure, while the third, labelled "White Clover Honey," contained 50 per cent. of artificial glucose.

CONFECTIONERY.

Attention is called to the fact that some of the candy now made is composed almost entirely of glucose, while the common stick candy is often adulterated with 7 or 8 per cent. of artificial glucose. With regard to poisonous colouring matter, it is stated that, of ten samples of yellow candies examined, seven contained chromate of lead. In one instance terra alba was found to the extent of from 10 to 15 per cent. Some black cough-drops contained a large amount of powdered charcoal.

(To be continued).

ANALYST'S REPORT.

At last week's meeting of the Dudley Guardians, Dr. Hill, of Birmingham, sent a letter to the board as to the result of his analysis of what was supplied to the house under the name of butter. No. 1 was butterine, and contained but 10 per cent. of butter fat; No. 2, about 20 per cent. butter fat; and No. 3 was butter, with 19·1 per cent. of water, or 7 per cent. more than was allowed in good butter. The foreign fats in Nos. 1 and 2 appeared to be cotton seed stearine. The master was appealed to as to his statement that he knew it was butterine all the quarter, and he now said that he based his opinion as to its being butter or butterine by the tubs and the brands on them. A letter from the contractor, Mr. Brown (Dudley), was read, and in this he said that only on one occasion had butterine been sent, and that was by a mistake of the assistants. He regretted that the board had jumped to the conclusion that butterine had been supplied all the quarter. There was a long discussion on the subject, and the Guardians generally believed that Mr. Brown should pay the analyst's fee, and the difference between the price of butter and butterine. Ultimately the matter was referred to the visiting committee.

AMERICAN MUSTARD.

Attention has recently been called to the very general practice of the adulteration of mustard. It has long been known in the trade that it is almost impossible to obtain ground mustard entirely free from adulteration, and now that the attention of the public has been called to the matter, it is hoped the State Board of Health will decide whether any admixture of any other substance as an adulterant is admissible and to what extent. There is no better excuse for adulterating this article to be used as a condiment, than to cheapen its price; and for medicinal purposes any addition, such as is ordinarily found, is deleterious and without a redeeming feature. The foreign brands, so extensively sold in our drug and grocery stores, are nearly all adulterated, and should never be used for medicinal purposes. It is this fact of universal adulteration of this article that has made the plasters of one or two prominent manufacturers so popular, as they have been careful to make them of pure materials, and are for that reason far superior to those made by the most careful of nurses.—*Oil and Drug News.*

ERRATA.

American Cheese.—In Dr. Vieth's paper in our last issue the decimal point is wrongly inserted before the proportions of butter fat and foreign fat in the fat analyses, which should be—

FAT OF CHEESE CONTAINING LARD.

Butter Fat	63·0 per cent.
Foreign Fat	37·0 ,,

FAT OF CHEESE CONTAINING OLEOMARGARINE.

Butter Fat	46·0 per cent.
Foreign Fat	54·0 ,,

Mr. Hehner's Milk Analysis Table.—On page 131, in the fourteenth analysis from the top, the amounts of fat and solids not fat are given as 2·72 and 8·31. They should be 3·72 and 7·31.

LAW REPORTS.

Gin Adulteration.—Important Judgment:—

Recently John Selby Nesbitt James, landlord of the "Camel" public house, Philip Street, Kingsland Road, appeared to an adjourned summons, at Worship Street Police Court, for selling gin adulterated 43½ per cent. below proof, being 8½ below the minimum standard. The case had been adjourned for evidence on the question as to whether two notices said to be in the bar that all spirits sold were adulterated were really conspicuously placed, the parish inspector saying that he did not see any such notice. After some evidence, Mr. Hannay said that on the facts and the evidence of the inspector he thought a conviction could proceed. The mere fact of such notices being in the bar was not enough to take the offence out of the Act. The defendant, however, appeared to have bonâ fide believed that he was protected, and therefore there would be no conviction. The defendant asked the magistrate how he could protect himself. Mr. Hannay said the Act required the article to be labelled, but if that were not possible the customers should be told that it was below standard strength.

A Somerset House Cow:—

At the Sevenoaks Petty Sessions, recently, Bailey Brown, a farmer, of Westerham, Kent, was charged with cruelly illtreating a cow on the 4th ult. Superintendent Okill stated that on the day in question he inspected a cow-shed belonging to the defendant, situate at Mapleton Farm, Westerham. In a barn he saw a cow slung by means of the shafts of a wagon. The animal was in a very emaciated condition, and suffering from a compound fracture of one leg. An attempt had been made to reduce the fracture by placing a bandage round it. He called Brown's attention to the state of the cow, whereupon he replied that its leg had been broken for six weeks, and that he had had cows in a similar way, and was under the impression that the bone would join. He succeeded in persuading the defendant to have the cow shot. When the carcase was lowered from the sling witness noticed that there was a wound in the breast about ten inches each way and six inches deep. The iron bound portion of the shafts had been completely embedded in the wound. This was caused from exhaustion and the animal resting on the iron. Mr. Ashton, a veterinary surgeon, stated that the animal must have suffered intensely for some time. Another witness said the cow gave seven or eight quarts of milk up to the last. After some consideration the magistrate convicted the defendant, and imposed a fine of £5 and costs—altogether amounting to £8 4s.

Mustard Adulteration:—

At the County Petty Sessions, Gloucester, last month, the case against Mr. William Short, grocer, for selling adulterated mustard, was after two adjournments brought to a termination before a full bench of magistrates, Sir William Guise in the chair. Mr. Chipp, the Deputy Chief Constable, said when the matter was first brought forward he produced the County Analyst's certificate that the mustard was adulterated to the extent of 40 per cent. Mrs. Short, who then appeared for her husband, pleaded that she had purchased the mustard as pure. In accordance with instructions from the Bench he (Mr. Chipp) had visited the wholesale house in Gloucester which had supplied her, and had inspected the invoice, and the house had sold the mustard as pure. The firm who supplied the wholesale house had been written to, and a sample of Mrs. Short's, under seal, had been sent by him to the firm, and they admitted that the County Analyst's certificate was correct, but stated that the sample was not of their mustard. The firm also threatened to bring an action against anyone who mentioned their name in court. Mr. C. Morris, of the firm of Messrs. Sterry and Morris, of Southgate Street, Gloucester, admitted that the mustard was sold to Mrs. Short as pure, but the firm with whom they dealt warranted it to them also as pure. The chairman (Sir William Guise) said that the tradesman had written to him with regard to the remarks he made a short time ago on the difficulty in getting pure mustard in Gloucester. He now repeated that from his own knowledge it was an absolute difficulty to obtain pure mustard. The proper colour for mustard was a brownish yellow, and if it was yellow it was a sign that something had been mixed with it. The difference between the mustard which he had at his club in London and that which he had in Gloucester was palpable to anyone who tasted it. With regard to the case before the Bench against Mr. Short there was not sufficient evidence to convict, and it would consequently fall to the ground.

Coffee and Chicory:—

At Ramsgate Police Court, lately, Mr. John Louth, grocer, 40, Harbour Street, Ramsgate, was charged under the Food and Drugs Act with selling coffee of quality other than that demanded, on

June 22nd last. Mr. Burrows appeared for defendant, who pleaded not guilty. H. Herd, a gardener, said he was employed by Mr. May, Inspector of Nuisances, on June 22nd last, and remembered going into defendant's shop in Harbour Street. He asked for a quarter of a pound of 1s. coffee, for which he paid 3d., and handed it to Mr. May, who came into the shop. Nothing was said to witness about it being a mixture of coffee and chicory, and his attention was not called to a label. He saw Mr. May divide the sample in three parts in defendant's presence, and heard him say he should send it to the Public Analyst. Edward Stephen May, Inspector of Nuisances to the Ramsgate Improvement Commissioners, said he sent the previous witness into defendant's shop in Harbour Street on June 22nd last to ask for a quarter of a pound of coffee. He left the price entirely to the witness, with the exception that he was not to pay a very high price. Herd handed it to him at the shop-door, and pointed out a young man named Henry Austen as the person who had served him, and said he had paid 3d. for it. He (Mr. May) told the young man he should have it analysed by the Public Analyst, defendant being present at the time. Witness then divided it into three parts, one of which he left with defendant and one he delivered to Mr. S. Harvey, the Public Analyst, at Canterbury. He produced the portion retained. Witness afterwards received the certificate from Mr. Harvey, dated July 19th, stating that the sample No. 56 was adulterated with 67 per cent. of chicory. Mr. Burrows said that Mr. May's agent went into the shop and asked for a quarter of a pound of 1s. coffee, and he obtained what he asked for. Everybody must know that coffee at 1s. per lb. would not be pure. He admitted that 1s. coffee was two-thirds chicory and one third coffee, and as the paper in which it was wrapped had the words "This is sold as a mixture of coffee and chicory," as required by the Food and Drugs Act, on it, he (Mr. Burrows) contended that the law had been complied with, and that the defendant had not sold the coffee fraudulently for the sake of gain. The magistrates retired to consider the case, and on their return the chairman said it had failed and would be dismissed. A similar case against Messrs. Vye and Son was withdrawn.

Hislop and Mackwood v. Coston.—Action to recover value of Adulterated Flour:—

In the City of London Court, before Mr. Commissioner Kerr, plaintiffs, who are corn merchants in Seething Lane, sued the defendant, a baker in Harrow Road, for the sum of £9 2s. 6d., being the value of five sacks of flour bought by him at 36s. 6d. per sack. The defence was that the flour was not according to sample, and besides was not of a quality fit for making into bread. The case was adjourned on the first hearing in order that the flour might be analysed, and Mr. A. W. Stokes, Public Analyst, Harrow Road, now reported as follows: "I have examined a sample of the flour and also of the bread. The flour was of a dark colour and musty smell, with bitter taste. Microscopically it was found to consist very largely of the husk or outer part of the wheat grain, such as is not present in flour of a good quality. The bread was almost as dark as that made from whole meal, and was of a very disagreeable taste and smell. In my opinion the flour is of exceedingly inferior quality, utterly unfit for making white and wholesome bread. No care on the part of the baker could produce a sweet and white loaf from such a sample of flour." For the plaintiffs it was urged that they were not millers, that the price was 10s. per sack below the ordinary market rate, and that they did not know for what purpose it was to be used. His Honour: But they knew the defendant was a baker. Mr. Hislop: Yes; but bakers very frequently buy that low-class flour in order to make it into ginger-bread. His Honour: If that is the case I should like to have all persons guilty of such a practice tried for adulteration. I find for the defendant, with £2 1s. costs, inclusive of one guinea for the analyst.

Cocoa and Chocolate Mixtures:—

At the Ramsgate Police Court before H. Curling, Esq. (in the chair), H. B. Hammond, Esq., K. W. Wilkie, Esq., H. Weigall, Esq., H. J. Johnstone, Esq., and General Sir W. M. Coghlan, K.C.B., Pilcher Page (Messrs. Crux and Page, grocers, 13, King Street) was summoned for selling to the prejudice of Edward Stephen May a certain article of food, to wit cocoa, which was not of the nature, substance, and quality demanded, on the 22nd June. Mr. Ambrose Haynes, solicitor of Wandsworth, instructed by Messrs. Fry, the chocolate manufacturers, appeared for the defendant who pleaded not guilty. H. Herd, a gardener, said he was employed by Mr. May on the 22nd of June last, and went to the defendant's and asked for a quarter of a pound of cocoa. The assistant enquired what price? mentioning the different prices. He said he had some at a 1s. and witness said that would do. The cocoa was weighed and put into paper and witness paid the assistant 3d. for it. He then called Mr. May into the shop and informed him what he had purchased, upon which Mr. May told the person who served him that he intended to have it analysed by the Public Analyst. S. May, inspector of nuisances for Ramsgate, said

that on the 22nd June he instructed the last witness to go into defendant's shop, and ask for a quarter of a pound of cocoa. After the purchase, he went in and the previous witness handed him the cocoa with which he had been supplied by the assistant. He (witness) told the assistant that he intended to have the cocoa analysed by the Public Analyst, and divided it into three parts, one of which he left with the seller, one he took to the Public Analyst the following day, and the other he now produced. They were all respectively numbered 54, and were fastened up and sealed in the presence of the seller. Witness now produced a certificate, signed by the Public Analyst, Mr. S. Harvey, of Canterbury, which stated that the sample marked 54 was adulterated with at least 43 per cent. of starch and sugar. Witness said he would like to add that after he left the shop, defendant followed him and informed him that what he had been served with was chocolate powder. He replied that that was not the article demanded. Cross-examined: He had not seen Mr. Page until then. He knew Fry's were large manufacturers and highly respectable people. He was aware that chocolate powder was sold for cocoa but it was quite against the meaning of the Act. Mr. Haynes reminded witness that it was for the Bench to expound the meaning of the Act and not him. This concluded the evidence for the prosecution, and Mr. Haynes, in defence, submitted that the case which had been put before them wholly failed to bring his client within the section of the Act of Parliament for contravening which a very high penalty might be imposed. He appeared there for Messrs. Fry who, upon hearing that their customers had been summoned for selling their chocolate as cocoa, instructed him, and he was there to submit to their Worships that there was no evidence brought forward to show that Mr. Page was guilty of the charge imputed to him, namely that he did unlawfully sell to the prejudice of Edward Stephen May a certain article of food, to wit cocoa, which was not of the nature, substance, or quality demanded. The evidence on the contrary showed that Mr. May was not the purchaser, and that the witness Herd was, for he had sworn that he purchased and paid for the cocoa. Mr. May certainly came in and divided the chocolate powder into three parts, but he (Mr. Haynes) submitted that he was not the purchaser within the meaning of the Act of Parliament. They would find in the Act that in any sale of food or drug no offence should be deemed to have been committed 'in any of the following cases,' and it was one of them which would, he contended, exempt his client from a penalty. The sub-section he alluded to was, "Where any matter or ingredient, not injurious to health, has been added to the food or drug, because the same is required for the production or preparation thereof as an article of commerce in a state fit for carriage or consumption, and not fraudulently to increase the bulk, weight, or measure of the food or drug, or to conceal the inferior quality thereof." There was no evidence to show any fraudulent intention on the part of Mr. Page; and there was also no evidence to show that starch or sugar were injurious to health, or that they were put in to increase the bulk or weight, or to conceal any inferiority. Having referred their Worships to a case in Stone's work, Mr. Haynes proceeded to comment upon the fact that only cocoa was asked for. This chocolate powder, he said, was as much known as cocoa; and he submitted that the case came clearly within the sub-section to section 6 of the Act which he had quoted. The Bench retired to consider the points submitted, and upon their return the Chairman said the Bench thought Mr. Haynes had better go on with his case. Defendant was then called. He stated that he dealt with Messrs. Fry, and that their powder was as much known as cocoa or chocolate. The retail price of cocoa nibs, unprepared and unground, was 1s. 8d. per lb. The chocolate powder was soluble, and was prepared so that it could be mixed at once. People could not do this with pure cocoa, which required stewing. It was customary to stew it one day and drink it the next. "Fry's soluble chocolate powder" was an article of commerce, made to suit the public purse and the public taste. There was nothing injurious in starch or sugar. By the Chairman: He (witness) had never seen pure cocoa sold in powder. Cross-examined: He received the cocoa from Messrs. Fry and Son exactly as it was sold. He was not told by them the percentage of starch and sugar. They sold quite as much as cocoa as they did chocolate powder. Frederick Maxted, of 19 and 21, Harbour Street, said he dealt with Messrs. Fry and Son. Their soluble chocolate powder was an article of commerce, and sold in large quantities. The article was as well known as loose cocoa as chocolate powder. By the Chairman: Had never heard of pure cocoa sold in powder. Cross-examined: Did not think 43 per cent. of starch and sugar would increase the bulk or weight of the cocoa. People did not calculate upon getting pure cocoa at 1s. per lb. Their Worships retired, and upon their return into Court, the Chairman in dismissing the case, said the Bench did not think there was any fraudulent intention upon the part of the defendant.

Similar summonses against Mr. Frederick Maxted, of Harbour Street, and Mr. Edward Lord, of Addington Street, were then withdrawn by Mr. May.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No 1881	Name of Patentee.	Title of Patent.	Price
5286	A. R. Sennett	Production of the Electric Light	6d.
5310	E. Cary, H. Gaskell. and F. Hurter	Purification of Alkaline Solutions	6d.
5536	J. H. Gordon	Dynamo Electric Machines	6d.
5566	A. Miller	Producing Electric Currents	2d.
5593	L. S. Powell	Dynamo Electric Machines	6d.
5660	L. S. Powell	Electric Lamps	6d.
5604	E. B. Burr, and W. T. Scott	Galvanic Batteries for Electric Lighting	6d.
5617	J. H. Johnson	Production of Cyanides of the Metals, of the Alkalies, and Alkaline Earths	4d.
5623	C. A. Carus Wilson	Measuring Electric Currents	4d.
5631	J. S. Sellon	Secondary Batteries	2d.
5650	P. and F. M. Spence	Manufacture of Alum	4d.
5651	St. G. L. Fox	Electric Current Meters	6d.
5667	S. A. Varley	Collection and Distribution of Electric Currents	6d.
5668	Sir W. Thomson	Dynamo Electric Machines	1/10
5697	P. T. J. Voltmer	Production of Artificial Human Milk	4d.
5702	J. W. Swan	Sockets or Holders for Electric Lamps	6d.
5738	J. G. Lorrain	Electric Lamps	4d.
1882			
14	A. Mackie	Apparatus for Electric Lighting	6d.
29	D. G. Fitzgerald, C. H. Biggs, and W. Beaumont	Secondary Batteries	2d.
40	W. R. Lake	Manufacture of Grape Sugar	4d.
72	R. Kennedy	Secondary or Reversible Electric Batteries	2d.
94	J. W. Culmer	Manufacture of Sugar	2d.
95	W. J. Mackenzie	Electric Lamps	6d.
109	W. Weldon	Manufacture of Soda	4d.
120	J. E. Liardet, and T. Donnithorne	Storing Electrical Energy	8d.
132	E. Edwards	Manufacture of Manure from Waste from Distilleries	2d.
134	J. H. Johnson	Treatment of Animal Refuse for Manufacture of Animal Fat	4d.
144	H. J. Haddan	Secondary Galvanic Batteries	2d.
185	H. J. Haddan	Electric Accumulators	2d.
196	E. G. Brewer	Manufacture of Wine from Beetroot	4d.
202	A. McDougall	Treating Solutions Containing Compounds of Ammonia	4d.
224	W. R. Lake	Electric Lighting Apparatus	6d.
319	J. S. Sellon	Construction of Secondary Batteries	2d.
1063	H. H. Lake	Process of Extracting Metals from their Ores	6d.
1437	S. Cohné	Electric Accumulator	4d.
1591	H. H. Lake	Manufacture of Starch and other useful Products from Maize	1/2
1848	W. R. Lake	Manufacturing Crystalline Anhydrous Grape Sugar	4d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Weekly Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine; London Water Supply, by Crookes, Odling and Tidy; Chemical Review; Report on Operations of Glasgow Sanitary Department; Analysis of Accounts of Metropolitan Water Companies, by A. Lass.

THE ANALYST.

OCTOBER, 1882.

NOTES ON THE ACTION OF WATER ON LEAD.

By Alfred H. Allen.

An action was recently brought by Mr. J. J. Milnes, a solicitor in practice in Huddersfield, against the Corporation of that town, for damages resulting from the injury to his health which had resulted from his drinking water supplied by the defendants, and which was alleged had a powerful action on lead.

For the plaintiff there were called Mr. Fairley of Leeds, Mr. Jarmain of Huddersfield, and myself, while the defence were represented by Dr. Tidy, Dr. Odling and Mr. Wm. Crookes. It was proved by Mr. Fairley and myself that the water took up lead in one night in the proportion of ·5 to ·8 grains per gallon, and these amounts were actually found in the water which had stood over-night in the leaden pipes supplying water to the house of the plaintiff. A report of Mr. Jarmain, made to the Huddersfield Corporation several years since, showed that he had pointed out the corrosive action of a certain part of the Huddersfield water supply on lead, had traced the corrosive tendency to the presence of ochreous springs containing free sulphuric acid, and pointed out a remedy in the neutralization of the free acid by means of lime. A distinct trace of mineral acid having been detected in the water by Mr. Fairley and myself, it is not surprising that the jury found a verdict for the plaintiff, subject to appeal on certain points of law.

At the trial, there arose the question of the influence the presence of sulphuric acid had upon the tendency of water to act on lead, and in the words of an article in the "Chemical News," "the water in question was admitted to have an acid reaction. This was due to sulphuric acid, as was shown by Dr. Tidy." I was not present in Court while Dr. Tidy's evidence was being taken and have seen no published account of his examination, but, seeing that the proportion of free acid was very small, it would be interesting to learn how it was proved to be *sulphuric* acid. That a free acid was present was proved by the fact that the water distinctly reddened a solution of Poirier's orange, and, after concentration, had a distinctly acid reaction to litmus, but it seems very improbable that the trace of acid present was recognisable by its charring action, and if not how was it proved to be sulphuric acid? That the free acid originated in the influx of ochreous water containing free sulphuric acid seems to be admitted, but what becomes of free sulphuric acid when added to a water containing several times its equivalent of metallic chlorides? It may reasonably be argued that sulphates are formed, together with free hydrochloric acid, and, until this view is experimentally disproved, most chemists will regard it as probably correct. On evaporation we all know that hydrochloric acid would volatilize and a sulphate remain.

Now the presence of a small quantity of free hydrochloric acid admittedly increases the tendency of waters to act on lead, and is probably the cause of the influence observed

in the case of the Huddersfield water. But on the other hand, Dr. Tidy, Professor Odling, and Mr. Crookes were of opinion that sulphuric acid if present in small quantities, must tend to protect the pipes from the action of the water, a thin layer of the insoluble, or at least very sparingly soluble, lead sulphate being formed. How far it is reasonable to expect that such protection would be exerted by very small proportions of sulphuric acid may be gathered from a consideration of the relative solubilities of the oxide, carbonate, and sulphate of lead in distilled water; thus:—

1 part of	PbO	dissolves in	7,000	parts of water	= 9·8 grs. Pb	per gallon.
1 ,,	$PbCO_3$	,,	50,500	,,	= 1·07	,,
1 ,,	$PbSO_4$	,,	22,800	,,	= 2·09	,,

I am unable to find the solubility of basic lead carbonate, but it is probably less than that of the neutral salt.

It appears then from these figures that distilled water in contact with lead and oxygen might take up 9·8 grs. of lead per gallon, but in presence of carbonic acid as in most natural waters, this would be reduced to 1·09 grains. In the presence of free sulphuric acid, however, shewn by Dr. Tidy to be present, the carbonate would be changed to sulphate, and the possible amount of lead in solution, would be *nearly doubled*. It is true that in presence of a very large excess of sulphuric acid (sufficient to convert the water into "dilute sulphuric acid") this solubility of lead sulphate is somewhat diminished, but that is a state of affairs which does not apply to the Huddersfield water, respecting which the three high scientific authorities quoted expressed an opinion leading the jury to infer that the presence of a trace of free sulphuric acid was rather beneficial than otherwise, as it would "tend to protect the pipes from the action of the water."

But experiment on such a subject is better than theory, and hence I submit the following data on the action of lead on water containing different amounts of free sulphuric acid. The experiments were made by adding to four quantities of 250 c.c. of distilled water a definite volume of decinormal sulphuric acid (=4·9 grammes H_2SO_4 per litre). Pieces of sheet lead of equal size, scraped clean immediately before use, were then immersed in the liquids, and the beakers loosely covered and left over night.

Expt. I.—Distilled water without any addition of sulphuric acid acted strongly on the lead. The metal was removed and the white deposit at the bottom of the beaker was dissolved in a few drops of hydrochloric acid, when the water was found to contain 7 grains per gallon of metallic lead.

Expt. II.—To 250 c.c. of distilled water 0·1 c.c. of decinormal sulphuric acid was added. This corresponds to 0·112 grains SO_3 per gallon, or about the quantity of free acid found by Mr. Fairley in the Huddersfield water. The experiment was conducted as in I. when 7 grains of Pb. were found, as in the previous case.

Expt. III.—The sulphuric acid was increased to 1·0 c.c. = 1·12 grains free SO_3 per gallon. The lead appeared little acted on, there being no formation of carbonate, but the water was found to contain 1·75 grains of lead per gallon.

Expt. IV.—5·0 c.c. sulphuric acid added = 5·6 grs. SO per gallon. No apparent action on the lead, but the water contained 1·70 grains Pb. per gallon.

In the first two experiments it must be remembered that in the absence of sulphuric acid the lead was converted into carbonate, and hence was not really in solution in the water, but in experiments III. and IV. it existed as dissolved sulphate.

These experiments were made with distilled water, and consequently under conditions that do not occur in practice. Hence the following experiments are of more real value. They were made side by side with those already described, but Sheffield water was substituted for distilled water. Sheffield water is a pure moorland water containing from 5 to 7 grains per gallon of total solids, of which the chlorine is 0·7 grains. The reaction is neutral or very faintly acid rather than alkaline.

Expt. I.—Sheffield water without any addition of acid took up a trace of lead,—less than 0·05 grain per gallon. (In a subsequent experiment 0·10 grain was dissolved).

Expt. II.—With an addition of 0·112 grains per gallon of SO_3, a strong trace of lead was dissolved, notably more than in Expt. I.

Expt. III.—With 1·12 grains SO_3, 0·28 grain of lead was dissolved.

Expt. IV.—With 5·6 grains SO_3 per gallon, the lead dissolved was 4·9 grains per gallon.

In none of these experiments was there any sensible formation of carbonate, and only the clear liquid was used for the determination of lead. It will be seen that the presence of sulphuric acid, even in very small quantity, notably increases the tendency of the water to act on lead. The repetition of the experiments always furnishes results pointing in the same direction, but the actual figures vary from time to time, being probably influenced by variations in the composition of the water. Thus, previously to the trial, I found the addition of 0·224 grs. SO_3 to 1 gallon of Sheffield, caused the solution of 0·6 grains of lead per gallon in 24 hours, though the unacidulated water dissolved a barely perceptible trace of lead in the same time. It was to this experiment that I referred in court, as proving that the addition of a trace of sulphuric acid to a pure water (not distilled water) increased its tendency to act on lead.

Since the date of the trial a death has occurred at Keighley which is suspected by the medical men to be due to lead-poisoning through the medium of water. The deceased was in the habit of drawing a glass of water from the tap the first thing in the morning, and by drinking this he would necessarily introduce into his system any lead dissolved from the pipes during the night. In his liver I found lead. The water which had been standing in the lead pipes all night contained 0·61 grains of lead per gallon. Water taken from the neighbouring main was free from lead but had a marked acid reaction to Poirier's orange. Left over-night in contact with clean lead it dissolved from ·42 to ·56 grains per gallon. Rendered faintly alkaline with lime water and left over-night in contact with lead, only 0·14 grains of Pb. was dissolved.

These experiments appear to me to indicate that a trace of free acid is a leading cause of the action of water on lead and that the effect can be greatly diminished by neutralisation.

Occasionally, during a period extending over many years, I have examined the Sheffield water for lead. At present it is wholly free from that metal, even after standing overnight in the pipes, but not unfrequently I have found notable traces in it. In the light of recent researches it is probable that, on those occasions, the water as delivered from the main contained a free acid,—whether sulphuric acid or, as I contend is more probable, hydrochloric acid is at present an open question.

Of course the few experiments above described do not wholly clear up the difficult and obscure problem of the cause of the action of water on lead, but they at least indicate the great probability of one of the leading causes, and they help to lay at least one old ghost, and lead to a better understanding of some misinterpreted observations. It remains for others to show, if they can, why sulphuric acid or sulphates should be theoretically held to reduce the tendency of water to act on lead when lead sulphate is more soluble than the carbonates, and why free sulphuric acid should be assumed to exist in water simultaneously with metallic chlorides.

ON ACETATE OF LIME AND ALLIED SUBJECTS.*

By Messrs. Stillwell and Gladding.

METHODS OF ANALYSIS.

1. *Based on the Amount of Soluble Lime Salts Present.*—The value of an acetate of lime depends entirely on the amount of glacial acetic acid present. Two methods of analysis are in use at the present time; one determines the amount of lime salts soluble in water, and by calculation the amount of lime so found is converted into acetate of lime, or glacial acid, as the case may be. This method is based on the supposition that all the soluble lime salts present are acetates; but this is not so. Acetates of lime almost invariably contain caustic lime in slight amount, and if the lime has been overheated, it is present in still greater quantity. Again, organic salts of lime are always present. With improved methods of manufacture, the amount of these has diminished of late years, and the difference between the amounts of acetate of lime found by distillation of the acetic acid and that found from the amount of soluble lime is much less than formerly. The better the sample of acetate, the less is the difference between the results given by the two methods.

In the year 1872 (see *American Chemist*, vol. ii., p. 324, and vol. iii. p. 8), this question of methods of analysis came up. It is necessary to state here the objections raised by certain English chemists against the process of distillation, which was advocated by some American chemists, since the objectors to a distillatory process had no good foundation upon which to rest. But as the general custom of the trade was at that time based upon the method of analysis by means of the soluble lime salts present, we have before and since that date used the term "English Commercial Test," to designate analyses made in this manner, and so state the results on our reports of analysis. Whenever an analysis is made by distillation it is so stated.

2. *Based on the Distillation of the Acetic Acid.*—Three acids may be used in the process of distillation—hydrochloric, sulphuric, or phosphoric.

(*a.*) When *hydrochloric acid* is used, a part of it is carried over with the acetic acid and must be estimated and a correction made. It possesses these two advantages: that it does not act upon the organic matter present, and that the solution of chloride of calcium will permit of the distillation being carried to a low point without danger of error. The distillation is made in a retort connected with a condenser, and the total acids present in the condensed liquid are estimated, and the proper correction applied for the amount of hydrochloric acid found to be present.

* Read before the American Chemical Society.

(*b.*) The use of *sulphuric acid* has three disadvantages.

First.—As it becomes concentrated in the retort during the process of distillation, it acts upon the organic matter present, forming sulphurous acid, which is carried over with the acetic acid and included in the estimation of the total acid power of the distillate. Thus the amount present would be calculated as acetic acid, and the result thereby increased unduly. To prevent such action, resource is had to distillation in a current of steam.—(See *American Chemist*, vol. vi., p. 294.)

Second.—The sulphate of lime formed by the addition of sulphuric acid to the solution of the acetate of lime, is troublesome on account of the bumping which takes place during the distillation. This is partly prevented by the use of a current of steam.

Third.—When a sample of acetate of lime contains *chloride of calcium* or *chloride of sodium*, the chlorine is carried over in the form of hydrochloric acid and neutralises its equivalent amount of the standard soda, used to receive the acid distillate. The amount thus distilled must be estimated and the correction made. To prevent this, the chlorine present is precipitated by the addition of sulphate of silver to the solution of acetate before distillation begins.

(*c.*) *Phosphoric acid* is the best acid for use in the process of estimating acetic acid by distillation. It has three advantages.

First.—It does not act on the organic matter.

Second.—During the distillation, the liquid in the retort is not suffered to fall below 15 cc. in bulk. Under such circumstances, phosphoric acid does not decompose any chlorides of calcium or sodium which may be present in the acetate, thus requiring no addition of sulphate of silver. Only the merest trace of chlorine is carried over, as shown by experiments with a sample of acetate containing nearly 5 per cent. of chloride of sodium and also by trial on a known amount of pure chloride of sodium. This unexpected result merits attention, since in this respect phosphoric acid differs so decidedly from sulphuric acid.

Third.—It forms a perfectly clear solution with the acetate of lime. By the use of a large amount of glacial phosphoric acid, at least five times the weight of acetate of lime taken for analysis, the phosphate of lime first formed is redissolved to a clear solution. The distillation proceeds quietly and uniformly without bumping, and the liquid in the retort is easily kept at any desired point. The use of a current of steam is necessary, both for ease of manipulation and accuracy of results.

After a thorough trial of hydrochloric and sulphuric acids, we discarded both in favour of phosphoric acid, and for some years past have used it to our full satisfaction. It is important that the phosphoric acid should contain no nitric or other volatile acids which would increase the results obtained above the truth. Each new lot of phosphoric acid should be examined for such impurities before use. If it be suspected that any phosphoric acid has been carried over during the distillation, it is easily detected in the distillate by the use of molybdate of ammonia.*

* The objection raised against this method by Dr. Waller, namely, that the presence of acetic acid interferes decidedly with the precipitation of phosphoric acid by the molybdate solution, was answered by Mr. Stillwell to the effect that he overcame the difficulty by using large quantities of ammonium nitrate.

The process of distillation, if carefully and intelligently done, is very accurate. Duplicates made by this method agree with each other fully as closely as do those made by the estimation of the soluble lime. For example, in January last, a sample of grey acetate was analysed by distillation in our laboratory, with a result of 78·22 per cent. acetate of lime. Three months later, the same sample was re-analysed by another man in our laboratory, using fresh standard solutions, and 78·20 per cent. of acetate was obtained. This sample contained 3·16 per cent. of common salt, shell-lime having been used in its manufacture. With care and experience in this method of analysis by distillation, it is not difficult to obtain duplicates which agree to two-tenths of one per cent. of acetate of lime; usually the difference is less than that. A sample of grey acetate analysed recently was distilled with sulphuric acid, and a duplicate with phosphoric acid. The results agreed exactly; the latter distillation, however, requiring less attention than the former, for reasons given above under processes of distillation.

The indicator used for titration is a few drops of a solution of phenol-phthalein, one gramme in 250 cc. of a mixture of equal parts of water and alcohol. We have found this indicator far preferable to either litmus or cochineal; of course, whichever indicator is used, the same must be used both for the standardising and the actual analysis.

To show the need of some uniform and accurate method of analysis, we refer to a note in "Allen's Commercial Organic Analysis," vol. i., p. 205. He finds from experiments made in his own laboratory on the *same sample* of acetate of lime, that results were obtained varying from 47·4 per cent. to 57·6 per cent. of acetic acid. In our own practice for many years previous to the publication of the present, we found differences fully as great between results by distillation and by the various commercial processes; but, as we said before, at the present time the differences are not nearly so great as formerly.

In conclusion, we wish to lay strong emphasis upon the facts that, inasmuch as the process of distillation is the only one which gives the real amount of glacial acid present, and inasmuch as it is an imitation of the actual manufacturing process for obtaining acetic acid from its acetates, it is the most reliable and should be adopted. This position we have maintained for many years, and we notice that, especially in the case of grey acetate, buyers are more and more insisting on the test by distillation. The price should be based on the unit of glacial acid, just as, in fertilising materials, the prices are based upon the units of phosphoric acid, nitrogen, and potash.

In the course of discussion on the above paper, Dr. Grothe asked if the authors had noticed the presence of acetone in the products of the decomposition of acetate of lime by heat.

Mr. Stillwell said he had not noticed it particularly, since his attention had been confined simply to the loss of acetic acid.

Dr. Squibb remarked, respecting the production of acetic acid from wood, that it was not necessary to carbonise the wood, but that all the acetic acid could be obtained at a much lower temperature (about 160 to 200° C.), and the products then contain no acetone. For the analysis of sodium acetate, he uses a glass retort covered with copper gauze, and heats it on one side to prevent frothing and bumping. He uses 10 grms. of the acetate, with 20 cc. of water, and 10 cc. sulphuric acid; after distilling off 10 to 15 cc. of

liquid the distillation is interrupted—about 10 cc. of water are added to the retort, and 10 to 15 cc. of fluid again distilled over. This is repeated a third time, when all the acetic acid will have come over, without trouble from frothing or bumping during distillation.

Dr. Squibb further remarked that he uses in his factory retorts 20 feet long, 2 feet wide, and 10 feet deep, holding 2½ cords of wood, and heats them in a hot air bath. During the first twelve hours, only water is given off. In about twenty-four hours the acetic acid begins to distil over, the process being completed in six to seven days for each retort.

Seasoned oak is preferred, and any admixture of softer woods diminishes the yield of acetic acid. Chestnut is notable in this respect. Throughout the active heating, but more copiously toward the end, a gas, colourless and odourless (and so far as tested, unin flammable), comes over, having anæsthetic properties. This gas adheres to the wood after the charge is cooled and drawn, and seems to be a reason why small vermin will not remain near it. If the charge is heated too long, smoke appears at the exit pipe, and carbonisation of the wood begins at the centre of the top of the charge, extending in V shape towards the bottom. When once started, this carbonisation proceeds spontaneously without further application of heat. Indeed, it is sometimes found difficult to check it, even by the liberal application of cold water to the outside of the retort.

In the course of the operation, when properly managed, the charge shrinks to one-third of its volume. 4,000lbs. of wood yielded about 2,800lbs. of residue. The residue retains all the appearances of the wood before distillation, only that it becomes walnut-coloured, and it has the same elementary composition as that of kiln-dried wood. It is brittle and not well adapted to construction, but forms a most excellent fuel for many purposes, especially for kindling anthracite coal. The distillate is neutralised with soda-ash and distilled to about one-fortieth its volume. The first product is crude wood spirit. This is redistilled, and gives rectified wood spirit, and lastly wood oils, which contain large quantities of furfurol and no acetone. The wood oils are separated by passing the last portions of distillate into water. The rectified wood spirit contains about 80 per cent. of methyl acetate, and when saponified, gives a very pure methyl alcohol. One cord of well-seasoned wood will afford 1,200 to 1,400lbs. of liquid products. A cord of oak yields 60 to 70lbs. of glacial acetic acid. There was no process commercially practicable for obtaining pure acetic acid from pyroligneous acid or acetate of lime, but only from acetate of soda.

Mr. Parker remarked that he had tried a process for making acetic acid by heating wood-fibre with steam, under a pressure of 60lbs. at 275° C., and confirmed Dr. Squibbs's observations on the deterioration of the woody fibre, and also the impracticability of making pure acetic acid from pyroligneous acid.—*New Remedies.*

TAXING OLEOMARGARINE.

The Committee of Ways and Means of the American House of Representatives has made a favourable report on a Bill to "tax the manufacture and sale of oleomargarine." The Bill imposes a tax of 5 dols. on every manufacturer of oleomargarine or other compound in imitation of butter, and a tax of 2 dols. on every dealer in such articles. It also imposes a stamp-tax of 1c. per lb. upon oleomargarine and other spurious butter, and the absence of the proper internal revenue stamp shall be *primâ facie* evidence of the non-payment of the tax thereon, and, in addition to other prescribed penalties, the unstamped packages shall be forfeited to the United States. Other suitable penaltie are prescribed for violation of the law.

ON THE RELATION BETWEEN THE SPECIFIC GRAVITY, THE FAT, AND THE SOLIDS NOT FAT IN MILK.

By E. F. Willoughby, M.B. Lond.

Dr. Vieth has published in The Analyst a rapid method of examining milk as practised by him in the laboratory of the Aylesbury Diary Company. It, or some similar process, is much to be recommended, on the ground that the analyst would be thereby able to make a much greater number of examinations in a given time, and might thus exert a constant control over the milk supply of his district, resorting to the more accurate, but far more tedious processes hitherto employed, whenever the results of the shorter examination indicated, or led him to suspect, adulteration. The specific gravity of milk is, we need scarcely remind our readers, the resultant of two opposing forces—the fat which lowers, and the other solids which raise it above that of water. In Germany, the question of the value of the specific gravity has long been a subject of investigation, and it has recently been studied here by Mr. Otto Hehner and Mr. Wynter Blyth, independently of one another.

Mr. Hehner reasoned that if the percentage of solids not fat S raise the specific gravity G of milk above 1,000 to the amount s, and if each percentage of fat F depress it by the quantity f, then

(1) $Ss-Ff=G$, and we know that

(2) $F+S=T$ (total solids).

substituting in (1) for F its value T—S (from 2)

we have $Ss-(T-S)f=G$

$$Ss-Tf+Sf=G$$

$$Ss+SF=G+Tf$$

and $$S=\frac{G+Tf}{s+f}$$

that is, we should obtain the percentage of solids not fat, by adding to the specific gravity of the milk (by which term he understands the excess of weight of 1,000 volumes of milk over 1,000 volumes of water) the percentage of total solids, multiplied by the gravity of each percentage of fat, the sum being divided by that of the gravities of one per cent. of solids not fat, and of fat.

If the factors s and f were ascertained, we should be able to infer the proportion corresponding to each in a given sample, of which we knew only the specific gravity and the total solids, and the examinations would be reduced to these simple operations. Dissatisfied with the calculations of Behrend and Morgen and of Clausnitzer and Mayer, Mr. Hehner made a series of careful experiments, in order to ascertain the true value of the factor s in each, drying the residue of 5 grammes of milk for four hours in a water bath, extracting the fat for two hours in a Sohxlet's tube, and drying the exhausted residue for an hour at 100° Cent. The specific gravity he obtained by means of a Sprengel tube, which is for several reasons, very much to be preferred to the old specific gravity bottle. He never found the weighings thus obtained to differ from each other by more than a milligramme, and generally by much less. An average of twenty-two consecutive analyses gave the value s 3·605 that is, each percentage of solids not fat raises the gravity of milk

on an average by 3·605, and this is true even in the extreme cases of skim milk and milk extraordinarily rich in fat. He believes, then, that provided the exact condition of drying and taking the specific gravity are observed in every analysis, we may obtain the percentage of solids not fat, and indirectly of the fat, with sufficient accuracy for all cases which are not to be made the basis of legal proceedings.

The necessary factors are s=3·605=the amount by which each percentage of solids not fat raises the specific gravity over 1,000, and f=0.725=the amount by which each percentage of fat depresses the same, while (s+f)=4·33, and the calculation is as follows. Multiplying the total solids by 0·725, adding the product to the "specific gravity" as defined above, and dividing the sum by 4·33, we have the percentage of solids not fat, which, subtracted from the total solids, gives the fat.

If any great divergence from the normal percentage be indicated, a complete analysis would of course be made, and a considerable difference between the solids not fat calculated and found, would suggest adulteration with sugar or other body, for which a search would be made.—*Sanitary Record.*

COFFEE MIXTURE IN THE ISLE OF MAN.

At the Tynwald Court, held recently, His Excellency the Hon. Spencer Walpole, Governor of the island, brought up for consideration a supplementary notice, which, he said, had been issued a few weeks ago by Her Majesty's advisers, making a slight change in the revenue laws. The object of this change was, he understood, to prohibit the importation of vegetable matter applicable to the use of chicory or coffee, and to prohibit the sale of any such matter. In consequence of the desire to prohibit their importation, it was necessary to make a slight change in the English tariff, and they had excluded every vegetable matter other than chicory and coffee from the tariff. It seemed to him and to his advisers that if it was desirable in the interests of the consumers of Great Britain to make this change, it must also be desirable in the interests of the consumers of the island. It seemed to him and his advisers that if all vegetable matter other than chicory and coffee were struck out of the Customs laws of Great Britain, it should also be struck out of the Customs laws of the island. If the court agreed with that view a resolution would be laid before them as to what was to be done. The Attorney General stated that by the English Customs law there was a duty on chicory and coffee and every vegetable matter applicable to the use of chicory and coffee. In our Act we had—"that there shall be payable on chicory and coffee, or any other vegetable matter applicable to the uses of chicory and coffee, per the pound one penny." If it were necessary to prohibit the importation and use of such vegetable matter in England, he thought it was necessary to prohibit it there. It would not affect them in the matter of revenue, because they would get the duty on the real articles of coffee and chicory, instead of on imitations. He understood there never was a penny collected there on these importations. He proposed—"Whereas, it is proposed to repeal the duty of Customs payable in the United Kingdom on the importation of vegetable matter applicable to the use of chicory and coffee, and to prohibit the sale of any such matter: Resolved—That in case such duty be repealed, it is expedient that the Customs duty of one penny the pound in respect of any other matter applicable to the use of chicory and coffee payable on the same being imported or brought into this island under the Customs (Isle of Man) Tariff Act 174, Section 1, be repealed, and that the sale of any such matter within this isle should be prohibited. And that His Excellency the Lieutenant-Governor be requested to take such steps as may be necessary to give effect to this resolution." Mr. Clucas seconded the motion, thinking it most desirable the change should be carried out. The motion was unanimously adopted. Replying to Mr. Stevenson, His Excellency presumed the resolution would have effect on the importation of date-coffee. Deemster Drinkwater hoped it would, and the Attorney-General said that if it were an imitation it would be prohibited.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in September, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Sept. 11	c. blue	none	1·56	none	·50	·0016	·0025	trace	·006	20·0°	5·6°	31·0	satisfactory	Wigner & Harland.
New River	,, 15	c. f. yellow	none	1·06	trace	·13	·0014	·0014	·009	·025	14·5°	3·5°	18·2	satisfactory	B. Dyer.
East London	,, 9	c. yell. green	none	1·27	none	·33	·0017	·0048	·022	·056	13·4°	3·4°	20·2	veg. debris, animalculæ	Wigner & Harland.
Southwark & Vauxhall	,, 6	c. pale yell.	none	1·26	trace	·13	·0009	·0035	·028	·050	14·5°	3·0°	19·6	satisfactory	John Muter.
West Middlesex	,, 28	yell. green	none	1·05	trace	·11	·0020	·0035	·025	·049	13·0°	3·5°	18·4	satisfactory	O. Hehner.
Grand Junction	,,	p. straw	none	1·24	trace	·16	·0016	·0061	·007	·087	12·1°	3·1°	17·4	satisfactory	A. Wynter-Blyth.
Lambeth	,, 6	c. pale yell.	none	1·26	trace	·13	·0009	·0035	·028	·050	14·5°	3·0°	18·9	satisfactory	John Muter.
*Chelsea	Aug. 31	c. gr. yellow	none	1·22	trace	·16	none	·0056	·002	·053	13·7°	4·0°	17·2	satisfactory	A. Dupré.
Chelsea	Sept. 18	c. gr. yellow	none	1·26	trace	·16	none	·0053	none	·003	13·5°	4.5°	17·6	satisfactory	A. Dupré.
Birmingham	Sept. 6	c. blue	none	1·05	trace	·16	·1014		·013	·026	11·9°	7·5°	21·7	none	A. Hill.
Bolton	,, 13	s. yellow turbid	none	·50	none	·02	·0013	·0060	·022	·060	3·6°	3·6°	7·6		W. H. Watson.
Brighton	,, 10	c. grn. blue	none	1·98	none	·35	·0031	·0026	none	trace	12·4°	4·2°	20·4	veg. debris, & animalculæ	Wigner & Harland.
Bristol	,, 11	grnsh. brown	none	·85	none	·17	·0002	·0049	·039	·075	12·0°	2·6°	13·7	veg. deb.	F. W. Stoddart.
Cambridge	,, 18	c. p. blue	none	1·38	trace	·37	none	·0030	none	·015	17·0°	5·0°	24·0	satisfactory	J. West Knights.
Croydon	,, 20	f. green	none	1·19	trace	none	none	none	none	·014	15·5°	6·0°	23·2	none	C. Heisch.
Dublin	,, 4	s. yellow	none	·89	trace	trace	·0020	·0056	·065	·250	1·5°	·7°	4·6	satisfactory	C. A. Cameron.
Edinburgh	,, 15	s. brown	none	·88	none	trace	·0032	·0090	·012	·076	4·2°	3·9°	5·6	none	J. Falconer King.
Exeter	,, 16	f. b. yellow	none	·84	trace	·24	·0007	·0024	·024	·041	2·6°	2·6°	5·6	satisfactory	F. P. Perkins.
Hastings	,, 19	grnsh. s. turbid	none	3·90	trace	·10	·0028	·0056	·008	·015	8·0°	5·5°	29·4	satisfactory	H. F. Cheshire.

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									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Liverpool	Sept. 21	green yell.	none	1·22	trace	·04	·0007	·0028	·014	·045	3·7°	3·0°	10·3	satisfactory	A. Smetham.
Maidstone—															
Wtr. Company	,, 14	p. green	none	2·40	trace	·56		·0030	·012	·040	16·8°	6·6°	31·5	none	M. A. Adams.
Public Conduit	,, 14	p. blue	none	2·20	trace	·57		·0010	·006	·015	18·9°	6·8°	32·1	none	M. A. Adams.
Manchester ..	,, 20	s. turb. f. yell.	none	·73	none	none	·0024	·0075	·051	·122	2·0°	1·9°	5·3	satisfactory	W. Thomson.
Nottingham ..	,, 9	c. yellow blue	none	1·34	trace	1·03	·0014	·0021	trace	·040	11·2°	6·8°	16·6	veg. deb.	Wigner & Harland.
Norwich	,, 8	p. grnsh. yell.	none	1·90	trace	·07	trace	·0076	·045	·074	11·0°	4·7°	12·4	veg. deb.	W. G. Crook.
Rugby	,, 6	c. p. yellow	none	1·44	h. trace	·07	·0056	·0109	·032	·088	13·0°	7·0°	18·0	veg. deb., desmids	A. P. Smith.
Salford	,, 2	f. yell. & cloudy	none	·80	none	none	·0007	·0021	·002	·031	3·0°	2·5°	4·5	none	J. Carter Bell.
Southampton ..	,,	p. yellow	none	1·05	trace	·14	·0028	·0049	·008	·097	12·0°	4·8°	17·9	diatoms, veg. deb., &c.	A. Angell.
Swansea	,, 25	s. turbid	none	·90	trace	none	·0010	·0042	·003	·004	1·4°	1·4°	3·7	none	W. Morgan.
Whitehaven ..	,, 14	c. f. green	none	·43	none	.01	none	·0007	·009	·019	·4°	·4°	2·0	veg. deb., movg. org.	A. Kitchin.
Worcester	,, 11	p. yellow	none	2·90	trace	·16	none	·0064	·008	·140	13·3°	6·2°	18·8	veg. deb.	W. E. Porter.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

ERRATA.—In the August Table, Birmingham Water, the Ammonia should be ·0014 instead of ·1014; Worcester Water, the Oxygen absorbed in 15 minutes should be ·0105 instead of ·105.

* Omitted from last month's table.

POTASSIOBISMUTHOUS IODIDE AS A TEST FOR ALKALOIDS.

DRAGENDORFF, in his Manual of Toxicology, recommends this compound as one of the most delicate tests for alkaloids, but adds that it cannot be employed to distinguish one alkaloid from another, as it gives orange-coloured precipitates with most of them. F. Mangini, however, finds that the characters of this reagent vary considerably according to the manner in which it is prepared. When obtained by Russland's process, described by Dragendorff, it produces a turbidity even in pure water; but when prepared by mixing 8 pts. potassium iodide with 16 pts. liquid bismuth iodide and 3 pts. hydrochloric acid, it does not give any turbidity with water, and is an extremely delicate test for alkaloids, serving also to distinguish many of them one from the other by the various gradations of color of the precipitates and their alterations after long standing. The following are the results obtained:—

Strychnine: Light yellow precipitate becoming dark yellow after some time; supernatant liquid remains clear.

Morphine: Reddish yellow precipitate which agglomerates at the bottom; liquid remains clear, precipitate disappearing after a few days if the whole is left at rest, and the liquid becoming canary yellow.

Codeine: Immediate, copious, yellowish-red precipitate, remaining for some time suspended in the liquid, and assuming a light brick-red color when left at rest.

Atropine: Precipitated at first in filaments, but gradually settling down in the form of a reddish-yellow powder, which if left at rest becomes canary yellow, and dissolves after some time, coloring the liquid golden-yellow.

Aconitine: Precipitated at first in flocks, but suddenly forms at the bottom a chrome-yellow pulverulent precipitate, which does not change color when left at rest, whereas the liquid becomes yellow.

Brucine: Precipitated at first in filaments which ultimately settle down with golden-yellow color, becoming paler when left at rest for some time.

Nicotene: Immediate red pulverulent precipitate, which suddenly falls to the bottom, and becomes reddish-yellow when left at rest.

Cicutine: Precipitate similar in character but of darker color, and becoming dirty-white when left at rest.

Solanine: Slowly precipitated with lemon-yellow color, becoming darker on repose and adhering to the bottom of the tube when shaken.

Veratrine: Light yellow precipitate forming slowly, remaining suspended for some time and becoming light canary-yellow when left at rest.

Narceine: Light yellow precipitate forming slowly and remaining suspended like that of veratrine, but of deeper color; becomes reddish-yellow on repose.

Quinine Sulphate: Immediate brick-red precipitate which suddenly falls to the bottom, and becomes dirty-yellow on repose; remains suspended after agitation.

Cinchonine Sulphate: Like the last, but does not fall down so quickly, and acquires a darker color when left at rest.—*New York Weekly Drug News.*

REPORTS ON ADULTERATION IN THE STATE OF NEW YORK,

From the *Sanitary Engineer*, New York.

(Continued from page 164.*)*

Group VIII.

Wines, Beers; Spirits; and Cordials.

Report by F. E. Engelhardt, Ph.D., of Syracuse, N. Y.

WINE.

By the term "wine," should be understood only pure grape juice, fermented and clarified. Those preparations made from grape juice by other than the ordinary methods of procedure might be designated as "improved wines," to which could be added the name of the person originating the modifications in manufacture. Wines prepared artificially from raisins, cider, &c., with the alcohol, colouring matter, and other substances, should be sold only as "artificial wines."

A good wine should be clear, with a pleasant taste and aroma. A sour taste is always a sign of poor wine. A burning sensation in the throat is generally an indication that alcohol has been added. Dizziness and headache are not produced by drinking pure wine.

Wines are divided into three classes, "dry," "greasy," and "cordial," each having three divisions according to quality.

Under the heading "analysis of wines," Dr. Engelhardt has given the most approved methods for the determination of the specific gravity, alcohol, extract, sugar, acids, ash, glycerine, &c.

In speaking of the sulphuring of wine, it is stated that certain wines are completely bleached by sulphuric acid. The bi-sulphite of lime is sometimes used for a similar purpose. The practice should be condemned, however, as one likely to produce injurious results. The burning of sulphur in wine casks should be done only in cases where it is necessary to remove a musty odour, and even then the cask should afterwards be thoroughly washed.

The principal adulterations of wine are "plastering," "fortifying," and "colouring." The "plastering" of wines consists in adding calcined plaster, either to the unpressed grapes or to the expressed juice during fermentation. The main objection to the practice is that it introduces into the wine a considerable quantity of sulphate of potash, a salt having a purgative action even in small doses. The French Government prohibits the sale of wine which contains over 0·2 per cent. of this salt. "Plastering" is practised in Spain, Portugal, and the south of France.

The "fortifying" of wines consists in the addition of brandy or of French spirits, in order to increase the alcoholic strength of the wine. Wines with more than 20 per cent. of alcohol are "fortified."

The "colouring" of wine is practiced to a great extent and with various substances, either to heighten the colour of a natural red wine deficient in colour, or to make from white wines coloured ones, or finally to colour artificial wines.

A large number of substances are used for this purpose, many of which cannot be considered as injurious, while others certainly are so. Several methods are given for the identification of these colouring materials, but the whole question is one of great difficulty.

Mention is made of the various methods for the so-called inprovement of wines. Chaptal adds sugar to the grape juice before fermentation to increase the alcoholic strength of the product. Gall's method consists in the addition of sugar and water—poor in sugar and rich in acid; while in that of Petiot the pulp and skins of the grapes are repeatedly fermented with sugar-water. Scheele's method, said to be practised by wine dealers in England, Germany, and Austria, consists in the addition of from 1 to 3 per cent. of glycerine to the wine, whereby the wine, if young, appears older, has more body and stability.

The manufacture of artificial wines from raisins, cider, &c., is by no means uncommon in this country, and in Europe. In some countries the artificial product is considered in the same light as the natural wine. A number of recipes are given for the manufacture of these artificial wines.

No samples of wine were submitted to Dr. Engelhardt for examination.

LIQUORS.

Liquors are sugar solutions fermented and then distilled, hence they are also called distilled spirits. They are obtained, first, from liquids containing alcohol, previously formed by fermentation; second, from liquids or solids containing sugar; third, from substances which contain neither alcohol nor sugar, but may be made to yield these products.

Cognac brandy is the distilled spirits of wine, and contains from 48 to 60 per cent. of alcohol. Its quality, like that of all liquors, depends more upon its bouquet and taste than upon the alcoholic strength.

Methods are given for the analysis of brandy, and considerable is said of fusel-oil and its detection. Fusel-oil is a mixture of various alcohols and complex ethers, and each of the distilled liquors has an oil peculiar to itself. It communicates to the liquor a very unpleasant flavour, and if present in any considerable quantity it has an injurious effect on the human system. Several facts and opinions are given, however, which go to prove that the most injurious ingredient of distilled liquors is the alcohol itself, and next comes the fusel-oil.

The chief adulterants of brandy are water and alcohol. This liquor is also largely produced artificially, and a number of recipes are given for its preparation.

Twenty-five samples of brandy were examined by Dr. Engelhardt. The percentage of alcohol varied from 30·8 to 50·4 by volume. None of the samples contained sulphuric acid or chlorides. Sixteen gave a distinct reaction for fusel-oil, six contained only traces, and three none whatever.

The distinguishing characteristics of genuine and artificial brandies lie in the relative quantities of alcohol, extract, ash, acidity, colouring matter and tannic acid, together with the flavour. In the samples examined no indication could be found of the oil of bitter almonds, nitro-benzol, nitrous ether, or other injurious substances.

Whiskey, like brandy, consists of a diluted alcohol, with a peculiar flavour derived from the material used in its preparation, and developed during the process of fermentation and distillation.

Whiskey is manufactured from malt, wheat, rye, corn, or potatoes, and is named either from the material used in its manufacture, or from the country where it was produced. The first step in its manufacture is the conversion of the starch of the raw material into sugar by the action diastase. The resulting sugar solution is fermented and then distilled. Purification is necessary to remove the fusel-oil. The analysis of whiskey is similar to that of brandy.

Whiskey is often made artificially, the same as other liquors, and a number of recipes are given for accomplishing this. The most objectionable ingredients in the artificial whiskies are creosote and sulphuric acid, substances which are recommended in some of the recipes given.

Twenty-five samples of whiskey were examined; and it appears "evident that the addition of water and colouring matter is practised more than any other adulteration." No free sulphuric acid was found in any of the samples. The percentage of alcohol varied from 28·9 to 60·3 by volume.

Rum.—This liquor is obtained by the fermentation and distillation of the juice of the sugar cane, its molasses, or the refuse from the manufacture of sugar. It is produced especially in France, the East and West Indies, and in the United States. The manufacture of rum is essentially the same as that of other liquors, but special attention must be paid to the temperature of the liquor during fermentation. The addition of yeast is usually unnecessary. In its place the planters of the West Indies employ the lees of former distillations; and to this is attributed the fine aroma of genuine rum. In some cases cinnamon, anise-seed, and the leaves of various trees are added to disguise the nauseous odour of the liquor.

Like all distilled liquors, rum is colourless, as it comes from the still, and whatever colour it acquires is derived from the cask in which it is kept, or is produced by the addition of caramel.

Various forms of fraud are practiced in the manufacture and sale of rum: It is sometimes made of grain spirit, with the addition of flavouring compounds. Water or diluted alcohol are often added by the retail dealer. The flavouring essences, which are added in making artificial liquors, are but trifling in amount, and when skilfully used, cannot be distinguished by chemical tests from the natural bouquets.

Twenty-five samples of rum were examined by Dr. Engelhardt. The alcohol varied from 26·4 to 57·8 per cent. by volume. No injurious foreign substances were detected.

GROUPS IX. AND X.

IX.—CRUDE Vegetable and Animal Drugs.

X.—PHARMACEUTICAL Chemicals and their Preparations.

Report by F. Hoffmann, Ph.D., of New York.

Drugs and chemicals are liable to become impaired by accidental or intentional substitution of inferior materials, by contamination resulting from want of knowledge and care in gathering and preparing drugs. An article originally good may have its value diminished or destroyed by deterioration through moisture, exposure, and age.

In examining crude and powdered drugs, Dr. Hoffmann relied on their chemical characteristics, and their structure, and also on chemical tests in some cases. The "most approved methods" were employed in the examination of chemicals. No methods of procedure are given in detail, reference being made to the "National" and the "United States" Dispensatories, Pharmacopœia and the "Examination of Medical Chemicals" by F. Hoffmann.

"As absolute purity in most medicinal chemicals and their pharmaceutical preparations is neither necessary, nor in many of them readily attainable, a certain margin has to be admitted and the due allowance to be made" for insignificant and different admixtures incident to their preparation. The skill and experience of the analyst must be relied upon to draw the "proper line between the legitimate limit and the undue excess of any such impurity." "Their nature and character, moreover, have to be taken into special consideration whenever the impurity, or its amount and nature in any way may be objectionable, either by their powerful properties, or by their lessening or modifying the therapeutical value and effect of the chemical."

"For all such chemical and pharmaceutical preparations which admit and require, and for which the Pharmacopœia has established the standard of strength on the basis of a specific or otherwise well-known and chemical assay, this test has in general to be applied as the principal criterion."

In a foot-note Dr. Hoffmann mentioned the system of inspection carried out in Germany with regard to the pharmacies and dispensing establishments. The Board of Inspection consists of the department councillor of the provincial government, the district physician, and an apothecary. All the supplies of drugs and pharmaceutical preparations are examined, the assistants are questioned, the books looked into, and indeed, it appears to be a thorough inspection of everything and everybody about the establishment.

Dr. Hoffmann then proceeds to give the results of his examinations of samples submitted to him.

CRUDE VEGETABLE DRUGS.

Twenty-three specimens of *Seneca root* were examined, of which eighteen were of good quality, the balance being composed wholly or in part of "inert rootlets," and roots of inferior quality.

Virginia snake root, twenty-one specimens examined, all of fair quality except one, which was the rhizome and rootlets of *Asarum canadense*.

Sarsaparilla root, twenty-three specimens examined, of which number nine were of good quality. Six consisted of false sarsaparilla (*Aralia nudicaulis*), two were of poor quality, and four consisted largely or entirely of foreign matter.

Foxglove leaves.—Of twenty-two samples of *foxglove leaves*, ten were found deteriorated by age and exposure.

Saffron.—Twenty specimens of *Spanish saffron* were next examined, sixteen of which proved to be florets of safflower, or bastard saffron, three were true saffron, and one which was true saffron had been completely exhausted.

Myrrh.—Twenty-one samples of *myrrh* were found of good quality, excepting four, which were inferior.

White wax.—Seventeen samples. Eleven were pure wax, three contained paraffin, and three contained stearin. For detecting the stearin 5 grains of the wax were dissolved in chloroform and agitated with lime water. The presence of paraffin was ascertained by treating the wax with benzine and evaporating the fluid to dryness. The residue, if any, is paraffin with a little wax, the latter being then destroyed by concentrated sulphuric acid.

Oil of Cacao.—Nineteen specimens examined. Thirteen were sufficiently pure, while six contained tallow. Bjorklund's test was employed, the material being dissolved in ether and then placed in ice water, by which the oil of cacao separates in granules, the ether remaining more or less turbid in accordance with the amount of foreign fats present.

Quince seed.—Thirteen samples. One was of poor quality and six were adulterated with foreign substances.

Lycopodium.—Fifteen specimens and all of good quality.

Lupulin.—Eighteen specimens. Eleven were of good quality, the rest being inferior or worthless.

Arrowroot.—Twenty specimens. Twelve were genuine Maranta arrowroot, and the others were adulterated with potato, corn, or wheat starches.

POWDERED DRUGS.

"The estimation of the quality and purity of most powdered vegetable drugs offers greater difficulties, since the methods for the detection of inferiorities and adulteration are less definite and established than is the case with unpowdered drugs, and since their adulteration consists not only in the admixture of cheaper foreign material, mostly starches, flour, or cellulose, but also and now pre-eminently in the admixture of inferior brands of the same drug. The microscopical method of examination has largely been made unavailing in recent years by shrewdly dispensing with the use of flour or starches as adulterants, once much practised." Pharmaceutical and chemical tests are not applicable except in certain cases where the value of the drug depends upon some constituent which can be readily determined, as in opium and cinchona bark. These tests are of questionable value in the case of such drugs as ipecac., whose percentage amount of pure emetia is both too small and too variable to furnish a constant and reliable criterion; or in jalap or other drugs containing resins or gum resins, whose amount of soluble resin can readily be maintained by substitution in case of fraudulent exhaustion or adulteration. Empirical and comparative tests have therefore more or less to be resorted to for obtaining an approximately correct and reliable estimate of the quality of the powdered drugs; and these tests must be based and conducted on a thorough knowledge of the physical characteristics of each drug, and on a sufficient amount of skill, experience, and unbiased judgment of the expert.

Ipecac. root.—Twenty-two specimens examined. Ten contained "small admixtures of flour or starch other than that of ipecac."

Jalap root.—Twenty-two specimens. Most of them were more or less wanting in the strength of the characteristic odour and taste of best jalap, and eight contained foreign starches.

Orris root.—Nineteen specimens. "Ten specimens were of good quality," four contained corn starch, "six contained evidently an admixture of some flour."

Rhubarb root.—Twenty-three specimens. All were of good appearance, some of unusual bright yellow colour, six contained foreign starches.

Mustard seed.—Twenty-four samples. Ten were pure mustard, twelve contain admixtures of more or less flour.

MEDICINAL CHEMICALS.

The following is a list of the medicinal chemicals examined:

Benzoic acid	17	No Adulteration.
Citric acid	14	,, ,,
Tannic acid	18	,, ,,
Gallic acid	3	,, ,,
Subcarbonate of Bismuth ..	12	,, ,,
Subnitrate of Bismuth ..	18	,, ,,
Oxalate of cerium	14	,, ,,

Codeia	.. 7	One specimen consisted of sulphate of morphia.
Iodine	.. 20	No Adulteration.
Iodoform	.. 16	,, ,,
Iodide of ammonium..	.. 11	,, ,,
Iodide of sodium ..	.. 3	,, ,,
Iodide of potassium ..	.. 17	Two specimens were the bromide of potassium and one contained a small quantity of this salt.
Cream of Tartar ..	.. 15	No Adulteration.
Saltpetre	.. 15	Three contained considerable chlorides.
Tartar emetic	.. 15	No Adulteration.
Reduced iron	.. 7	Two were deteriorated by age and exposure.
Carbonate of iron ..	.. 8	No Adulteration.
Nitrate of silver ..	.. 15	,, ,,
Oxide of zinc.. ..	.. 14	,, ,,
Sulpho-carbolate of zinc	.. 6	One was the sulphate of zinc.
Santonin	.. 15	No Adulteration.
Sulphate of morphia ..	.. 16	,, ,,
Muriate of quinia ..	.. 2	,, ,,
Sulphate of quinia ..	.. 19	Two specimens were composed entirely of sulphate of cinchonidia, one contained an undue amount of this salt besides an admixture of the lower cinchona alkaloids. The other specimens are of sufficiently good quality. They lose from 11 to 16 per cent. by drying at a temperature not exceeding 120° F.; and all show by the pharmacopœial ether test a slight reaction for the lower cinchona alkaloids.

"In consideration of the fact that there are in the State of New York, according to reliable statistics, approximately not less than 2,800 drug stores, and besides about 3,000 country and variety stores where among all sorts of merchandise, drugs and ready-made medicines are also vended, the number of specimens (659) obtained for the present examination represents a comparatively insignificant figure, altogether inadequate to serve for forming a correct inference or an average estimate of the quality and general character of drugs and medicines dispensed at present throughout our State." From the examination made, medicinal chemicals are considered of "fair quality," less so in the case of crude drugs. Powdered drugs "are to a great extent of unsatisfactory quality and questionable reliability."

In regard to patent medicines, Dr. Hoffmann says, they are increasing in number and are of much importance as articles of commerce. The trade list of secret and proprietary medicines embraces at present a much larger number of articles than all the legitimate preparations of the Pharmacopœia."

"These medicines are vended everywhere in our State and country, under no restriction or control whatever."

"Much has been written about the exteneive and indiscriminate and frequently reckless use and misuse and the consequent injury and dangers of this kind of medication by medicines and preparations of unknown composition and qualities. A number of them have from time to time been analyzed, and some have been found to contain potent drugs, the dispensation of which in such doses would hardly be risked or approved in the practice of legitimate medication, while the nostrum-makers dispense them with the additional medical advice, unrestricted."

Group XI.

Gelatin, and sugar-coated and Compressed Pills of Quinine.

Report by Prof. G. C. Caldwell, Ph.D., of Ithaca, N. Y.

QUININE IN PILLS AND CAPSULES.

"The literature of this subject is very scanty indeed, and it does not appear that the large quinine-consuming public of this country has any assurance whatever that it gets its two, three or five grains of sulphate of quinine in the pills, capsules and other preparations said to contain these quantities."

Prof. Caldwell's work in this division was confined to the determination of the amount of quinine sulphate in the samples received, without attempting to ascertain the extent to which other alkaloids of the bark are substituted for it to make up the deficiency where it exists. Twenty-nine samples of quinine pills were examined, and it appears that in every case the amount of quinine sulphate was below that which it was professed the pill contained. Two-grain pills were found to contain from 0·9 to 1·8 grains of the sulphate; the three-grain pills contained from 1·7 to 2·8 grains, while the five-grain pills contained from 2·4 to 4·7 grains.

To be continued.

SOCIETY OF PUBLIC ANALYSTS.

The Country Meeting of this Society will be held at Birmingham on the 20th inst. The usual particulars will be sent to Members.

THE ANALYST, VOLS. I., II., and III.

The Publishers would be obliged by the return of copies of the above, for which the full published price will be given.

MILK ADULTERATION IN FRANCE.

M. Girard, Director of the Paris Municipal Laboratory, has forwarded a letter to the Society of Public Medicine (*Médécine Publique*), concerning the system adopted by cow-feeders (*nourrisseurs*) in order to produce an excessive production of milk. This Society has appointed a commission to investigate milk adulteration: its members are MM. Barier, Baron, Budin, du Mesnil, Dupré, Fauvel, Girard, Pabst, Porak, Railliet, Trasbot, Emile Trélat and Vallin. M. Girard's letter draws special attention to the fact, that the cowkeepers reject the simple method of adding water to the milk supplied to customers, this fraud being too easily detected. Therefore a special regimen, which is inexpensive, and certain to result in excessive lactation, is adopted, such as malt and the *debris* of oil factories. The cows fed on this diet give a milk which is thin, non-nutritive, and watery, though excessive in quantity. The animals, after a short space of time become phthisical and die, their proprietors having, however, realised large profits on a small outlay.—*Sanitary Record.*

THE MILK OF PARIS.

Paris authorities for some time suspected that the milk of that metropolis was watered. Then they decided to stop it, but first to assure themselves that it was watered. The milk cans are all unloaded in a large warehouse at the side of the Batignolles Station, and twenty-five policemen were posted outside, loop-holes having been made in the wall to enable them to watch the movements of the milkmen. Just when they had brought in the water, and were beginning to make their customary mixture, the police rushed in and caught them. They were at first inclined to resist, but the presence of the commissary with his tricolor scarf seems to have overawed them, and they allowed him to make a very important capture. They were also found to have a large quantity of bi-carbonate of lime, together with a contrivance for removing the sealed covers which some of the milk cans have, and for putting them on again after the contents have been adulterated.—*Sanitary Engineer.*

LAW REPORTS.

Butter or Butterine:—

At Tunstall Police Court, lately, Mr. John Plant, shopkeeper, Wolstanton, was charged with selling adulterated butter. The certificate of the County Analyst stated that the sample contained only 4·6 per cent. of real butter-fat. Defendant's wife, after the purchase had been made, and its purpose mentioned, said she did not sell it as butter, but as butterine. Mr. Ackrill, on behalf of the defendant, said the butter was purchased from a wholesale grocer as genuine butter. He produced an invoice which described the article as butter, and he contended that this was a written warranty. Major Knight, the county inspector, disputed this description of the invoice. Mr. Randall (of the firm of Harrison and Randall, wholesale grocers) said he took the order for the butter of the defendant's wife, and in due course handed it in; but butterine must have been sent by mistake. The price charged was the price of pure butter of second quality. Mr. Ackrill pressed his view that the invoice constituted a written warranty; and, after some discussion, the Bench adopted that view, and dismissed the charge.

Coffee Adulteration.

Mr. James Morris, shopkeeper, Butt Lane, was charged with selling coffee adulterated with 60 per cent. of chicory. Defendant said he sold the coffee as he bought it, and he did not know it was not genuine. He had bought a pound in February last, and he had not sold the whole of it yet. In this case a fine of 2s 6d. and costs (22s. 6d.) was imposed.

Ann Beech, Alsager's Bank, was charged with selling coffee adulterated with 70 per cent. of chicory. This defendant also pleaded that she sold the coffee as she bought it. She was ordered to pay 5s. and costs, in all £1 7s. 6d.

In the Glasgow Sheriff Court, before Sheriff Guthrie, Mr. James Anderson, grocer, 604A, Gallowgate was charged, at the instance of the Sanitary Department, with having sold a quarter of a pound of coffee, certified by the Public Analyst to contain 15 per cent. of chicory. The defendant pleaded guilty, and after hearing agents on both sides, the Sheriff imposed the penalty of 30s.

At Liverpool Police Court, Mr. John Tyson, grocer, 30, Copperashill, was fined 20s. and costs for selling, as pure, coffee to which upwards of twenty parts of chicory had been added; and Jarratt Roberts, grocer, 1, Fairclough Lane, was fined 20s. and costs for selling, as pure, rock-cocoa to which 35 per cent. of sugar had been added.

Pepper and Dirt :—

At Clerkenwell Police-court, on September 15, Mr. William Tozer, grocer, 103, Central Street, St. Luke's, was summoned for selling pepper which had been adulterated with 4¾ per cent. of earthy matter. The defendant said he sold the pepper in the same condition as he purchased it; it was difficult to avoid a little dust getting into the pepper, however much care was taken. Mr. Barlow said he hardly knew what to do in the matter, but the percentage of adulteration was so small that he thought he would dismiss the summons.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No	Name of Patentee.	Title of Patent.	Price
1881			
5400	T. Rowan	Electric Light Lamps or Lanterns	2d.
5477	W. R. Lake	Electric Lamps	6d.
5632	J. S. Sellon	Incandescent Lamps	2d.
1882			
130	W. T. Henley	Machinery for obtaining Electric Currents	1/6
203	G. Payne	Distillation of Glycerine	6d.
231	C. W. Siemens	Telephonic Conductors	6d.
234	W. R. Lake	Dynamo Electric Machines	6d.
252	H. H. Lake	Electrical Accumulators	6d.
289	J. Humphrys	Secondary Batteries	4d.
290	H. J. Haddan	Telephone Conductors	2d.
299	S. Pitt	Utilization of Phosphatic Metallic Slags	4d.
305	J. N. Aronson	Electric Lamps	6d.
311	Hy. D. Scott	Treating Phosphatic and Nitrogenous Substances for Manure	4d.
316	E. G. Brewer	Telephone Transmitters	6d.
339	E. de Pass	Regulating Electric Lamps	6d.
346	R. E. Crompton	Electric Lamps	8d.
354	H. J. Haddan	Manufacture of Acetic Acid	2d.
359	J. N. Aronson	Electric Lamps	8d.
367	W. Windus	Manufacture of Sulphuric Acid	2d.
377	Sir C. Bright	Electric Lamps	6d.
392	W. P. Thompson	Obtaining Light by Electricity	6d.
398	C. Scheibler	Manufacture of Sugar	4d.
440	G. Neilson	Abstracting Ammonia from Gaseous Products of Combustion in Furnaces	6d.
433	L. Mond	Manufacture of Cyanogen Compounds and Ammonia	6d.
441	C. F. Varley & W. Judd	Electric Railways	4d.
473	J. Brock	Utilizing Alkali Waste	2d.

No. 1882	Name of Patentee.	Title of Patent.	Price
489	G. Skrivanoff	Electrical Batteries	6d.
509	G. S. Hazlehurst	Manufacture of Salt Cake and Muriating Acids	6d.
518	C. V. Boys	Electric Meters	6d.
538	W. R. Lake	Electrical Accumulators	6d.
540	J. D. Andrews	Dynamo Electric and Electro Dynamic Machines	6d.
541	T. Morgan	Electric or Magnetic Motor	6d.
543	P. Thomas	Bleaching Fibrous Matter without employing Chlorine	4d.
554	F. Springmuhl	Apparatus for Concentrating Milk	4d.
555	F. Springmuhl	Manufacture of Condensed Grape Juice or Must	4d.
563	A. J. Jarman	Arc Electric Lamps	6d.
578	B. J. Mills	Electric Lamps	6d.
607	R. & M. Theiler	Telephone Transmitters	2d.
620	G. Scott	Manufacture of Triple Alloys of Manganese	6d.
621	J. B. Rogers	Effecting and Maintaining Continuity of Divided Electric Currents	6d.
626	A. A. Common	Electric Lamps	6d.
633	A. Rieglelman	Anti-corrosive Paint	4d.
661	H. H. Eldred	Telephone Exchange Systems and Apparatus	8d.
667	H. J. Haddan	Purifying and Discolouring Saccharine Liquids	2d.
669	P. Class	Distillation and Purification of Alcohol	6d.
676	C. Scheibler	Manufacture of Sugar	4d.
686	A. M. Clark	Telephone Call or Signalling Apparatus	6d.
688	A. M. Clark	Transmitting and Repeating Sounds by Electricity	8d.
731	E. V. Gardner	Manufacture of White Lead	1/0
732	W. Gentles	Manufacture of Sulphate of Alumina	2d.
740	A. M. Clark	Electric Lamps	6d.
760	C. W. Siemens	Dynamo Electric or Electro Dynamic Machine	6d.
761	C. J. Chubb	Dynamo Electric and Magneto Electric Machines	2d.
777	C. D. Abel	Recovering Tin contained in Waste Metals	4d.
798	H. C. Stormer	Recovering Soda used in making Wood Pulp Stuff	6d.
831	J. Rapieff	Electric Lamps	6d.
837	I. L. Pulvermacher	Apparatus for Collecting and Storing Electric Currents	2d.
869	C. E. Spagnoletti	Dynamo Electric Machines	6d.
898	J. Brockie	Electric Arc Lamps	8d.
905	J. W. Swan	Secondary Batteries	4d.
921	J. Dempster	Manufacture of Sulphate of Ammonia	6d.
960	J. A. Dixon	Production of Certain Derivatives of Metaoxybenzaldehyde	4d.
2278	H. H. Lake	Manufacture of Oxide of Lead	4d.
2416	H. H. Lake	Electric Batteries	6d.
2526	W. R. Lake	Dynamo or Magneto Electric Machines	6d.
2563	W. R. Lake	Electric Lamps or Lighting Apparatus	6d.
2570	W. R. Lake	Electric Lamps	6d.
2632	W. R. Lake	Electric Lamps	6d.
2744	J. Imray	Dynamo Electric Machines and Electric Motors	6d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Weekly Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine; London Water Supply, by Crookes, Odling and Tidy; Chemical Review; Report on Operations of Glasgow Sanitary Department; Analysis of Accounts of Metropolitan Water Companies, by A. Lass; Chemistry, Inorganic and Organic, by T. W. Drinkwater.

THE ANALYST.

NOVEMBER, 1882.

SOCIETY OF PUBLIC ANALYSTS.

THE next GENERAL MEETING of this Society will be held at Burlington House, Piccadilly, on Wednesday, the 15th November, at 8 o'clock.

THE DETERMINATION OF ORGANIC MATTER IN POTABLE WATER.

IN reference to the Instructions for Water Analysis published in THE ANALYST last year, we print the following abstract (from the *Weekly Drug News*) of a preliminary report by Professor J. W. Mallett, F.R.S., University of Virginia, U.S.A., on the results of an investigation made by direction of the New York National Board of Health as to chemical methods in use:—

Examination of Water Samples in general.

1. Great care should be taken that water samples be placed in the hands of the analyst, and their examination begun with the least possible delay after they have been collected. The changes which take place, sometimes rapidly, on keeping, may seriously affect the results, especially in the case of waters much polluted by foul organic matter.

2. It is very desirable that, besides examining a water in its perfectly fresh condition, samples of it should be set aside, in half filled but close glass stoppered bottles, for some time—say 10 or 12 days—and one of these examined every day or two, so as to trace the character and extent of the changes undergone. Not only may conclusions be drawn from such a series of observations as to the general stability or decomposability of the organic matter present, but light will be thrown upon the changes which may be expected to occur under ordinary conditions when the water is stored for use, as in cisterns, wells during periods of drought, or carelessly allowed to remain stagnant in pitchers, water coolers, &c.

Combustion Process.

1. In applying this process, no matter how skilled or well trained the analyst may be, duplicate or even triplicate concordant results should be insisted upon before accepting the determinations as trustworthy.

2. In order to avoid the presence in the atmosphere, about the water bath used for the evaporation, of ammonia derived from coal gas, the bath should be heated by steam brought in a small, closed pipe from a distant boiler, preferably situated in another room, and the waste steam and condensed water therefrom should be in like manner carried off to a safe distance.

Albumenoid-Ammonia Process.

1. In order to avoid the uncertain ending of the collection of ammonia, whether "free" or "albumenoid," it would be well to adopt the rule that the distillation be stopped when, and not before, the last measure of distillate collected contains less than a certain

proportion—say one per cent.—of the whole quantity of ammonia already collected. This would in many cases involve the necessity of replenishing the liquid contents of the retort with ammonia-free water.

2. In order to diminish the loss of amines or other volatile forms of nitrogenous matter, a separate distillation should be made with alkaline permanganate added at once, in addition to the usual course of treatment prescribed by Wanklyn—distillation begun with sodium carbonate, and continued after addition of the alkaline permanganate. The results of the two separate distillations should then be compared.

3. In reporting the results obtained by the albumenoid-ammonia process, including the determination of free ammonia, the details of the evolution of ammonia, as collected by separate measures of distillate, should always be given.

Permanganate Process.

1. In view of the evidence obtained rendering probable the loss of organic matter by volatilization in the use of acidified permanganate at a boiling temperature, the Tidy form of the process is rather to be recommended than that of Kubel if but one be used.

2. On the other hand, the advantage of more extended oxidizing action, and the greater general accordance of the results by the Kubel process with those for organic carbon by the combustion process, make it desirable that as far as possible the same advantages should be secured by substituting the influence of time for that of temperature, and that the time during which the permanganate is allowed to act in the Tidy process should be increased to at least 12, better to 24, hours, several determinations (on different samples set aside at the same time) being made at such intermediate intervals as 1, 3, 6, 9, and 12 hours, in order to trace the progress of the oxidation.

SUGGESTIONS AS TO POSSIBLE IMPROVEMENTS ON THE PROCESSES EXAMINED DESERVING FURTHER INVESTIGATION.

Combustion Process.

1. I would propose to evaporate the water, not under ordinary pressure and in contact with the atmosphere, as usual, but as the specimens of water were evaporated for the biological experiments, in a closed vessel immersed in a water bath and connected with a good (water jet) air pump, so as to secure a nearly complete removal of air, with a condensing worm to dispose in part of the aqueous vapour given off. It would not do to simply place the water in a flask, since the residue could not be removed for combustion, but it would not be difficult to arrange a suitable vacuum vessel, with wide mouth and tightly clamped on cover, within which might be placed the usual glass dish to receive the water, and the feed might be managed through a nearly capillary tube with a glass stopcock. By such an arrangement the evaporation might be effected within a moderate time at a fixed temperature much lower than the boiling point, thus probably reducing any loss from simple volatilization of organic matter; the nearly complete exclusion of air would tend to greatly diminish or do away with loss of organic matter by oxidation, and permit of large reduction in the quantity of sulphurous acid used; for the same reason the tendency to formation of sulphuric acid would be reduced to a minimum, and the absorption of ammonia from the atmosphere about the dish would be altogether prevented. In testing this last named effect, two bulb tubes containing pure sulphuric acid might be interposed between the vacuum chamber and the pump; the contents of the one to be tested for ammonia given off

from the water, those of the other to guard against any trace of ammonia coming back from the outside air during irregular action of the stream of water.

2. In order to avoid loss during the evaporation of readily volatile substances, such as butyric, valerianic, &c., acids, to dispense with the necessity for the uncertain and unsatisfactory correction for ammonia lost by dissociation, to get rid of the influence on the determination of organic nitrogen of any errors in the determination of the total ammonia, and to avoid corresponding difficulties arising from the presence of nitrates if these be allowed to remain, it might be well to evaporate at first with the addition of a small excess of magnesia (as recommended by Lechartier), thus removing all ammonia, and then, the water having been brought down to a small volume, add a moderate excess only of sulphurous acid* with a drop of a solution of a ferrous salt (as directed by Frankland), and complete the evaporation to dryness—the whole process to be carried out in a jet pump vacuum, as above suggested

3. Further experiments are desirable in order to completely determine the merits and defects of the Williams' ("copper-zinc couple") method for the removal of nitrates.

4. Some preliminary experiments of my own seemed to show that nitrates and nitrites may be completely reduced by evaporating to a small bulk with no great excess of phosphorous or hypo-phosphorous acid, guarding against the evolution of phosphoretted hydrogen by the low temperature employed, then adding magnesia in small excess and completing the evaporation, thus leaving the residue in a pulverulent instead of a sticky condition, easy of removal from the dish, and probably allowing of complete combustion without inconvenience from the final oxidation of the small excess of phosphite or hypophosphite, and without any wrapping up of carbon particles. This plan deserves to be carefully tested.

Albumenoid-Ammonia Process, including Determination of Free Ammonia.

1. In order to prevent, or at least to largely reduce and render uniform, the loss of ammonia from imperfect condensation, I would prefer to effect the distillation, not by a lamp flame, but in a retort of uniformly determined shape and size, uniformly immersed in a bath of saline solution or other suitable material kept at a uniform temperature—say 102° or 105° C.—by means of steam, and to condense in a glass worm, surrounded by ice-water, sufficiently long to bring the distillate to a uniform temperature, not exceeding say 5° C.

2. It would be perhaps still better to conduct the distillation in a completely closed apparatus, with a fixed difference of temperature between the retort and the far end of the fully effective condensing tube, with a glass stopcock to draw off the distillate in successive measured portions, and a little safety valve (mercury or other) near the cold end to prevent any dangerous difference of external and internal pressure.

3. In the determination of free ammonia, with a view to distinguishing as sharply as possible between ammonia really existing as such or in ammoniacal salts and that found by breaking up of organic matter, it might be well to try a closed distilling apparatus connected with a (water jet) air-pump, so as to maintain a partial vacuum within, keeping the retort at a fixed temperature much below 100° C. and collecting the whole of the ammonia in a flask and one or more bulb tubes containing rather weak mineral acid, interposed between the condenser and the pump. This would, however, be attended with the disadvantage of

* I doubt, however, the possibility of fully reducing nitrates, by means of sulphurous acid, if they are present in large quantity.

not readily permitting the progress of the evolution of ammonia to be traced by its collection in separate successive measures of distillate; and it would become necessary to ascertain whether the application of the Nessler test would be in any way interfered with by the sodium salts formed from the acid used to collect the ammonia.

4. In order to overcome, if possible, the most serious difficulty in the way of a correct determination of free ammonia, namely, the ready breaking up of urea (and other amides), when present, on heating with sodium carbonate, it would be well to ascertain at how low a temperature and within what time, if at all, ammonia really existing in ammoniacal salts could be completely driven off from an extremely dilute solution by adding a small excess of magnesia and maintaining a (water jet) air-pump vacuum above the liquid, forming a stratum of small depth, with bulb tubes of acid between the liquid and the pump to intercept the ammonia, and guard tubes to prevent any being received from the air; in other words, to ascertain whether Schlœsings's method for the determination of ammonia admits of being applied to such excessively minute amounts of it as the water analyst is concerned with.

5. In the conduct of the albumenoid-ammonia process proper, *i.e.*, the distillation with alkaline permanganate, I would propose that the original volume of liquid in the retort be maintained constant, by running in at the proper rate, through a nearly capillary tube with a glass stopcock, ammonia-free distilled water. And, in cases in which the amount of organic matter is so large as to wholly, or in great part, reduce the usual charge of alkaline permanganate, I would determine by a preliminary experiment at about what rate the reagent is used up, and would then progressively supply its solution, instead of simply pure water, at such a rate as to keep the original strength as nearly as possible unaltered.

Permanganate Process.

1. The principle involved in the last paragraph applies also to this process. Instead of using a fixed amount of permanganate at first, and adding a second or third charge only when the former has been completely reduced, there ought to be a fixed excess at the end of the action, or rather there should be present a constant excess all through the process. Hence, when a preliminary experiment has shown that more than the usual charge of permanganate will be needed, and about the rate at which it will be consumed, for the final experiment additional permanganate solution should be gradually dripped in, from a nearly capillary tube, at such a rate as to maintain the original excess as nearly as possible constant.

2. It is desirable that the process be carried on at a pretty nearly fixed temperature. If the Tidy method be followed, a temperature of say 20° C., could, with a little management, generally be secured, and the flasks kept approximately at this point during the time required for the action.

CREOSOTE—ITS TESTS AND ACTION.*

BY M. HAGER.

I HAVE previously written on the curative value of creosote and the preparation of creosote pills. Now that we are able to procure and dispense genuine creosote from beechwood tar, I take the liberty of again treating the subject from a therapeutical and chemical point of view.

* Translated for *The Weekly Drug News* from *Deutsch Amerikanische Apotheker Zeitung.*

Camboulives, a French physician, warns us in his *Manuel Pratique de la Therapeutique* to distinguish well between creosote and phenol (carbolic acid), as the former from beechwood tar was destined to play a great part in therapeutics owing to its powerful action. More than this; it coagulates albumen, has the property of preserving animal substances for a long time, and being antiseptic, anatomical preparations can be kept in a lasting state of preservation.

But creosote has other virtues, owing to its causticity and astringent power. When put in contact with the skin it produces wounds that are similar to burns and pain like them. On account of its corrosive power it is much used to kill the tooth nerve in toothache. When diluted it is no longer caustic, but becomes astringent. Taken inwardly in moderate doses it develops a feeling of warmth in the stomach with sour eructations, &c. When it has passed into the blood circulation it tightens the capillaries, and decreases the mucous flow both in the bladder and the air passages.

Camboulives remarks further: "This medicament has enjoyed an undeserved reputation since its discovery, for people were soon convinced that it was only useful for carious teeth and toothache." Nevertheless, Bouchard and Gimbert endeavoured to restore its reputation as a curative agent, and they administered it in pulmonary consumption, &c. Their experiments were successful, and they have published a long list of their observations, to the effect that creosote after being administered for a week or two has the effect of decreasing the expectoration, lessening the cough, increasing the appetite, removing the fever, increasing the strength, and almost suppressing night sweats, while it gives an *embonpoint* such as the patient had only in his healthy days. The abnormal noise heard in the breast of the consumptive ceases and is replaced by a healthy respiration, or at least is smoother in sound owing to the cicatrization of the diseased pulmonary tissue. The improvement in condition may continue for months, provided that the cure is not interrupted too soon. These physicians observed that the symptoms of the disease recur as soon as the use of the creosote is neglected, in the opinion that the lungs are healed.

From these statements it will be seen that Camboulives and many others did not believe in this beneficent action of creosote. They used it without obtaining the desired results. But creosote is a medicament that comes into the market of various degrees of quality, and if the apothecary does not dispense the genuine beechwood tar creosote—*Kreosotum faginem*—the expected results cannot be had.

To ascertain how justified was this unequalled action of creosote, I made use of it in several cases, and I found that consumptives, and sufferers from chronic catarrh visibly improved, and in one instance its use had to be stopped because the *embonpoint* of the patient who had lost flesh considerably, had so increased that new and large clothes had to be obtained. The results obtained by Bouchard and Gimbert have been fully confirmed by my experience, but, of course, only where genuine creosote is employed.

Among the curative qualities of creosote must also be reckoned its anti-asthmatic action. A railway employé who suffered from *asthma spasticum* and who derived some relief from the usual remedies without getting rid of the attacks, had only two attacks after taking the creosote pills. These, however, were mild, and they then ceased altogether. As a precautionary measure, however, he continues, to take the pills every other day.

As creosote made from beech tar is one of the grandest remedies for keeping up

consumptives and those suffering from bronchial diseases, for increasing the flesh of the emaciated, removing asthma, and perhaps bringing tuberculosis to a standstill in its early stages, as well as relieving kidney diseases and destroying the vitality of intestinal worms, it is the incumbent duty of the apothecary to dispense only the genuine and to convince himself of its quality. We shall explain the marks of genuine creosote and the sources from which it can be had.

In a case before me are phenols and creosotes, as follows:

1. Colourless Kreosotum.
2. Colourless Kreosotum album verum.
3. Yellow Kreosotum Anglicum.
4. Brownish Yellow Kreosotum Faginum.
5. Chemically pure Ph. G. Kreosotum from beechwood tar (Kreosot Hannoveranum) yellowish.
6. Kreosotum Saginum (A) yellow.
7. ,, ,, (B) yellow.
8. ,, ,, (C) brown.

Out of these eight kinds only Nos. 4 and 5 proved to be genuine; No. 8 was genuine but very dirty.

1. Pure creosote made from beechwood tar is insoluble in double its volume of anhydrous glycerine, while other creosotes are completely soluble, or give a perfectly limpid mixture. When the mixture is milky or whitish with double the volume of anhydrous glycerine, the creosote is presumably pure, but if coloured (No. 8 was of a muddy red) then the creosote is not genuine.

Phenol is not an adulterating agent in every case; there are others which are not soluble in glycerine, and least of all in a solution of 75 per cent. of glycerine (as for instance creosol or creosylalcohol).

Nos. 1, 2, 3, 6 and 7, when mixed with a double volume of anhydrous glycerine gave clear liquids. Mixtures of $\frac{1}{4}$ to $\frac{1}{3}$ of creosote and $\frac{3}{4}$ to $\frac{2}{3}$ of phenol with glycerine under the same conditions give clear liquids.

2. To observe the action of the phenol, we mix three volumes of glycerine (75 per cent.) with one volume of the suspected creosote and shake well. Two layers will be formed when the mixture settles; one will be very muddy; the other somewhat less so.

The volume by which the last layer has been decreased is approximately that of the phenol present; in order to ascertain it definitely we must increase the layer of the 75 per cent. glycerine by an equal quantity of the same glycerine and shake the whole well. The phenol passes into the glycerine up to 98 per cent.; or we can shake up the creosote with 5 per cent. of caustic ammonia, which dissolves phenol but not creosote from beech tar.

Graetzel and the writer both observed that creosote when agitated with glycerine almost doubled its volume. But, with an undoubtedly genuine specimen before us, we cannot obtain this increase of volume, and this change cannot therefore be regarded as an indispensable mark of beech tar creosote.

These two tests (1 and 2) with anhydrous and 75 per cent. glycerine indicate whether we have genuine creosote, but two reactions are yet required to fully prove it. 3. Equal volumes of creosote and soda lye (of 1·334 specific gravity) are mixed together to ascertain

the wood tar particles. With a very slight degree of heat development there is a clear yellow solution. If the mixture is not clear and transparent, or has another colour, or when it stiffens to a non-liquid mass, the creosote is not pure, if it be present at all. No. 1 gave a muddy whitish, and No. 8 a grayish brown mixture, which thickened after the lapse of half an hour. The remaining non-creosote specimens gave light lemon, dark lemon, or brownish yellow mixtures. No. 4 gave a red mixture, and contained 9 per cent. of non-creosote matters.

The new German *Pharmacopœia* gives a variation of this lye reaction. The soda lye of 460 specific gravity and creosote mixed by equal parts of weight should give a clear liquid (it may be yellow), but must not be dark coloured or throw off bad-smelling tar when diluted with water. According to this test, three kinds of non-creosotes, Nos. 1, 2, and 3, genuine creosotes, and only No. 8 gave a dark coloured muddy mixture. Testing with a soda lye of 1·334 specific gravity is therefore to be preferred. 4. Beech tar creosote gives a clear solution in petroleum benzine. A mixture of 1 volume creosote and 2 volumes of benzine is almost colourless or yellowish, but perfectly clear. Neither phenol nor cresol are soluble in benzine, and creosote gives a rather muddy mixture with even 5 per cent. of this phenol, which, after settling an hour, separates into two layers. This benzine solution, when transparent, is divided into three portions. The first is decomposed by an equal volume of caustic ammonia; the second by a lye of caustic soda of 1·160 specific gravity, and both parts are well shaken. No dark colouring, dark brown, or cinnamon should show itself in the course of half an hour. The third portion is (according to Hartmann and Hauers) mixed and shaken up with an equal volume of caustic baryta water. In this case neither blue, violet, nor red colour should appear. It is immaterial in what layer, the aqueous or the oily, the colouration is; they indicate tar components which should not be present.

5. Mix 1 volume of creosote and 2 volumes of a 15 to 18 per cent. caustic ammonia, shake well, and put aside. The genuine clear creosote will, in the course of half an hour, be coloured almost a lemon shade, and an aqueous layer on top will be yellow gray or some pale colour. A dark colour indicates foreign bodies, and if the volume of the creosote has diminished it contains phenol, cresol, or kindred matters that do not belong, however, to creosote. The test can be made with even a 10 per cent. caustic ammonia, but a double volume is then requisite.

6. Equal volumes of collodium and creosote should not form into a jelly, but should rather become a liquid mass after half an hour; in the contrary case more or less phenol is present.

The first three or five tests are sufficient for true creosote, so that the other reactions may be dispensed with.

A creosote that does not comport itself as such should not be used, at least inwardly. Some of the kinds may be admitted for external veterinary use, but must not be classed as genuine.

Doses should be as small as possible, but often repeated. Proper doses for an adult are 0·02 to 0·03 and 0·04 two or three times daily. The maximum single dose is 0·05, and the maximum for a day 0·2. The pilulæ Kreosotatæ contain 0·0167 g. in each pill (Ph. Centralh. 1881). Consumptives in the last stage may take two or three of these pills two or three times a day, according to bodily size, and if they feel tolerably well after some days'

use, they should take two or three pills uninterruptedly night and morning, dropping them, perhaps, one or two days a week.

Pure creosote is pale yellowish, exudes oil, and is of 1·06 specific gravity. The gravity should be fixed at 1·050 to 1·080, as the lighter creosotes were either impure or not properly such.

Creosote is best administered in pills. The pilular mass is made by melting together 2 parts of yellow wax and 1 part of creosote, to which other suitable ingredients are added in form of powder, as quinine salts, salicylic acid, bals. solution, rad. gent., &c. Any addition of ether or spirits of wine, to give consistency to the mass, should be avoided, and is not necessary.

A lukewarm mixture of 7·3 creosote and 15·0 cera flava can, however, be mixed with 40·0 or 45·0 of the powder, so as to form a good pilular mass.

REPORTS ON ADULTERATION IN THE STATE OF NEW YORK,

From the *Sanitary Engineer*, New York.

(Concluded from page 186.*)*

Group XII.

Granular effervescent Salts; Fluid Citrate of Magnesia; Seidlitz Powders.

Report by W. G. Tucker, M.D., of Albany, N. Y.

"Under the head of 'Effervescing Medicinal Preparations,' are included a large number of effervescing salts and compounds, many of which, however, are but little known and have but a limited sale. It was therefore deemed best to make an examination first of the two most important officinal preparations belonging to this class, both of them being well known and highly popular remedies which have long been largely sold and commonly employed, namely, the seidlitz powders (Pulveres effervescentes aperientes, U. S. P.) and the solution of citrate of magnesium (Liquor magnesiæ citratis, U. S. P.) The sales of these two preparations in this State probably largely exceed those of all other effervescing preparations (used strictly as medicines) combined."

I. SEIDLITZ POWDERS.

These are officinal, having been introduced into the Pharmacopœia of 1850.

Composition, etc.—"One powder (commonly enclosed in a white paper) contains 35 grains of powdered tartaric acid, and the other commonly wrapped in blue paper) contains an intimate mixture of 40 grains of bi-carbonate of sodium and 120 grains of the double tartrate of sodium and potassium, or 'Rochelle salt.' When the contents of the two papers are separately dissolved in water and the solutions mixed, the chemical reaction which takes place results in the formation of the neutral sodic tartrate and the liberation of carbonic acid gas, which aërates the mixture, while the Rochelle salt is unchanged. The proportions in which these substances are directed to be employed are almost exactly those which insure the complete decomposition of the bi-carbonate, the chief use of which is to render the mixture effervescing, while the Rochelle salt, a gentle purgative, is the chief medicinal ingredient, although the sodic tartrate produced by the decomposition of the bi-carbonate is not entirely inert. It is therefore seen that these proportions should be preserved, and that if they be widely departed from the powders become less valuable, inert or even harmful. Thus if the Rochelle salt be reduced in quantity while the amount of the bi-carbonate is increased, without at the same time increasing the amount of tartaric acid, the medicine as administered consists largely of undecomposed bi-carbonate of sodium, so that instead of furnishing an aërated solution of neutral purgative salts, it consists largely of the alkaline bi-carbonate, possessing no value as a cathartic, and perhaps even operating injuriously."

Chief sophistications.—Since the cost of Rochelle salt varies from 32 to 36 cents per lb., and that of the bi-carbonate of sodium but from 4½ to 7 cents per lb., it is a not unusual practice to diminish the quantity of the former and increase that of the latter ingredient.

Some slight variation from the correct standard there will generally be, since it is exceedingly difficult intimately to mix the two substances so as to render the composition of a batch of the powder perfectly uniform, but this mixture should be accomplished by proper machinery if the powders are made on a large scale, and the proportion of the two ingredients ought not to vary far from the correct ratio of one to three.

Aside from this unwarranteed alteration, powders are frequently sold which fall below the officinal weights. Slight errors will of course occur, because these powders are ordinarily measured and not weighed, but the variation ought not to be large.

Samples examined.—Seventy-two powders wers examined, of which 35 were received from New York, and 37 were collected in Albany and vicinity.

1. *Tartaric acid.*—The average weight of the samples received from New York was 42·6 grains, being 7·6 grains above the prescribed weight. The smallest powder weighed 25 grains and the largest 60 grains.

The average weight of the samples obtained in Albany and vicinity was 35 grains—18, however, being under weight. The smallest weighed 18 grains and the largest 56 grains.

The average weight of 71 samples was 38·7 grains.

There seems little reason to doubt that the amount of tartaric acid is often purposely increased for the sake of decomposing the excess of the bi-carbonate employed in the seidlitz mixture.

2. *The seidlitz mixture.*—The average weight of 35 samples obtained from New York was 162·5 grains, or 2·5 grains over weight. The variation was considerable; 14 were under weight, and 21 over weight, the smallest weighing only 90 grains and the largest 206 grains.

Of the 36 samples collected in Albany and vicinity, the average weight was 143·7 grains. The smallest weighed 63 grains and the largest 225 grains. The average weight of 71 samples was 153·1 grains.

Chemical examination.—A qualitative examination was first made of each powder. The contents of the white paper was proved in every instance to be tartaric acid of good or fair quality. Almost all the samples showed, as would naturally be expected, traces of sulphates and varying traces of lead.

The "seidlitz mixture" contained in the blue paper was found in but three instances to be other than a mixture of Rochelle salt and soda. In one of these labelled "siedlitine." sugar was added; a second contained considerable quantity of bi-carbonate of soda, and in the third the soda was omitted entirely, probably through mere carelessness. No make-weight, or any gross adulterant was detected in any of the powders, save as here stated.

Traces of sulphates were found, but nothing indicating the intentional addition of sulphate of soda, as has been frequently asserted.

The quantitative estimation of bi-carbonate of soda in the seidlitz mixtures was effected by determining the carbonic acid gas in about 4 grammes of each powder, "and in case a qualitative examination had shown no other constituent in decided quantity than soda and Rochelle salt, the amount of the latter was determined approximately by subtracting from the weight of the powder taken the weight of the soda calculated. The ratio was then determined by dividing the weight of the Rochelle salt thus obtained by the weight of soda present. Since good articles of commercial bi-carbonite were found to yield from 94·97 per cent. of real hydro-soda carbonate, 5 per cent. was added to the amount of the constituent calculated."

Results.—"Thirty-five samples from New York gave a ratio of soda to Rochelle salt of 1 : 2·49, while 35 from Albany and vicinity gave a ratio of 1 : 2·63, the correct officinal proportion being 1 : 3. The average of 70 samples was 1 : 2·56. Calling a variation in the proportion of Rochelle salt to soda of from 2·8 to 3·2 of the former to 1 of the latter as fairly allowable, we find that in the 70 samples examined, 50 per cent. fell below the ratio of 2·8 : 1, the lowest ratio being 1·05 to 1, or nearly equal parts of each constituent; 31 or 40 per cent. gave a ratio of between 2·8 and 3·2 to 1, and only 4 of over 3·2 to 1, clearly showing that this variation is by no means accidental, but evidently the result of an intentional alteration in the proportions of the ingredients employed."

Conclusions concerning seidlitz powders.—1. Gross adulteration is probably uncommon. 2. The weights of both the acid and the seidlitz mixture showed a great diversity, and in many instances the

powders are without doubt intentionally manufactured of short weight. 3. The ratio in which the constituents were present in the seidlitz mixtures was in at least one-third the samples too low to be accounted for save by intentional decrease fn the amount of Rochelle and increase in the amount of soda. Such a disproportion annuls or materially lessens the efficacy of the powders for the purpose intended.

II. SOLUTION OF CITRATE OF MAGNESIUM.

This also is an officinal preparation, having been introduced into the Pharmacopœia of 1850, and continued in those of '60 and '70, the formula, however, being changed in each instance. The preparation is a highly popular one, and is largely sold, more particularly in cities and large towns.

To be "officinal," it should be prepared by the process prescribed in the Pharmacopœia of 1870, although this, with those which have preceded it, is open to some objections, the chief being that after standing for some time the solution deposits a granular precipitate of magnesia citrate. Probably this difficulty cannot be obviated except by diminishing largely the amount of carbonate of magnesium employed in its manufacture.

Sophistications.—In order to obtain a clear, unalterable, saleable solution, and also to lower the cost of manufacture, an effervescing solution of sodium tartrate made in various ways, sweetened with simple syrup and flavoured with essence of lemon to simulate the real citrate, is frequently sold in its stead and under its name.

Fourteen samples were examined, 9 from New York and 5 from Albany and vicinity. Of the 9 New York samples 6 contained magnesic citrate, potassic citrate (potassic citrate being added in bottling and just before corking, to cause effervescence) and free carbonic acid. These contained no carbonic acid, and may be considered genuine. Three consisted mainly of a solution of sodic tartrate, and contained no magnesia nor citric acid. Of the 5 samples obtained in Albany and vicinity, 2 consisted of a solution of magnesic citrate, &c., and were considered genuine, while three were solutions of sodic tartrate, and contained no magnesia nor citric acid. Of the 14 samples examined 6 were therefore spurious, from which it would appear that the preparation sold under the name of the "solution of citrate of magnesia" is frequently sophisticated.

ON A NEW METHOD OF MAKING A VOLUMETRIC SOLUTION FOR DETERMINING THE HARDNESS OF WATER.*

By C. R. C. Tichborne, F.C.S.

It was remarked that to determine the hardness in waters we have never been able to improve, or modify, to any extent the original process of Dr. Clarke, invented nearly half a century ago. The most important proposals have been made in connection with the making of the soap solution and the standard calcium solution used for titration. Dr. Clarke used a soap made from animal fats (curd soap), and it has been respectively proposed to use a soft soap made from olive oil, lead soap *(emp. plumbi)*, or a soda soap of olive oil (Castile soap). These are undoubtedly better than curd soap, as the fatty acids in the others mainly consist of oleic acid, and the oleates are less prone to separate in cold weather.

Dr. Tichborne now proposes to prepare a definite oleate of soda to replace the somewhat variable soap solution. He points out in this paper that oleic acid forms a monobasic and a dibasic salt. Either answer for the purpose.

The following is the process:—

Five c.c. of oleic acid are measured with a pipette and 50 c.c. spirit added to it in a beaker; 2 drops of phenolphthalein solution are also added, and immediately a volumetric solution of soda is run in until a pink indication is produced. This indicates that the point of neutrality has just been passed. The result is a solution of the monobasic salt A

* Read at the meeting of the British Pharmaceutical Conference.

drop more of the volumetric solution of soda develops the pink to a magenta, but, as the process goes on the solution again becomes decolorised, indicating the formation of the dibasic salt. When half the second equivalent of soda has been added the solution begins to pectise, and when the process is complete the solution becomes a solid jelly. Whichever solution is made (the author prefers the latter, as it lathers more freely and is more permanent), the oleate of soda is then made up to the required measure by the addition of a mixture of equal parts of rectified spirit and distilled water.

The advantages claimed are that the soap solution may be made in five minutes, requires no titration against a standard water, and is more permanent than those made from ordinary soaps.—*Chemist and Druggist.*

PURIFICATION OF SULPHURIC ACID BY CRYSTALLIZATION.

In the *Zeitschrift für Analytische Chemie*, Tjaden Moddermann remarks that he has for some time been accustomed to prepare pure sulphuric acid by recrystallization of the hydrate $H_2SO_4H_2O$, and finds this seldom adopted method of purification to be really an excellent one. The author has experimented in this way upon acids containing considerable quantities of lead and arsenious and nitric acids, &c., and by protracted recrystallization has in all cases obtained a pure acid from them. The method is very simple. The acid is mixed with sufficient water, and, in bottles two-thirds full, exposed to the cold in the open air on a frosty night. If the mixture has been properly made, it is generally frozen throughout the next morning. The chief thing then is to carefully separate the crystals from the mother liquor, and for this purpose the author employs a centrifugal apparatus, so constructed that the acid only comes in contact with glass. The separation is very easily effected, and except in cases where an acid is strongly contaminated with the different oxides of nitrogen, one recrystallization is generally sufficient.

SODA IN COMMERCIAL POTASH.

A Belgian chemist gives the following method for detecting the presence of soda in samples of carbonate of potash. It is based on the fact that chloride of sodium is much less soluble than chloride of potassium in strong hydrochloric acid. A solution of the potash to be tested is prepared, the potash being dissolved in ten times its weight of water. One ounce of this solution is saturated with diluted hydrochloric acid, and then evaporated until it is dry. The residue, which is a fine powder, is introduced in a bottle of 10 oz. of hydrochloric acid of 1·189 specific gravity which has been previously saturated with chloride of sodium, being then added. The mixture is well shaken, then left to settle, and after five or six hours all the chloride of sodium will have settled to the bottom, whilst the chloride of potassium will be in solution. The whole is now filtered through asbestos, and the deposit is washed with hydrochloric acid saturated with chloride of sodium. It is then dried at 150° C., weighed, and will consist entirely of chloride of sodium, an accurate result being obtained if the operation has been carefully executed.—*Weekly Drug News.*

A late analysis of ash from the last eruption of Vesuvius shows it extremely rich in sulphuric acid, phosphoric acid, soda, potash, lime and iron. Doubtless there are many chemicals to be had from the products of this great laboratory of nature. An American journal remarks that were such an "institution" in that country it would have been utilized ere this.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in October, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Oct. 19	bluish	none	1·84	none	·29	·0029	·0043	trace	·032	20 0°	5·5°	35·2	satisfactory	Wigner & Harland.
New River	,, 21	c. f. yellow	none	1·09	trace	·14	·0018	·0021	·002	·007	16 0°	5·0°	21·3		B. Dyer.
East London	,, 19	c. yell. green	none	1·20	none	·08	·0056	·0033	·016	·060	13·0°	3·2°	19·4	satisfactory	Wigner & Harland.
Southwark & Vauxhall	,, 19	c. p. y. & clear	none	1·24	none	·18	·0007	·0049	·028	·053	14·0°	3·5°	19·3	none	John Muter.
West Middlesex	,, 30	c. yell. green	none	·95	trace	·10	·0007	·0052	·069	·137	13·0°	4·0°	18·5		O. Hehner.
Grand Junction	,,	pale straw	none	1·24	trace	·17	·0005	·0048	·021	·068	13·3°	3·4°	19·6		A. Wynter-Blyth.
Lambeth	,, 19	c. p. y. & clear	none	1·24	trace	·17	·0007	·0049	·026	·050	14·5°	4·0°	19·6	none	John Muter.
Chelsea	,, 19	c. p. br. yell.	none	1·23	trace	·18	·0007	·0045	none	·026	13·7°	4·0°	19·3		A. Dupré.
Birmingham	,, 2	c. gr. yellow	none	1·12	trace	·69	none		·091	·245	10·5°	4·4°	15·0	none	A. Hill.
Bolton	,, 16	s. yell. & turbid	s. mossy	·48	none	·02	·0018	·0080	·033	·062	3·6°	3·4°	7·8		W. H. Watson.
Brighton	,, 10	c. p. blue	none	5·39	trace	·25	trace	·0032	none	·010	12·0°	4·6°	25·2	veg. debris	Wigner & Harland.
Bristol	,, 9	brnsh. green	none	·86	none	·06	·0002	·0050	·023	·034	13·7°	2·3°	19·0	sand veg. debris	F. W. Stoddart.
Cambridge	,, 20	c. p. blue	none	1·40	trace	·40	·0010	·0020	none	·020	17·0°	5.5°	24·5	satisfactory	J. West Knights.
Edinburgh	,, 16	s. brown	faint	·88	s. trace	trace	trace	·0056	·016	·134	3·9°	3·7°	4·8	none	J. Falconer King.
Exeter	,, 16	f. b. yellow	none	·84	s. trace	·15	none	·0029	·037	·063	2·7°	2·7°	6.3		F. P. Perkins.
Hereford	,, 25	clear colourless	none	1·25	none	none	·0012	·0025	·001	·008	5·0°	2·8°	5·0°	none	G. J. Stephens.

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									15 mins. at 80° Fahr.	4 hours at 80° Fahr	Before Boiling.	After Boiling.			
Liverpool	Oct. 26	yell. green	s. peaty	1·08	trace	·05	·0028	·0042	·014	·073	3·5°	2·9°	7·5		A. Smetham.
Maidstone—															
Wtr. Company	,, 17	c. green	none	2·40	trace	·58	·0014	·0028	·014	·060	17·2°	7·0°	33·5	none	M. A. Adams.
Public Conduit	,, 17	c. blue	none	2·20	trace	·59	none	·0014	·004	·009	17·5°	7·0°	33·2	none	M. A. Adams.
Manchester....	,, 25	s. turb. s. yell.	none	·73	trace	none	·0027	·0078	·078	·146	1·7°	1·7°	4·4	satisfactory	W. Thomson.
Northwich	,, 14	green yell.	none	3·00	h. trace	·10	·0004	·0020	·110	·187	11·0°	7·0°	18·2	diatoms, veg. deb., &c.	C. M. Blades.
Norwich	,, 9	p. grnsh. yell.	none	2·00	trace	·08	traces	·0120	·039	·090	12·5°	6·5°	16·0		W. G. Crook.
Nottingham ..	,, 17	c. p. blue	none	1·20	none	.84	·0029	·0034	trace	·020	8·2°	7·0°	15·4	veg. debris	Wigner & Harland.
Portsmouth ..	,, 17	turbid reddish	none	1·20	trace	·17	traces	·0126			13·5°	2·3°	18·5	veg. deb., movg. org. diat.	W. J. Sykes.
Rugby	,, 9	c. p. yellow	none	1·30	h. trace	·07	·0060	·0102	·040	·096	13·5°	7·5°	19·4	veg. deb., diatoms	A. P. Smith.
Salford	,, 13	yellow	none	·60	none	trace	·0007	·0014	·022	·098	3·0°	2·5°	5·0		J. Carter Bell.
Southampton ..	,, 26	v. t. orang. yel.	none	·99	trace		trace	·0163	·054	·159	11·3°	3·3°	18·3	veg. deb., diat., organisms	A. Angell.
Swansea	,, 25	s. turb.	none	1·00	trace	none	·0014	·0056	·003	·004	1·5°	1·4°	4·0	earthy matter	W. Morgan.
*Worcester	,, 16	p. yell. s. turb.	none	2·15	trace	·21	·0005	·0084	·023	·153	16·2°	7·5°	24·4	veg. deb. animal	W. E. Porter.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

* The River at this date was rising fast, and the water was much discoloured.

ERRATA.—September Table.—Chelsea Water, Oxygen absorbed in 4 hours should be ·030 instead of ·003; Birmingham Water, Ammonia should be ·0014 instead of ·1014; Norwich Water, Vegetable Debris should not have been inserted.

THE SOLUBILITY OF BORIC ACID IN GLYCERINE.*

By David Hooper.

Professor Barff's "Boro-glyceride," and still later the glycerborate of calcium and the glycerborate of sodium, described by M. Le Bon in the *Comptes Rendus*, xcv., 145, have created a demand for these antiseptics. Mr. Hooper's experiments were directed to the elucidation of the solubility of the one substance in the other at various temperatures. Especial care was taken to ensure absolute purity of the two substances. The result of a number of determinations showed a regular progression of solubility as the temperature was increased. Thus at 0° C. 100 of glycerine dissolve 20 of boric acid; at 25°, 30 parts; at 50°, 43 parts; at 75°, 58 parts; and at 100°, 72 parts.—*Chemist and Druggist.*

REVIEWS.

Sugar Growing and Refining.

By Charles G. Warnford Lock, G. W. Wigner, and R. H. Harland.

London: E. & F. N. Spon, 16, Charing Cross.

This work (which extends to 750 pages, and is illustrated by 215 plates and engravings) is a comprehensive treatise on the culture of sugar-yielding plants and the manufacture and analysis of sugar. It also contains subject matter upon milk and starch sugar, and on the distillation of rum. Any criticism of this book in these columns would be manifestly out of place, and we can only sketch the outlines of the work, leaving our readers to see for themselves and form their own opinion of its merits. The book commences by a short notice of the general chemistry of sugars, and then we have seven chapters devoted respectively to the culture of the cane, composition of the juice, extraction, defecation, and concentration of the same, and to the granulation and curing of the sugar. Next after cane we find five chapters devoted to beet-root, on the same plan, and one each to maple, milk, palm, maize, and starch sugars. Then follows a long section on sugar refining, with a summary of all the patents which have been from time to time taken out in this matter, and another equally complete on the analysis of sugar both by the optical and chemical methods. Although this portion of the work is exhaustive, yet it also aims at being concise, and only the best processes, which have been thoroughly proved in the laboratory of the authors of the section, are recommended. The authors, in addition to each bringing his own special experience to bear on his own section, have consulted such other acknowledged authorities as Messrs. B. E. R. Newlands and Maxwell Lyte, as well as several large sugar planters.

Handbook of Volumetric Analysis (Fourth Edition).

By F. Sutton, F.C.S., F.I.C. London: J. & A. Churchill, New Burlington Street.

The fourth edition of this book has been on our table for some time. We should have reviewed it earlier, but that it is already so well known to all English-reading chemists that we should fancy any recommendation of it unnecessary. The fact that the book has reached a fourth edition speaks for itself; but further than that, each edition appears to bring in not only improvements in the old processes described, but considerable changes in the way of addition of new processes which are of value for those special analyses which

* Read at the meeting of the British Pharmaceutical Conference.

have become now the practical necessity of commercial work. The author says that he has done his best to eliminate the good from the bad, and after a careful perusal of his work we think he has done so, and that in the most satisfactory way. We suppose that no Analyst in practice is without a copy of *Volumetric Analysis*, but even those who have a copy of the older editions only, would gain in some respects by procuring this new edition also.

Manual of Colours and Dye Wares (Second Edition).

By J. W. Slater. London: Crosby, Lockwood, & Co., Stationers' Hall Court.

We do not like the title of this book at all—in fact the title is almost its worst feature; it would have been much more appropriate to have named it "Dictionary of Dyes." It is quite true that there are some other details comprised in it, which fairly belong to the head of testing dyes, say for instance a note of some twenty lines as to acidimetry, and a few useful tables, but essentially it is neither more nor less than a dictionary work, or as, perhaps, the word is more applicable, a *directory* of the different colours in use by dyers at the present time; and not colours only, for mordants, gums, and all the different substances that come under the category of dyers' materials, are referred to. Therefore, had the book been described under the title we have mentioned, we should have said that it was a most valuable work of reference, and one which should be bought and read by every chemist who directly or indirectly had anything to do with dyeing matters.

We have examined the information contained in the volume, and there is no question that as a whole it is extremely satisfactory in character. The index is however not by any means so complete as it might be; a good many of the colours in common use are not indexed under their commercial names, but only under their special trade names, and it is difficult therefore to find such an article which needs to be referred to, while the information as to the ordinary analytical processes of alkalimetry and acidimetry, which should really find no place in a book of this kind, are inserted in such an imperfect manner that it is necessary to refer to other books dealing with those particular subjects. Dealing with its own matters, the book is past reproach, but where it goes beyond the bounds of what it should fairly touch, there are errors in it which we regret. Passing these by, and viewing the work simply as a dictionary of dyeing materials, it is the most handy book we have seen for some years.

THE ALLEGED DEATH FROM LEAD POISONING AT KEIGHLEY.

The inquest concerning the death of Mr. Wilson Riley, machinist, Belgrave Road, Keighley, which took place in August from the effects, it is supposed, of lead poisoning, was held on the 26th ultimo by adjournment in the Keighley Petty Sessional Court, before Mr. T. P. Brown, coroner. The inquest had been adjourned for a month, and the viscera of the deceased, together with samples of the town's water taken after it had passed through the pipes, were sent to Mr. Allen, the Public Analyst for the West Riding, for examination. Mr. E. Tindal Atkinson, barrister, appeared for the Keighley Local Board.

Police-Inspector Tebbutt stated that he duly delivered the viscera and the samples of water to the Public Analyst of the West Riding.

The Coroner then read the following report, sent in by Mr. Allen:—

"I have duly examined the viscera of Wilson Riley, deceased, brought me, on August 30th, by Inspector Tebbutt, and have obtained the following results:—In one kidney I found a doubtful trace of

lead. The second kidney gave an identical result. In one half of the heart I found no lead. In a portion of the brain I found no lead. In one half of the liver and spleen I found a notable quantity of lead, and a distinct trace of copper. The copper being very small in amount I did not determine it. The quantity of lead separated from the half-liver and spleen was 0·125, or ⅛th grain. This amount is smaller than one might expect to find in the liver of a person who was poisoned by lead, but I have not unfrequently noticed very insignificant amounts of lead in the viscera of cows and other animals which undoubtedly met their death by lead poisoning. What strikes me as somewhat more remarkable is the almost entire absence of lead from the other organs. I am unable to find any records of the amounts of lead found by other observers in cases of death by chronic lead poisoning, the absence of such data being not improbably due to the comparatively rare instances in which inquiries have been made under such circumstances; the patients most frequently recovering, or the cause of death being so apparent that no analysis has been made. I attach no importance to the presence of the trace of copper in the liver, as I have met with it in several other instances.

"I have examined the sample of water in the smaller of the two bottles received, marked 'Quart of water drawn from tap in dwelling-house No. 68, Belgrave Road, Keighley.' It contained 0·61, or about 3-5ths of a grain of metallic lead per gallon of the water. This proportion is amply sufficient to produce poisonous effects. Some persons appear to be much more sensitive to the influence of lead than others; but, speaking generally, anything over 0·1 (1-10th) of a grain of metallic lead per gallon of water must be regarded as a decidedly dangerous contamination. I have myself known 0·2 (equal to 1-5th) of a grain of lead per gallon to produce severe symptoms of lead poisoning. I have also examined the water in the larger bottle received, marked 'Quart of water drawn from main in Highfield Lane, Keighley.' It contained no trace of lead. It contained a distinct trace of mineral acid. By remaining in contact eighteen hours with a strip of clean lead the water became contaminated with lead to the extent of 0·56 (over half) grain of lead per gallon. A repetition of the experiment showed that 0·45 grain of lead was taken up in fourteen hours. As already explained, these proportions of lead would render the water highly injurious to a person who drank it regularly. When the water in question was rendered faintly alkaline with lime water and left in contact with lead over one night, it took up the smaller quantity of 0·14 grains of lead. I consider this and analogous experiments show that it is the free acid in the water which gives it so great a tendency to act on lead, and that this property is in a great measure destroyed by getting rid of the acid. I found that Sheffield water took up merely a trace of lead during one night, but in presence of a very minute proportion of acid the action on the metal was notably increased. Rotherham water took up no trace of lead even after two nights' contact with the metal."

Examined by Mr. Tindal Atkinson, Mr. Allen stated that he was surprised at the small quantity of lead found in the tissues, considering that the person was supposed to have died from lead poisoning. It was, however, possible that some of the lead might have been eliminated by medical treatment. It would linger longest in the liver, except, perhaps, in the bones. He had had no experience of fatal cases of lead poisoning in human beings, but he had seen many cases in animals. He believed that a fortnight's medical treatment would serve to eliminate all traces of lead from the system. Iodide of potassium was an agent which would so eliminate lead, but he should expect that the organs would show traces of deterioration.

Mr. William Dobie, M.D., examined by Mr. Atkinson, said he did not consider the state of the kidneys as shown by the *post-mortem* examination to be such as to account for death. They were in an advanced stage of disease, but not in an extremely advanced stage. He believed that the disease of the kidneys had not advanced sufficiently to cause death. They were in the ordinary stage of "granular kidney." The most important causes of that disease were gout, rheumatism, intemperance, and lead poisoning. The last-named was a very common cause. Of forty-two cases of lead poisoning treated in a London hospital, in twenty-six there was suffering from granular kidney. Excessive mental depression, with anxiety, was also recognised as a cause of the disease. He should expect to find some symptom of paralysis in lead poisoning; but that was not a necessary symptom. In answer to the Foreman of the Jury, Mr. Dobie said he was of opinion that the deceased died from lead poisoning. In the first place lead poisoning was a common cause of the diseased state of the organs shown by the *post-mortem* examination; then, during life, the deceased had shown unmistakable signs of lead poisoning; and lastly, the analysis of the viscera has shown the presence of lead in the tissues after death.

Mr. Jack, surgeon, gave similar evidence, and stated that he administered iodide of potassium to the deceased some ten or twelve days before his death.

After the examination of a few other witnesses, who deposed as to the laying of the service pipes,

Mr. Tindal Atkinson said that he had to apply on behalf of the Local Board for another adjournment, in order that they might have the evidence of Mr. Tidy, of London, a gentleman who had attended fifty cases of deaths from lead poisoning. The Board regarded his evidence as absolutely necessary to the verdict.

The inquest was accordingly adjourned for a week.

On the resumption of the inquiry on the 3rd October, Charles Meymott Tidy stated that he was a Bachelor of Medicine, Master of Surgery, Professor of Chemistry, and Medical Adviser to the Home Office. He had had a large experience in cases of lead poisoning, the number of cases with which he was acquainted being sixty. He was frequently called upon to make analyses for the detection of poisons. In all the cases of alleged deaths from lead poisoning that had come before him he found that lead poisoning was not the actual cause of death, although in some cases it had preceded death for some time. He had never seen a case of chronic lead poisoning. Nearly all the cases had been under medical treatment. He knew of no well-recorded case of death from chronic lead poisoning. He had read the evidence in regard to the present case very carefully. He was of opinion that death might have resulted perfectly independent of lead poisoning. When the latter disease was much advanced there was always paralysis of the extensor muscles, either more or less. He knew of no case of chronic lead poisoning in which there had not been paralysis in some form or other. In nine out of ten cases the extensor muscles had been affected, producing the appearance of the hand popularly called "drop-wrist"—resulting from the want of power to hold the hand up. He should expect to find that symptom in any case of advanced lead poisoning. The muscles were in all cases affected before the nerve centres. There was no exception to that statement. That was his experience, to which there had been no exception. He would expect to find a state of coma under these conditions. He would not expect to find any affection of the nerve centres such as delirium preceding the paralysis of the muscles. He would make that statement with some reservation, because the affection of the nerve centres took different forms in different people. The condition of the muscles in the case of "drop-wrist" was that the muscles were much paler. In some cases they were almost white. He could not understand that part of the evidence which referred to "drop-wrist" as a *post-mortem* symptom. It was a life symptom. It was stated that the muscles were healthy, whereas he held that "drop wrist" was the result of a disease in the muscles. If the symptom had been there before death he held that it would have been easily noticed by those around the deceased. It was a sign too apparent to escape observation. With regard to the stated enlargement of the intestines, as far as he understood the evidence there had been constriction of the ascending colon only; but his experience was that the whole colon was in these cases more or less restricted. There was an entire absence of inflammation which would account for that constriction. In this case it was stated that the mucous membrane of the follicles was enlarged. That would indicate to his mind that local inflammation had set in. It would be a symptom of local inflammatory action rather than the action of poison which affected the general system. In some cases granular disease of the kidneys resulted from lead poisoning. He had read the report furnished by Mr. Allen, the Public Analyst. He agreed with Mr. Allen, that in the case of a death from lead poisoning he would expect to find a greater quantity of lead in the organs of the deceased. In five very distinct cases where there had been lead poisoning—in one, especially, which he remembered, he made an analysis of the liver and the spleen, and he found five grains of lead in the spleen, and four grains in the liver, yet death was not primarily caused by lead poisoning. The patient had been in the hospital, and had been sent out and was brought in again, having been run over by a cab, from which accident he died. Iodide of potassium was one of the agents used in treating cases of lead poisoning, but it was not now so extensiveiy relied upon. It was difficult to state the exact course that the lead would take in the system, but he would state that it was more generally located in the spleen than in the liver. But in cases where the general health was low lead would be liable to act with most pernicious effects. Lead was, however, sometimes found in the bodies of men exposed to its influence, yet there was no symptom of poisoning in these men. He referred to workers in lead works, painters, &c.

In reply to the Coroner, who asked if it was quite possible that all traces of lead might be eliminated by medical treatment extending over eight or ten days, Dr. Tidy said that that was a very difficult question to answer. Iodide of lead was an insoluble body. When they wished to make an estimate of the amount of lead in any material they added iodide of potassium, when the lead was precipitated, being rendered insoluble and inert. The lead in the organs would still be kept there, but it would be rendered harmless. In this case he did not admit that the small quantity of lead found in the organs of the deceased was owing to the medical administration of iodide of potassium, and if death had resulted from lead poisoning there would have been a larger quantity found in the deceased's body. Mr. E. Tindal Atkinson—Having read the evidence in this case, do you think that lead poisoning was the primary cause of death? Dr. Tidy—Well, of course, it is a very difficult thing for one who was not present at the *post-mortem*, and had not an opportunity of seeing the symptoms during life, to give an opinion, especially in opposition to such an able man as Dr. Dobie; but I must say, having considered the facts—the granular state of the kidneys, the exceedingly small quantity of lead found in the deceased after death—considering the absolute absence of all the symptoms of lead poisoning, except the blue mark on the gums and colic, there being no "drop-wrist," no paralysis, no coma—I should think that death resulted from granular disease of the kidneys. Of course I will not assert that the granular disease was not produced by lead poisoning. It is very likely that it would be accelerated by drinking water in which there was lead. There was, however, no evidence to show that the nerve centres had been affected. There was no paralysis—at least none observed before the *post-mortem* examination was made.

Some further evidence was then given, and the jury retired, and after an absence of two hours they brought in the following verdict:—"We find that the deceased Wilson Riley died from granular disease of the kidneys, but how caused we are unable positively to say, but we believe it was accelerated by lead poisoning."

LAW REPORTS.

Refusing to Sell, and Adulteration of Milk:—

Stamford Smith, of Wawne, was summoned by the Urban Sanitary Authority of the Hull Corporation for two offences under the Adulteration Act. Mr. A. Wilson, Deputy Town Clerk, appeared for the prosecution. The offences were proved by Mr. Osborne, the Nuisance Inspector, and Mr. Thackeray, his assistant. It appeared that on the 16th July the defendant was selling milk on the Beverley Road, and the officers requested him to sell them a sample for analysis. He declined to do so, and said that if they would wait ten minutes he would get them some. They watched him go to a house and sell a pint of milk. This milk the officers subsequently succeeded in obtaining from the person to whom it was sold, and on analysis it was found to be adulterated with twelve per cent. of added water. The defendant was therefore summoned under the Act for refusing to sell milk to the authority when requested, the penalty for which was £10, and also for adulterating it, which rendered him liable to a penalty of £20. Defendant said it was not his intention to evade the law. Mr. Twiss fined him £5 and costs for the first offence, and 50s. and costs for the second. Defendant: Your Honour, this is a very serious matter for me. I'm sure I can't pay it at present. Mr. Twiss: It is a very serious matter for the public that they can't get the article they ask for.

Butter and Coffee Adulteration:—

At the Dartford Petty Sessions lately, Mr. Allen Groombridge, grocer, Dartford, was summoned for having, on August 11, sold, to the prejudice of Police-constable Conford, half-a-pound of butter at 1s. 2d. per lb., and half-a-pound of coffee at 1s. 4d. per lb. The articles were sent to the County Analyst for examination, and his report stated that the "butter" contained no butter at all, and that the "coffee" contained 60 per cent. of chicory. Defendant admitted that the butter was what was known in the trade as "bosh" butter, and that he had sold it for twenty years. The coffee, he said, was "what is usually sold to poor people." He was fined £2 in each case, and £1 costs.

Adulterated Milk:—

Robert Allen, of Ruxley Farm, St. Mary Cray, was summoned for selling adulterated milk.—Mr. Gregory appeared in support of the complainant.—Mr. Edward Brocklesby, a dairyman, of Bexley Heath, deposed that he had been in the habit of purchasing milk from the defendant, and retailing it. On Tuesday, the 6th ult., witness went with Mr. Parrish to receive the milk, and after it was put in the

churn, he took a sample of it in three bottles, one of which he sent to the analyst, one to the defendant, and one he kept himself.—In answer to the defendant as to why he did not take the sample out of the defendant's churn, witness said he thought he could only do it after delivery. Swore he had not brought a mixture and put it into the milk on previous occasions, nor had he brought a bottle with something in it to add to the milk. He owned cows himself, but did not know that the milk was sometimes poorer than at others, although it might be so after the cow had just calved. Witness had made frequent complaints of the poorness of the milk. The analyst had found that there was 14 per cent. of added water in the sample tendered to him. Did not know that the defendant had dismissed a cowman some time ago on account of the complaints made by witness. He had not told the man that the milk had got so bad that he was unable to add the usual six quarts of water to every churn. Did not know what milk was made of, but understood that the analyst meant there were 14 parts of added water. Did not know that there was water in milk in its normal state.—Alfred Parrish stated that he was with the last witness on the 6th ult., and assisted him to take the samples and seal the bottles. Previous to this they had called the attention of the defendant's man to see that there was no water at the bottom of the churn in which the milk was transferred. Witness did not know the properties of milk.—A discussion ensued as to whether the milk had become the property of complainant, but Mr. Gregory contended that according to the Act the milk that had been sold would have prejudiced the purchaser.—John Baxter said he had delivered the milk to the complainant on the 6th, and he had often received complaints as to the bad quality of the milk. The cows had been suffering from a fever, and could not properly digest their food, and this was why the milk was not so good as usual. To witness's knowledge the complainant had used some "colouring" for the milk, which he afterwards passed off as nursery milk. Complainant had frequently told witness that the milk was so poor that he could not add the usual six quarts of water to the barn gallon. Although the cows were being physicked with turps, salt, and sulphur, the milk was being sold as pure. The physic was being given to three cows, but it could not get into their veins. The complainant's churn, into which the milk was emptied, was not clean. Complainant knew the cows were being physicked.—The Bench, after some deliberation, said they had fully considered the case, and it was not one in which they could convict. There was a difference of opinion as to the quantity of water in milk in its normal state, and as the milk was likely to have been poor owing to the sickness of the cows, and the cowman's evidence as to the milk being taken out of the complainant's churn, the summons would be dismissed.

"*Pure Mustard:*"—

At Norwich recently, John Broughton, grocer, Friars-street, was charged with selling mustard adulterated with flour on September 18.—Sergeant Taylor said he went into defendant's shop in plain clothing and asked for a half-pound of mustard for the purpose of having it analysed by the Public Analyst. He paid 6d. for what was supplied to him, and the mustard was divided into three parts, one of which was returned to the defendant, one kept by the police, and one sent to the analyst. Defendant did not supply a label stating the mustard was a mixture. It was taken from a can labelled "Keen's Mustard." He told defendant the mustard was for the analyst, when it was on the scale, and defendant said he did not know if it was adulterated; it was just as he had it supplied to him.—Mr. Ware, who prosecuted, said the mustard had been submitted to the Public Analyst, who found it to contain a percentage of flour.—Defendant said he told the officer he had reason to suppose the mustard was adulterated.—Mr. W. Johnstone, Public Analyst, was called, and put in his certificate of analysis. He said pure mustard was sold in the town, and several pure samples had been submitted to him for analysis. The adulterated mustard was of the same colour as the pure article, as, after the addition of the flour, it had been coloured with turmeric. Messrs. Colman and Messrs. Keen always affixed labels to their tins stating whether they contained pure mustard or a mixture.—Defendant: I told the policeman I did not know if the mustard was pure. I had been reading an article in the paper on some recent prosecutions of tradesmen for selling adulterated mustard, and the article said the manufacturers ought to pay the fines.—The Mayor: You knew it was adulterated, and you said nothing until you were told it was to be analysed.—Defendant: I did not sell it as pure mustard.—Mr. Ware: Even then he has not complied with the law; he should have given a label. We don't wish unduly to press the case.—Mrs. Maria Salmon, Windsor-road, was called upon to answer a similar charge. The circumstances of

the sale were deposed to by the officer, who paid 8d. for the half-pound of mustard supplied.—Defendant said she was very sorry if she had broken the law. It was Colman's mustard, and she bought it as pure mustard for anything she knew.—A Magistrate: Then you must come upon the people who sold it to you for what it costs you to-day.—Mr. Ware said they did not press the case.—The Mayor said they must protect the public, and should mark their displeasure by imposing fines. However, they would give defendants the benefit of the doubt as to whether it was sold wilfully. Mr. Broughton would be fined 1s. and 8s. costs, and Mrs. Salmon 1s. and 7s. costs; but if defendants came before them again they would be fined £20.

At the meeting of the Salford Council recently the Public Analyst (Mr. J. Carter-Bell) reported that during the quarter ending September 30th, he had analysed 129 samples of milk, bread, drugs, beer, flour, syrup, sardines, and water, and of these thirteen were found to be adulterated. The adulterated articles were milk, beer, and syrup.

Wooden hams and nutmegs have not been unheard of as articles of trade, but wooden cloves seem to be a new invention. An East India paper publishes as a fact, that several bags of cloves received in London from Zanzibar were mixed with artificial cloves made from wood by machinery. The cloves were made of soft deal, stained a dark colour and soaked in a solution of essence of cloves to scent them.

RECENT CHEMICAL PATENTS

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No 1882	Name of Patentee.	Title of Patent.	Price
493	C. J. Allport	Preparation of Asbestos as an Insulating Material	2d.
700	J. S. Williams	Generation, Storage, &c., of Electricity	10d.
766	Ditto	Ditto Ditto	4d.
856	Ditto	Ditto Ditto	2/4
969	J. P. Kagenbusch	Extracting and Separating Metals from Silicious, Aluminious, and Other Substances	2d.
981	W. Howitt	Treating Dynamite to Remove its Liability to Explosion ..	4d.
1029	F. Wright and M. W. Mackie	Incandescent Electric Lamps	6d.
1036	H. Liepmann & P. S. Looker	Manufacture of Carbons for Electrical Purposes	6d.
1044	R. and M. Theiler	Telephone Transmitters	6d.
1055	H. H. Lake	Manufacture of Sugar	6d.
1057	C. Scheibler	Manufacture of Sugar	4d.
1058	J. Moris	Process for Production of Aluminium	4d.
1079	W. Crookes	Incandescent Electric Lamps	4d.
1156	J. Mactear	Manufacture of Soda and Potash	2d.
1163	W. R. Lake	Electric Lighting Apparatus	6d.
1167	G. C. Trewby	Purification of Gas, &c.	4d.
1172	J. Wanthier	Incandescent Electric Lamps	6d.
1199	R. Kennedy	Electric Lamp	6d.
1201	R. Matthews	Dynamo-Electric or Electro-Dynamic machines	2d.
1220	C. Wigg	Manufacture of Chlorine	4d.
1266	J. H. Johnson	Manufacture of Artificial Indigo	4d.
1879	W. R. Lake	Manufacture of Saccharine Compounds	6d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Weekly Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine; London Water Supply, by Crookes, Odling and Tidy; Chemical Review.

THE ANALYST.

DECEMBER, 1882.

SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held at Burlington House, Piccadilly, on Wednesday, the 15th November.

In the absence of the President, the chair was taken by Dr. Muter, Vice President.

The following gentlemen were proposed for election :—

As Members: E. J. Day, M.R.C.S., F.C.S., Public Analyst for Dorchester; Professor C. R. Fletcher, Boston, Mass., State Assayer; G. T. Stephens, B.Sc., Widemarsh, Analytical Chemist.

As Associates: C. Brisley, Assistant to Dr. Bernays; F. W. Simpson, Assistant Analyst to Midland Railway Company.

The following papers were read and discussed :—

"Notes on Commercial Albumin," by A. H. Allen.

"On the Diminution of the Total Solids in Milk by Decomposition," and "A Point Concerning Milk Control," by Dr. Vieth.

"On the Proportion of Dextrin to Maltose in Malt Worts," by J. West Knights, F.C.S.

The next Meeting of the Society will be held at Burlington House, on Wednesday, 13th December, and among the papers to be read will be one by Mr. C. T. Kingzett, on "Some Analyses of Asphalte Paving."

NOTES ON COMMERCIAL ALBUMIN.

BY ALFRED H. ALLEN.

Read before the Society of Public Analysts on 15th November, 1882.

THE applications of albumin are now very numerous, and as it differs much in quality, according to its origin and the details of its preparation, it is sometimes necessary to ascertain its purity and freedom from adulteration.

Commercial albumin is obtained chiefly from two sources—eggs, and the serum of blood. Fish-albumin is also met with occasionally, and may be recognised by its fishy odour.

Blood or serum-albumin is obtained by separating the serum from the clot of perfectly fresh blood. The liquid is evaporated in shallow trays, at a temperature not exceeding 50° C., when the albumin is obtained in brittle scales or transparent flakes of a greyish, yellowish, reddish, brown, or black colour. The qualities of serum-albumin, made by leading firms, are "refined," "prime," "No. 1," "No. 2," and "black." *Refined* is made from highly rectified serum, and is of a dirty yellow colour, and, like *prime*, is employed for printing delicate colours. No. 1 is darker in colour and less valued, though suitable for all ordinary printing purposes. No. 2 quality is made from the second draining of the

serum, which, after the clear top serum has been syphoned off, is more or less tinged with red, and consequently is only fit for printing dark colours; as a rule, it also contains some insoluble matter, which is objectionable. *Black albumin* or "dried blood" is obtained from the last portions of serum, and is almost black in colour. It is not used in calico-printing, but finds applications in sugar-refining and turkey-red dyeing. The clot, left after separation of all serum, consists chiefly of fibrin and blood-corpuscles, and is dried, roasted, and used as manure.

Serum-albumin may be employed for printing all but the very finest and brightest colours. Perfectly colourless blood-albumin, equal to the finest egg-albumin, is said to have been recently produced in Germany.

Egg-albumin is obtained in a solid state by cautiously evaporating the white of eggs, at a temperature below 50° C. It is generally transparent, and of a light yellow colour. It is more valuable than serum-albumin, and consequently is more liable to adulteration. Two genuine qualities are made. Egg-albumin should be free from blisters, which are often present in partially coagulated samples.

Albumin of good quality is recognised by its transparency when in flakes, by its taste, not being disagreeable, and by having no odour of putrefaction. Treated with cold water, with constant stirring, it should dissolve entirely.*

Commercial albumin is liable to adulteration with gum, dextrin, flour, sugar, &c. For its examination, 5 grammes of the powdered sample should be treated with 50 c.c. of cold water, with frequent stirring, until all soluble matter is dissolved. Pure and good samples leave no residue. A few drops of acetic acid should next be added, and any undissolved matter filtered off through silk or fine muslin. It may consist of coagulated albumin, casein, starch, or membranous matter. The casein may be dissolved out by treatment with very dilute caustic soda, and precipitated by exactly neutralizing its solution with acetic acid. The aqueous solution of the sample is boiled, when the albumin is thrown down as a flocculent precipitate, which may be filtered off, washed, and weighed; or ignited with soda-lime, and the albumin deduced from the ammonia obtained. The filtrate should be treated with acetic acid and potassium ferrocyanide to make sure that no albuminoid remains in solution.† Its absence being proved, tannin may be added to precipitate any gelatin; and the filtrate concentrated to a small bulk and treated with alcohol to precipitate any gum or dextrin, while sugar, if present, will remain in solution in the alcoholic liquid, and may be detected by boiling off the alcohol, heating with hydrochloric acid, and testing the liquid with Fehling's solution. Sugar might also be extracted by treating the original solid sample with alcohol.

Ziegler's method of assaying commercial albumin is to dissolve 20 grammes of the sample in 100 c.c. of cold water, strain through a sieve, and add 10 c.c. of the clarified liquid to a

* For practical purposes, the albumin is best dissolved in warm water, of a *maximum* temperature of 45° to 50° C. The albumin should be added gradually, and the liquid constantly stirred. The water should on no account be added to the albumin. The liquid, after straining through a fine silk sieve, is usually mixed with a small proportion of ammonia, turpentine-oil, &c., in order to prevent frothing and make it work smoothly. Turpentine also tends to prevent putrefaction, but an addition of about 1 per cent. of arsenious oxide is said to be the best preservative.

† Any precipitate produced at this stage will probably consist of casein.

boiling 20 per cent. solution of alum. After noting the appearance and volume of the coagulum, it is washed, dried, and weighed. De Coninck (*Journ. Chem. Soc.* xxv., 1129) finds that the process gives a precipitate containing not more than 1 per cent. of alumina, and that it is sufficiently accurate for the purposes of the calico-printer. With pure albumin very good results are obtainable, and their accuracy is not affected by the presence f dextrin, but gum-arabic prevents the precipitation of albumin to a very notable extent.

I have made some observations on the proportion of ash yielded by various qualities of commercial albumin, and the results have some interest, although they are not applicable to the detection of any special adulterants. The proportion of ash cannot be readily ascertained by direct ignition of the albumin, owing to the fusible nature of the carbonate of sodium and other salts of which the ash is mainly composed. The difficulty may be obviated by treating a weighed quantity of the sample in a porcelain crucible, with nitric acid of 1·42 specific gravity and two or three drops of strong sulphuric acid. On heating gently, the albumin dissolves to a clear yellow liquid, which may be evaporated to dryness without trouble, giving a residue which readily burns and leaves an ash of tolerably high melting point. Operating in this manner, Mr. J. C. Belcher obtained in my laboratory the following percentages of "sulphated ash" from a series of samples of commercial albumin manufactured by a leading firm :—

	Sulphated Ash.
"No. 1" Egg Albumin	7·4 per cent.
"No. 2" „ „	7·0 „ „
"Refined" Blood Albumin	9·1 „ „
"Prime" „ „	8·5 „ „
"No. 1" „ „	9·2 „ „
"No. 2" „ „	8·9 „ „
"No. 3" „ „	9·7 „ „
"Black" „ „	6·2 „ „

All the ashes were white, except that yielded by the black albumin, which gave a reddish ash, owing to the presence of blood-corpuscles in the original sample. Curiously enough, in this, the lowest grade of genuine albumin, the ash is less than in the better kinds.

ON THE PROPORTION OF DEXTRIN TO MALTOSE IN MALT WORTS.

By J. West Knights, F.I.C., F.C.S.

Read before the Society of Public Analysts on 15th November, 1882.

In brewing, the proportion of dextrin to maltose produced in the mash is of the greatest importance, as the character of the beer will almost entirely depend upon it.

Now that proportion is subject to considerable variation, and will depend upon—firstly, the temperature of the mash, which will determine the proportions of dextrin and maltose initially formed by the splitting up of the starch molecules; secondly, the duration or length of time the mash is subjected to the action of the diastase, which will determine the proportion of dextrin subsequently converted into maltose; and thirdly, the diastatic activity of the particular sample of malt under treatment, and to a slight extent the nature of the water used for mashing, which will determine the rate of the subsequent conversion of dextrin into maltose. The influence of the proportion of dextrin on the fermentation of

the wort is of course very great, dextrin being only capable of undergoing a very slow fermentation, and the result is that the final attenuation of a highly dextrinous wort is very high, too high to admit of ready clarification by ordinary methods of fining, but such a beer would be well adapted for keeping—or stock-beer; and on the other hand a wort low in dextrin will produce a low gravity beer which, although it would clear readily, would be thin drinking and *apparently* much weaker than a beer of the same original gravity but higher final attenuation. It is therefore very important that the brewer should have a simple method for estimating the proportion of dextrin in his worts. The usual method is to titrate with Fehling's solution to obtain the percentage of maltose, then to boil another portion four or five hours with sulphuric acid and again titrated with Fehling to get the percentage of glucose produced from the known amount of maltose and from the dextrin, but this method is of course altogether upset when the worts contain glucose and invert sugars from the use of the various brewing saccharums, unless the percentage of glucose in the wort is known.

The first method that I have employed for the estimation of dextrin in a wort is simply an alcohol method, but it is capable of giving very good results, and is so extremely simple that it is well adapted to the use of brewing pupils.

The gravity of the wort is first taken, and from that the amount of malt extract contained in 100 c.c. can be calculated by dividing the difference of gravity between the wort and water (water = 1,000) by 3·85 (3·85 being the solution weight of malt extract; that is, every 1 per cent. of malt extract contained in solution increases the density ·385 per cent. or 3·85 per thousand).—See Allen's Com., Org. Analysis, Vol. II. 297.

Maltose may be estimated in the usual way by Fehling, and dextrin by precipitation with alcohol as follows:—

Ten c.c. of wort are placed in a small tared beaker and 50 c.c. methylated spirit 60 o.p. added; the greater part of the dextrin will be precipitated, and after a few hours standing will deposit on the bottom of the beaker as a gummy mass, from which the alcoholic liquid can be easily poured off, and the deposit rinsed with a little more alcohol, the beaker is then dried in a water-bath and weighed, to the weight of dextrin so obtained must be added a correction for the quantity retained in solution by the alcoholic liquid—this quantity is ·045 grm. A sample of wort prepared from three-fourths malt and one-fourth germless maize gave the following results.

Sp. gr.	1107·4	27·89 per cent. dry extract.
Maltose, by Fehling	21·40	,, ,,
Dextrin	5·19	,, ,,
Albuminoid, mineral matter, &c., by difference	1·30	,, ,,

The second method of examining a malt-wort to be described is one of dialysis. If a solution of sugar be dialysed 24 hours into an equal measure of distilled water, the diffusion will be found to have been *practically* complete, *i.e.*, both the liquids will have the same density and will contain equal amounts of sugar; on the other hand, if a solution of dextrin be dialysed 24 hours into an equal measure of water the diffusate will be found to contain a trace only of dextrin. That being so, it follows that if a malt-wort be dialysed into water the difference in density between the two liquids will be due to dextrin (with a small quantity of albumenoid).

In all cases I prefer to use glass dialysers and a very thin membrane, sold as French gut-skin, which should be fixed by means of an elastic band, the dialysers are five inches in diameter, and are suspended so as just to touch the surface of the water, the object of which is to produce a slight flow of water from the dialysate to the diffusate, so that at the end of the process the volumes can be equalized by pouring from the diffusate into the dialysate, as of course to equalize volumes by pouring from dialysate to diffusate would not be admissible.

In practice I use 100 c.c. of each, and after 24 hours equalize the volumes and take the gravity of each liquid (or a measured quantity of each can be evaporated to dryness). The difference in gravity between the two liquids is due to dextrin, &c., the weight of which can be obtained by calculation as above; an example will make all clear.

A hundred c.c. of the same wort as above were dialysed into 100 c.c. distilled water for 24 hours, at the end of that time the volumes were equalized by pouring a sufficiency of the diffusate into the dialysate and the gravities were taken—

Gravity of dialysate	1065·5
,, diffusate	1042·0
Difference due to colloid matter	23·5

which gives 23·5, divided by 3·85 = 6·10 percentage of colloid matter, a result sufficiently close to the previous one to show that fair accuracy can be obtained by this method, which will be found very useful for brewers as no balance is required, a delicate hydrometer being all that is necessary (those sold as urinometers will answer every purpose, and have the advantage of requiring only a small qnantity of liquid to float them).

ON THE DIMINUTION OF THE SOLIDS IN MILK BY DECOMPOSITION.

By Dr. P. Vieth, F.C.S.

Read before the Society of Public Analysts on 15th November, 1882.

At former meetings of this Society Members have spoken several times about analysing samples of milk, which had been kept for weeks and months, and about the loss caused by decomposition. I always was of opinion that it is impossible to mix such a milk thoroughly and take a proper sample for analysis, and that an analysis of such an old and decomposed milk is scarcely of any value. Until some months ago I, however, did not object to taking samples of milk of normal appearance, and keeping exactly measured quantities for analysis for some days in case it was not convenient to analyse them immediately. But experience made me change my opinion.

Samples are taken by the inspectors of the Aylesbury Dairy Company from the Company's own milkmen to control the latter when delivering the milk to the customers. The samples so taken are brought to the laboratory in the forenoon and in the late afternoon, and specific gravity, total solids, and fat are determined. This is done as soon as the samples are brought in, with the only exception that the samples taken for the determination of total solids in the afternoon are not evaporated before the next morning, and, until some months ago, the Saturday's samples not before Monday morning. Of course the samples, contained in small platinum dishes, were kept in a safe place and properly covered.

When the days were getting warmer, the milk kept from Saturday to Monday was generally found to be sour on Monday morning. At the same time it was found that the Saturday afternoon samples always gave a smaller amount of total solids. The diminution was not a very distinct one during the month of May and the early part of June, but from that time became more and more prominent and reached an extraordinary height, when in the beginning of the month of August, on account of the bank holiday, the samples had once stood from Saturday night till Tuesday morning.

To investigate the matter, I at first, on the 4th of July, made the following experiment with evening milk of the previous day, which was brought to London by rail during the night. The milk showed a specific gravity of 1·0324 and amphioteric reaction. I measured nine times 5 cc. of milk into small platinum dishes, put one of the dishes on the steam bath directly, and of the other ones kept four in the laboratory and four in an ice-safe, the temperature of the former place being from 18 to 21° C., of the latter from 10 to 13° C., during the time of the experiment. On each of the following four days two further samples were evaporated, one of those kept at a higher and one kept at a lower temperature. In all cases the solids, after having been weighed, were burnt to ash and the amount of ash ascertained. The results are given in the following table.

Time of keeping	Temperature 10 to 13° C.		Temperature 18 to 21° C.	
	Solids.	Ash.	Solids.	Ash.
—	13·44	·74	—	—
1 day	13·44	·74	13·26	·76
2 days	13·44	·76	13·06	·76
3 ,,	13·18	·76	12·82	·76
4 ,,	13·06	·76	12·78	·76
Diminution after.				
1 day	·00		·18	
2 days	·00		·38	
3 ,,	·26		·62	
4 ,,	·38		·66	

Another series of experiments was commenced on the 15th of August, 1882, with milk from five different farmers. The milk was milked the same day in the morning, and brought to London by rail in the forenoon. The specific gravity varied from 1·0316 to 1·0328, the reaction was amphioteric in all cases. The five milk samples were operated upon in quite the same manner, so that of each milk five times 5 c.c. were taken to ascertain the total solids. One of each series of five samples was put on the steam bath directly, two were kept in the laboratory, and two in the ice-safe. Of the latter samples one of each was dried, and the solids ascertained after two and after four days. The temperature of the laboratory fluctuated at that time from 19 to 21° C., the temperature of the safe was generally between 10 and 12° C., but rose occasionally for a short time to 15° C. In all samples the ash was determined.

The following table gives the results of the experiment :—

Time of keeping—			Two days.				Four days.			
Temperature—			10 to 15° C.		19 to 21° C.		10 to 15° C.		19 to 21° C.	
No.	Solids.	Ash.	Solids.	Ash.	Solids.	Ash.	Solids.	Ash.	Solids.	Ash.
1	12 68	·76	12·26	·76	11·82	·78	11·50	·78	10·38	·76
2	12·70	·76	12·30	·76	11·88	·78	11·86	·76	11·18	·76
3	12·52	·76	12·26	·76	11·68	·78	11·60	·76	10·48	·76
4	13·12	·72	13·00	·72	12·32	·74	12·06	·72	10·46	·74
5	13·08	·74	12·78	·74	12·52	·74	12·08	·74	12·00	·76
Average	12·82	·75	12·52	·75	12·04	·76	11·82	·75	10·90	·76
Diminution of Solids.										
1			·42		·86		1·18		2·30	
2			·40		·82		·84		1·52	
3			·26		·84		·92		2·04	
4			·12		·80		1·06		2·66	
5			·30		·56		1·00		1·08	
Average			·30		·78		1·00		1·92	

Both series of experiments show very distinctly that the solids of milk are diminished to a considerable extent by decomposition of the milk. The diminution becomes more extensive with the length of time, and is limited if the milk is kept under conditions unfavourable to speedily progressing decomposition. In the first series there was, after two days, no diminution at all in those samples which had been kept in the safe. In the second series the diminution in the corresponding samples was, on the whole, very equal. If in comparison therewith the diminution in the first series after two and four days was very much less, it would be easy to find some causes for that. I only mention the possible and very probable difference in the temperature of the air, and further the circumstance that for the first series there was evening milk used, which was brought to London during the cool time of night, but for the second series morning milk, brought here during the warmer hours of the forenoon.

Regarding the diminution itself, we saw that it appears at the same time when the milk turns sour—that is, when the sugar is decomposed by lactic fermentation and lactic acid formed. But as the milk sugar thereby is merely split up, this decomposition does not involve any loss, and therefore cannot account for the diminution of the solids. So we have to look out for other changes, and would think in the first place of alcoholic fermentation, which again concerns the sugar; whether and how far the other component parts of the milk take part in its decomposition remains to be ascertained.

The experiments just communicated certainly show that the determination of the solids in sour milk, even in case the same should be only a few days old, sometimes may give results quite different from those which would be arrived at if the milk had been analysed in a fresh state.

ERRATA.

Dr. Tucker requests us to make the following corrections in the abstract of his Report, reprinted from the *Sanitary Engineer*. His letter arrived too late for the corrections to be made before the reprint appeared :—

Page 197, line 30 from top, for "bi-carbonate of soda," read "*carbonate of soda.*"
" " " 12 from bottom, for "hydro soda," read "*hydro sodic.*"
" 198, " 20 from top, for "potassic bi-carbonate," read "*potassic citrate.*"
" " " 21 (at end), for "carbonic acid," read "*tartaric acid.*"

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in November, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried at 220° Fahr.	Microscopical Examination of Deposit.	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	Nov. 16	c. blue	none	1·70	none	·33	·0025	·0028	·004	·022	21·0°	7·0°	34·4		Wigner & Harland.
New River	,,	clear yell.	none	1·12	trace	·18	·0007	·0031	·032	·084	15·5°	4·5°	22·1	satisfactory	B. Dyer.
East London	,, 16	c. yell. green	none	1·20	none	·13	·0018	·0049	·046	·082	16·0°	3·5°	26·8	veg. deb., myclm. animle.	Wigner & Harland.
Southwark & Vauxhall	,, 13	yellowish	none	1·15	trace	·11	·0014	·0120	·091	·147	15·0°	4·0°	22·4	veg. debris, &c.	John Muter.
West Middlesex	,, 27	green. yell.	none	·98	trace	·10	·0010	·0060	·063	·116	11·5°	3·5°	21·8	satisfactory	O. Hehner.
Grand Junction	,,	greenish yell.	none	1·24	trace	·18	·0016	·0061	·023	·074	14·4°	4·0°	21·2		A. Wynter-Blyth.
Lambeth	,, 13	yellowish	none	1·20	trace	·12	·0014	·0112	·092	·128	15·5°	4·0°	22·2	veg. debris, &c.	John Muter.
Chelsea	,, 21	yell. green	none	1·54	trace	·18	none	·0062	·064	·156	14·5°	4·5°	21·0	satisfactory	A. Dupré.
Birmingham	,, 2	greenish yell.	none	1·14	trace	·20	·0035		·051	·130	10·5°	7·4°	16·7		A. Hill.
Brighton	,, 9	c. pale blue	none	2·55	none	·30	·0025	·0022	·018	·024	13·0°	4·0°	24·8	animal hair, veg. fibre	Wigner & Harland.
Bristol	,, 6	brn. green	none	·90	none	·04	none	·0030	·007	·015	15·2°	1·8°	24·3	algæ sand	F. W. Stoddart.
Cambridge	,, 20	c. p. blue	none	1·40	trace	·38	none	·0007	none	·046	17·5°	5·0°	25·0	satisfactory	J. West Knights.
Croydon	,, 21	f. bluish green	none	1·26	none	none	·0050	·0040	·008	·011	16·0°	6·0°	23·6	satisfactory	C. Heisch.
Edinburgh	,, 27	s. brown	none	·96	trace	trace	trace	·0080	·016	·136	4·2°	3·9°	5·2	atisfactory	J. Falconer King.
Exeter	,, 16	f. b. yellow	none	·84	trace	·27	·0014	·0034	·021	·034	2·8°	2·8°	6·3	atisfactory	F. P. Perkins.
Hereford	,, 6	clear colourless	none	·30	none	none	·0002	·0005	·001	·007	4·1°	2·0°	3·7	satisfactory	G. J. Stephens.

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in November, 1882. All results are expressed in GRAINS PER GALLON.

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									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Liverpool	Nov. 27	grnsh. brown	s. peaty	·95	trace	·038	·0014	·0084	·022	·078	4·7°	3·3°	7·5		A. Smetham.
Maidstone—															
Wtr. Company	,, 22	c. yell. green	none	2·30	trace	·62	·0014	·0021	·036	·078	18·0°	6·0°	34·5	none	M. A. Adams.
Public Conduit	,, 22	p. green blue	none	2·20	trace	·60	none	·0014	·036	·072	17·5°	7·0°	33·7	none	M. A. Adams.
Manchester....	,, 18	s. turb. f. yell.	none	·73	none	none	·0034	·0051	·067	·135	1·7°	1·7°	5·3	satisfactory	W. Thomson.
Northwich	,, 18	yell. green	none	3·50	h. trace	·39	·0004	·0016	·036	·131	11·0°	8·0°	15·0	dtms., mvg. org. veg. deb.	C. M. Blades.
Norwich	,, 12	p. grnsh. yell.	v. slight	1·70	trace	·08	trace	·0132	·087	·173	12·0°	5·2°	16·8		W. G. Crook.
Nottingham ..	,, 17	c. grnsh.	none	1·56	none	.77	none	trace	·008	·046	12·0°	8·0°	23·0	veg. deb., myclm. animl.	Wigner & Harland.
Rugby	,, 9	turbid peaty		1·20	h. trace	·10	·0040	·0100	·016	·029	12·0°	6·5°	18·4	veg. deb. animal.	A. P. Smith.
Salford	,, 21	yellow	none	·65	none	none	·0010	·0010	·017	·067	3·0°	2·5°	4·5	satisfactory	J. Carter Bell.
Worcester	,, 10	p. yellow	none	1·30	trace	·24	none	·0090	·025	·150	11·5°	6·2°	15·5	veg. debris	W. E. Porter.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.

Errata.—Birmingham Water, October, Nitrates should be ·0693 instead of ·693.
,, Oxygen absorbed in 15 minutes ,, ·0091 ,, ·091.
,, ,, ,, 4 hours ,, ·0245 ,, ·245.

REPORT OF THE LOCAL GOVERNMENT BOARD.

We take the following from the Blue Book recently published :—

It will have been observed from our previous Reports that the Authority for each County in England and Wales and the several Vestries and District Boards of Works in the Metropolis had complied with the provisions of this important Statute as regards the appointment of Analysts. It will also be seen from our last Report that up to the 31st of December 1880, the total number of appointments made by Municipal Corporations was 156, and that we were then in correspondence with the Authorities who had not appointed an Analyst. The result has been that during the year ended on the 31st of December last some additional appointments were made, and, on that date, the total number of Districts in which Analysts were acting was 260. We shall not fail to urge upon those Authorities who, so far, have omitted to comply with the provisions of the Act in this respect, the importance and expediency of making suitable appointments.

A question has recently arisen as to whether a Town Council who have entered into an Agreement, pursuant to section 14 of the 3 & 4 Vict., c. 88, with the County Authority for the Watching of the Borough should appoint an Analyst. The Board have been advised that Boroughs in which such an arrangement exists must be held to come within the terms of section 10, paragraph 1, of the Statute 38 & 39 Vict., c. 63, and, consequently, that it devolves upon the Town Councils of such Boroughs either to appoint an Analyst pursuant to that section or to make an arrangement for analyses such as is contemplated by section 11.

The result of the analyses made during the year is shown in the abstract printed in the Appendix. It will be seen that the total number of such analyses is 17,823, or about 150 more than in 1880. Of these, 5,039, or not far short of one third, were made in the Metropolis, this number being, by a curious coincidence, exactly the same as in 1880. As the public continue to avail themselves only to a very small extent of the provisions of the Act, its operation depends principally upon the extent to which local authorities choose to exercise their power of procuring samples for analysis ; and the result is that while in some districts the Act is well enforced, in others it is almost a dead letter. We suggested in our last report that at least one sample should be analysed yearly for every thousand persons throughout the country, but we find that, outside the Metropolis, this proportion has been attained only in the districts of three County Authorities, and in 29 boroughs. Within the jurisdiction of the magistrates of the 12 counties of Berks, Bucks, Cambridge, Cornwall, Dorset, Hertford, Monmouth, Northumberland, Rutland, Salop, Suffolk, and Wilts, only about 50 samples in all were analysed, and from 66 boroughs the return is absolutely *nil*, while in many others the number of analyses is quite insignificant. We have in these cases endeavoured to induce the Authorities to take action, but we cannot congratulate ourselves on the success of our attempts in this direction. The Town Councils of the smaller boroughs, especially, seem generally very unwilling to entertain a suspicion that the articles sold in their districts may possibly be adulterated ; and, though we have taken care to point out that the Act is designed not only to protect the public, but also to prevent honest tradesmen from being undersold by unscrupulous competitors, we have, in most cases, failed to persuade this class of Authorities to have samples analysed.

In one case indeed a Town Council had at first refused to have samples analysed, giving as a reason that they had received no complaints of adulteration, but afterwards on

our insistance decided to make the experiment. The result was that no less than three out of four of the samples examined in the third quarter for 1881 were found adulterated.

Even in some towns of considerable population we have found the same indisposition on the part of the Authorities to exercise the powers entrusted to them. On the other hand the returns show that in many districts the Act is being efficiently administered with results that are unquestionably satisfactory.

It seems desirable to call attention to the necessity for more caution than has been exhibited in some instances as regards the purchase of articles for analysis. Inspectors of Weights and Measures, Inspector of Nuisances, and other persons, who remain in office year after year, are apt to get too well known to the tradesmen to have much chance of being served with the same class of goods that are sold to the general public. Even the police, unless they take exceptional precautions, are not unlikely to be recognised by the keen eye of the adulterating tradesman. The analyst for Southampton gives a good illustration of this. He says that after the Inspectors had visited one or two shops they found, to use their own words, that "the game was up." They were known, and neighbouring tradesmen were put on the alert; on asking for coffee or butter they were informed that the shopkeepers did not keep pure coffee or butter, and could only sell such as they had as a mixture. In one case when coffee was asked for, the shopkeeper ordered his assistant to weigh out two ounces of berries and pound them in a wooden mortar, while a person was despatched to give information elsewhere. The analyst adds that on the evening of the same day he sent to the shop in question for coffee, and his messenger was served with a mixture largely adulterated with chicory. And when one of the inspectors employed a boy to make the purchases on his behalf, out of 13 samples of coffee sold, 10 were adulterated with chicory, though in all cases "coffee" was asked for. The attention of inspectors acting under the 13th section of the Sale of Food and Drugs Act should be specially called to the fact that they may employ a deputy to buy articles for analysis, and may take proceedings against the seller if such articles are found adulterated. (See Horder v. Scott, L. R. 5, Q.B.D. 552.)

The following table shows the number of samples examined during the year and the percentage of cases in which adulteration was reported to exist:—

———	Examined.	Adulterated.	1880. Percentage of Adulteration.	1881. Percentage of Adulteration.
Milk	6,926	1,356	21·4	19·5
Bread	1,037	49	6·4	4·7
Flour	429	—	1·0	—
Butter	1,353	188	18·3	13·9
Coffee	1,224	224	19·2	18·3
Mustard	864	123	15·8	14 2
Pickles (including Tinned Vegetables)	34	2	2·2	5·8
Sugar	284	1	—	0·3
Jam	46	3	6·9	6·5
Confectionery	213	2	—	0 9
Wine	38	2	19·4	5·2
Beer	326	8	4·1	2·4
Gin	648	168	20·1	25·9
Spirits other than Gin	1,150	327	25·9	28·4
Drugs	398	60	15·5	15·0
Other Articles	2, 53	100	3 0	3·5
Totals	17,823	2,613	15·68	14·67

It will be seen from this table that the proportion of adulterated samples has fallen to 14·7 per cent. of those examined, and we are glad to state that a comparison of this percentage with those of previous years, seems to indicate that adulteration, so far as its prevalence can be judged of from these returns, is pretty steadily diminishing. The results of the five years during which the returns have been made in such a form as to admit of tabulation on a uniform plan, stand as follows:—

	Samples Analysed.	Adulterated.	Percentage of Adulteration.
1877 ...	14,706 ...	2,826 ...	19·2
1878 ...	16,191 ...	2,782 ...	17·2
1879 ...	17,049 ...	2,535 ...	14·8
1880 ...	17,673 ...	2,772 ...	15·7
1881 ...	17,823 ...	2,613 ...	14·7

It is noteworthy that in the Metropolis the percentage is only 12·4, which seems to show that London is much better off than the rest of the kingdom as regards the purity of its food.

More than a third of the samples analysed, and more than half of those reported against, were of milk. Some improvements in the purity of this article seems to have been effected by the Act, as the proportion of adulterated samples, which in the whole of England and Wales was 24·1 per cent. in 1877, was only 19·5 per cent. in 1881. In the Metropolis the percentage of samples reported against was 23·4; and this proportion, formidably large as it is, nevertheless compares very favourably with that recorded in previous years.

In some of the London districts the proportion of samples of milk returned as adulterated is enormous. For instance in the City of London itself no less than 30 samples out of 71 were reported against, in St. Pancras, 34 out of 87, and in Woolwich, 31 out of 46. On the other hand, in St. James's, Westminster, all the 60 samples examined were pronounced genuine, in Lambeth only 13 samples were found adulterated out of 143, and in Wandsworth only 11 out of 119. We confess that we have some doubt whether the relative prevalence of adulteration is accurately represented by these figures, or whether differences in the administration of the Act may not have something to do with these remarkable contrasts. As the area of distribution of particular milk supplies does not, as a rule, follow the boundaries of sanitary districts, it is difficult to know why, for instance, the district of St. James, Westminster, should, according to the returns, be invariably supplied with pure milk, while adulteration is reported in numerous instances from neighbouring districts.

Of the eight most populous provincial towns we find that Birmingham has 32 adulterated samples of milk out of 59 analysed; Manchester 39 out of 162; Salford 106 out of 457; Bristol 44 out of 195; Liverpool 44 out of 199; Leeds 6 out of 33; Bradford 11 out of 74; and Sheffield 7 out of 64.

Birmingham, therefore, still maintains the distinction which it has for some years enjoyed of having a larger proportion of its milk reported as adulterated than any other great town in the kingdom.

As regards the analysis of milk we regret to say that a difficulty to which we have referred in previous reports crops up from time to time with the effect of apparently discrediting the machinery of the Sale of Food and Drugs Act. It has happened in more than one instance that an analyst has found a sample to be about equal to average milk to which 25 per cent. of water had been added, and (after leaving an apparently ample margin for possible natural poverty) he has had no hesitation, from the results of his analysis, in reporting it to be adulterated. Then the dairyman has challenged the accuracy of the analysis, and has produced a cow which, when milked in presence of the inspector, has given milk of no better quality than that reported against. It is true that the milk in question has, perhaps, contained little more than half the nutriment which good milk affords (in one case a sample was found with only 8 per cent. of solids and 92 per cent. of water), but still, in consequence of its being undoubtedly the genuine product of the cow, the magistrates have felt a difficulty in convicting the seller. In one instance of this kind the Authority brought the facts specially under our notice, and expressed a disinclination to have any more milk dealt with under the Act. We advised, however, that in a case of such abnormal poverty of milk the analyst was not to blame, in the present state of science, for reporting against it. We pointed out that the case was a very proper one for such investigation as proceedings before a magistrate would afford, so that inquiry might be made into all the circumstances, and the magistrate might determine whether an offence under the Act had been committed by the sale, as milk, of an article not of the "substance and quality" of that usually sold under the name. The analyst, in judging of milk, must necessarily adopt a minimum standard of constituents, based on a large number of analyses of genuine milk. But there would be great difficulty in prescribing a standard by Act of Parliament, as has been occasionally suggested, for if it were fixed so low as to class as genuine the milk of the oldest and worst fed cows to be found in the country, it would admit of the addition of an enormous amount of water to milk of fair quality; if, on the other hand, the standard of a fair average milk were adopted, there would be a loud outcry against the prohibition to sell genuine milk falling below that average. It is much to be wished that science should devise some mode of distinguishing milk to which water has been added from that which contains only its natural constituents, for until this can be achieved we fear that the analysis of milk cannot be placed on an entirely satisfactory footing, so far, at any rate, as border cases are concerned.

The amount of water added is often very large, and in a few instances reaches the enormous proportion of 60 or 70 per cent. Probably 20 per cent. may be taken as about the average. The analyst for Woolwich, however, in reporting upon a number of samples as diluted to about this extent, remarks that according to experience the inspectors are not generally successful in procuring the worst specimens, and he suggests that the inhabitants of that parish must be paying some thousands of pounds a year under the name of milkmen's bills, but really as an additional water-rate. The analyst for Essex complains that the milk is not even adulterated with pure water, and suggests that the compound is "eminently favourable for the propagation and development of disease germs." He adds that this view is confirmed by the fact that in nearly every case he has observed that a diluted milk decomposes and putrefies much more rapidly than that which is genuine.

Complaint has been made of the smallness of the fines inflicted in some rather flagrant instances of milk adulteration. No doubt this particular form of fraud is as remunerative

as it is simple; and a dairyman who adds 20 per cent. to his legitimate profits by having recourse to the pump is not to be deterred by an occasional penalty of ten shillings or a pound. Of course the fact that legal proceedings against him have been successful tends to lessen his custom, but on the other hand, it is possible that a large proportion of his customers may never hear of the conviction.

We should be glad to see more extensive use of the provision of the Act of 1879, which allows the taking of samples from milk cans at railway stations before delivery to the retailers. The plan has been adopted in two or three districts with very satisfactory results, and not only checks adulteration near its source, but protects the characters of honest traders, who do not water the milk, and who may have no suspicion that they are themselves being cheated.

The adulteration of bread seems to be steadily on the decrease. Less than 5 per cent. of the samples examined were found impure. In these cases the adulteration consisted for the most part of additions of alum introduced in order to improve the appearance of the bread, but having the effect, when present in quantity, of making it very indigestible. A curious point arose in Essex, when proceedings were taken as to a sample of bread reported as adulterated with alum; for the case was dismissed, according to the analyst's statement, because the inspector, having bought two loaves, left one of them with the vendor, and sent a portion of the other to be analysed. The court held that a portion of the actual loaf analysed must be left with the seller, and so the prosecution fell through.

It is noticeable that of more than 400 samples of flour analysed not a single one was found adulterated.

In the matter of butter the returns show a marked improvement, the percentage of adulteration having dropped from 18 in 1880, to 14 in 1881. It is possible that the recognition of butterine as a wholesome article of diet and a cheap substitute has led to its being sold to a greater extent under its proper name instead of under that of butter. In some cases the ingenuity of dairymen seems to be directed to the introduction of as much water as possible into butter during the process of manufacture. The analyst for Southampton remarks on one such sample, containing no less than 19 per cent. of water, that water is rather dear at the price of 1*s.* 4*d.* a pound, being after the rate of 3*s.* 4*d.* per quart.

In coffee the proportion of adulteration is rather less than last year. It continues to consist principally of chicory. In fact the habit of selling a mixture of chicory and coffee when coffee is asked for, sometimes with, but oftener without, a label notifying the fact of admixture, has unfortunately become an apparently ineradicable custom of the trade. Sometimes a specious title such as "French coffee" is given to the mixture, and in these cases it is generally found that the proportion of chicory is exceptionally large, amounting sometimes to 60 or 70 per cent.

The so-called adulteration of mustard with flour and turmeric continues to take place rather probably for the convenience, than for the deception, of people who desire, not merely mustard seed, but a preparation of mustard for table. Moreover, it seems to be admitted that pure mustard cannot without difficulty be kept good for any length of time.

The adulteration of sugar is practically a thing of the past, and we are glad to say that the very dangerous practice of using poisonous pigments for colouring confectionery, a practice which used to be very general in the early days of analyses, seems also to have been almost entirely abandoned.

Eight samples of beer were reported against out of 326 analysed. Excess of salt was in most of these cases the cause of their condemnation. In Bolton a material known as "beer heading," and chiefly composed of liquorice, aloes, and capsicum, was submitted for analysis, but this substance does not seem to have been met with in beer itself.

It is somewhat disappointing to find that spirits still figure prominently in the enumeration of adulterated samples, as more than a quarter of those examined were reported against. It was anticipated by the framers of the Act of 1879, that the very low standards fixed by that Act would practically be attained by all spirits usually sold. But though the adulteration is nothing but dilution, it is found that water is added in many instances with extraordinary profusion, and a good deal of gin is sold containing not much more than 20 per cent. of alcohol.

The number of samples of drugs reported upon is still much smaller than in our opinion is desirable, and the percentage of adulteration continues very large.

Among the articles not specially enumerated in the table above was a sample of cayenne pepper adulterated with red lead. This form of adulteration, which is very dangerous to health, used to be popular, but has of late years apparently died out, and we trust that it will not be revived. A large number of samples were of cocoa, and this article seems, as a rule, to be less adulterated than formerly. In the pure cocoa-bean, with merely the fat extracted, there is a large amount of nutriment. But in some of the common preparations as much as 80 per cent. of the bulk is found to be made up of arrowroot and sugar, and a cup of cocoa made from this composition is almost valueless as diet. In Paddington the Sanitary Committee, in consequence of the general alarm as to the condition of bacon, caused a number of samples of the cheapest and lowest quality to be submitted for analysis. In no case, however, were any trichinæ discovered. Some German sausages were also examined, and were found free from any parasitic or other noxious substances. They were composed of about half bread, nearly one quarter of fat, nearly one quurter of bull beef, with a little pepper, salt, and some herbs.

Of the 17,823 samples analysed during the year, all but 358 were obtained by officers of local authorities. A much larger proportion of the private than of the public purchases were found adulterated; this being doubtless due, for the most part, to the fact that a private purchaser is not likely to take the trouble, and incur the expense of analysis, unless he is tolerably confident that the goods sold to him are adulterated. Besides, as we have said above, there is good ground for believing that in some cases the inspectors are served with better articles than the general public.

Probably the cost of analyses often tends to prevent the public from more largely availing themselves of the Act. Bristol, Salford, and some other boroughs have, we think, done wisely in making arrangements with the analyst to analyse samples at 2s. 6d. each, instead of the half-guinea, mentioned in the Act as a maximum fee. In both the towns named the proportion of samples submitted for analysis by private purchasers is exceptionally large.

Two important decisions of the High Court of Justice have been given during the year with reference to the Sale of Food and Drugs' Act. In the case of Stare v. Smith (45 J. P. 141.) it was held that where an article is purchased by an assistant acting on behalf of an inspector appointed under section 13 of the Act of 1875, it is not necessary that subsequent

TOTAL NUMBER OF SAMPLES.

	Examined.	Adulterated.	Proportion Adulterated. 1881.	1880.
The Metropolitan District	5039	629	12·4	14·5
COUNTIES.				
Bedford	297	25	8·4	7·0
Berks	72	7	9·7	15·4
Bucks	12	5	41·6	—
Cambridge	54	3	5·5	12·9
Chester	663	129	19·4	19·6
Cornwall	3	1	33·3	63·6
Cumberland	119	23	19·3	10·4
Derby	118	26	22·0	28·8
Devon	122	30	24·5	22·2
Dorset	9	5	55·5	56·2
Durham	591	118	19·9	22·3
Essex	352	50	14·2	3·9
Gloucester	725	60	8·2	7·0
Hereford	30	0	—	—
Herts	—	—	—	—
Hunts	29	5	17·2	72·2
Kent	150	28	18·6	21·3
Lancaster	2269	422	18·5	17·5
Leicester	298	32	10·7	12·4
Lincoln	429	49	11·4	10·6
Middlesex	215	47	21·8	16·2
Monmouth	58	3	5·1	27·4
Norfolk	135	19	14·0	31·6
Northampton	89	12	13·4	12·0
Northumberland	121	18	14·8	17·1
Nottingham	88	14	15·9	20·4
Oxford	163	28	17·1	40·0
Rutland	—	—	—	20·0
Shropshire	6	0	—	15·4
Somerset	1052	65	6·1	5·5
Southampton	528	101	19·1	17·0
Stafford	1001	124	12·3	16·1
Suffolk	7	2	28·5	50·0
Surrey	504	96	19·0	21·0
Sussex	373	49	13·1	16·8
Warwick	448	116	25·8	25·7
Westmoreland	9	1	11·1	18·7
Wilts	43	9	20·9	7·4
Worcester	151	17	11·2	14·2
York, E. Riding	71	13	18·3	18·0
,, N. Riding	31	3	9·6	20·0
,, W. Riding	667	108	16·1	17·1
WALES.				
Anglesey	15	4	26·6	33·3
Brecknock	11	5	45·4	30·4
Cardigan	20	9	45·0	30·7
Carmarthen	15	2	13·3	11·1
Carnarvon	9	3	33·3	66·6
Denbigh	8	2	25·0	22·2
Flint	32	13	40·6	45·0
Glamorgan	473	40	—	7·7
Merioneth	59	33	55·9	7·6
Montgomery	3	0	—	—
Pembroke	25	7	28·0	31·2
Radnor	12	3	25·0	33·3
TOTALS	17,823	2,613	14·67	15·68

legal proceedings on account of adulteration should be taken by such assistant, but that the inspector is to be regarded as the actual purchaser, and as such entitled to institute the proceedings. In the case of Harrison v. Richards (45 J. P. 552), a summons had been taken out in a Metropolitan Police Court against a dairyman for selling milk, which, according to the analyst's certificate, was adulterated with 20 per cent. of water. The dairyman did not tender any evidence at the hearing, nor was the analyst examined; but the magistrate dismissed the case on the ground that he was not satisfied that the milk had been adulterated, and believed that its exceptional thinness was due to accidental circumstances. The High Court, however, held on appeal that, as the conditions prescribed in section 21 of the Act with regard to the examination of the analyst and of the defendant had not been complied with, the magistrate was not justified in going behind the analyst's certificate, and his decision was therefore erroneous in point of law.

REVIEW.

Practical Chemistry, Analytical Tables, and Exercises for Students (Second Edition).

By J. Campbell Brown, D.Sc.

London: J. & A. Churchill, New Burlington Street.

This is another addition to the voluminous literature on Qualitative Analysis, but we feel sure it is a volume that will meet with approbation, not only on account of the carefully compiled tables for the "Systematic Examination" for bases and acids, but also for the *special information* given, that is omitted in most works upon this subject. We may mention the following tables: "Organic Acids;" "Table for the Separation of Organic Bases;" "Tests for the Principal Organic Bases;" "Table for Analyses of Gases." The reducing power of various sugars upon Fehling's Solution, and their specific rotatory power upon polarized light, is also given. It is a work that requires the student to possess more than a mere "class" knowledge of the subject, for its pages are few, and, therefore, all minor details are necessarily omitted.

PHARMACEUTICAL SOCIETY OF GREAT BRITAIN *v.* JAMES KELSALL.

This case was tried at the County Court at Stockport, on the 10th inst., before T. Hughes, Esq., Q.C., Judge.

Mr. Yates, instructed by Messrs. Flux, Son and Co., appeared for the plaintiffs, and Mr. Brown (Brown and Ainsworth) appeared for the defendant.

This was an action brought by the Pharmaceutical Society of Great Britain to recover from the defendant, James Kelsall, a penalty of £5 for an infringement of the Pharmacy Act passed in 1868. By a section of that Act it is enacted that from and after the 31st of December, 1868, any person who shall take, use or exhibit the name or title "chemist and druggist," or "chemist" or "druggist," not being a duly registered "pharmaceutical chemist" or "chemist and druggist," shall, for every such offence, be liable to a penalty of £5 to be recovered in the way prescribed by the Pharmacy Act. The circumstances of the case are these:—The defendant had a shop in Sandy Lane, Stockport, and over the door he had a notice "Kelsall, Analytical Chemist." He also had numerous handbills published, in which there was the heading "James Kelsall, Analytical Chemist." The defendant, having the words over his shop, was written to by the Society, and replied that when he used and exhibited the title of "analytical chemist," he was not infringing the Act of Parliament.

After evidence had been given, his Honour said: This, I must say, is a very unfortunate case for the defendant, and to the public it is a very important case. The defendant appears to be a person who has served his country in foreign parts and to have been wounded there, and everyone must feel the greatest sympathy for him. From his experience in South Africa it is said that he is considerably skilled in the healing of wounds, and it is also said that he is a competent analyst. Of course I am not prepared to say that he is not thoroughly competent, from his experience in South Africa, both to deal with wounds, &c., such as those he states in his prospectus, and also to sell drugs. You see that I have this bill before me. One of the contentions is that he is not a pharmaceutical chemist. I have here before me his own bill, which says that "James Kelsall, Analytical Chemist, late Surgeon's Assistant, Government Hospital, South Africa, cures burns, scalds, ulcers, bruises, &c., &c., at the little hospital in Sandy Lane." In fact he names nearly all the ills to which flesh is subject, and, therefore, there must be dressings and medicines. Now the case on behalf of the defendant has been opened as a very hard one for him, and certainly in one sense it was very hard that everyone should not be able to exercise every faculty they may possess for their own good; but for the protection of society the British Legislature has enacted that which has for its object the protection of the British public from those practitioners in the country who are not fully competent. Now, if the defendant is fully competent he has only to go through the ordinary course of obtaining power to deal as he wishes to deal with these drugs and other medicines. But now comes the question which really has to be settled, and which I must decide. The merits of the case I have thoroughly followed. I wish to state that I have respect for a man who has personally suffered in the service of his country, but then comes the legal question to be decided. This person puts himself forward as an "analytical chemist." He knows thoroughly well what he is about, for as early as August he was reminded by the Pharmaceutical Society that he had no right to the employment of the term "chemist." And what did he say in reply? He said that he did not use it in any sense which would bring him within the meaning of the Legislature in passing the Pharmacy Acts, and his argument has been an argument which has been well put before the court by Mr. Brown. He does not say that he is a chemist at all, because he says he is an "analytical chemist." It seems to me that, having regard to the meaning of the word "chemist," one might as well contend with regard to a man that he was not a man because he is a warm-blooded man. I think that is a contention which cannot be sustained at all. And what is the consequence? Mr. Brown, in his speech, has called attention to the fact that the Act should be strictly construed. I think that in the case of any such person as this, who uses or exhibits the name or title of chemist and druggist, or chemist or druggist, not being a duly registered pharmaceutical chemist or chemist and druggist,—it seems to me that it is impossible on the strictest construction of the terms of the section,—it is impossible to say that a person who publishes himself as an analytical chemist does not come within the meaning of the Act. I think that in this case the defendant has distinctly and clearly infringed the terms of the Act. The case seems precisely to be one of those which the Act is intended to meet, and to be applied to. Defendant has incurred the penalty, and judgment must be for the plaintiffs. Judgment for the plaintiffs for £5 penalty, and £5 12s. costs.

LAW REPORTS.

Adulterated Vinegar :—

Messrs. Cole & French, grocers, of High Street, Guildford, were summoned before the Borough Bench recently, for selling a pint of vinegar, on the 18th October, which was not of the nature, quality, and substance demanded by the purchaser. Police-constable Hall proved the purchase; he paid 3d. for the vinegar, which he afterwards handed to the superintendent. Mr. Superintendent Law said he received a pint of vinegar from the last witness, and afterwards handed a portion to the Borough Analyst. The analyst's certificate was produced, and stated that the vinegar contained 25 per cent. more water than it should do. Mr. Cole (one of the defendants) produced a letter from the makers of the vinegar, Messrs. Hills & Underwood, who stated that it was genuine when sent away, and it must have been seriously tampered with in transit by the addition of water. Mr. George Durbidge said he was instructed to watch the case on behalf of Messrs. Hill & Underwood. They had told him that all their vinegar was kept in one huge vat, and the whole of it was sent from that vat. Other casks had been supplied to the defendants from the same vat, and found to be genuine. The Bench said the case had been proved, so far as the defendants were concerned, and they would be fined £1 and 13s. costs.

Rain Water and Milk:—

At Lambeth, John Wilkinson, shopkeeper, of 63, Albany Road, Camberwell, was summoned by Inspector Fisher, on behalf of the Camberwell Vestry, for selling milk in an adulterated condition. The inspector proved that some milk purchased at the defendant's shop was submitted to the analyst, and found to be adulterated to the extent of 30 per cent. with added water. The defendant said the milk was left outside the house early in the morning, and at that time the rain was coming down heavily. Mr. Saunders asked the defendant if he had allowed the churn to remain in such a position on purpose, and he said he certainly had not. Mr. Saunders supposed the defendant wanted him to believe the rain-water had adulterated the milk to the extent of 30 per cent. He could not come to such a conclusion, and ordered the defendant to pay a fine of 40s. and 12s. costs.

Coffee and Chicory:—

At Swindon Police Court, Nov. 16th, the magistrates decided a case—several times adjourned—in which Mr. J. J. Cleverley, grocer, of Prospect Place, Swindon, was charged with selling Supt. North a tin of coffee adulterated to the extent of 80 per cent with chicory. Mr. J. C. Townsend appeared for the defendant. Superintendent North proved going to the defendant's shop and asking for a quarter of a pound of tinned coffee, which he said he wanted for analysis. The defendant gave him a tin of Cassell's coffee, pointing out that it was labelled "Coffee mixed with chicory." Witness told him that he did not think that would save him, and that he should send it to the Public Analyst to have it analysed. The defendant said he had no fear of that, and stated that he did not care to keep a sample. He initialed the label on the tin, which the witness produced. Witness forwarded the tin the same day to W. F. Donkin, St. George's Hospital, London, for analysis; and on September 27th he received a certificate of analysis stating that the tin contained coffee 20 per cent., chicory 80 per cent. On that certificate he took these proceedings. In cross-examination, the witness said he had no particular instructions to go to the defendant's shop. He dealt with him, and believed him to be a respectable tradesman. Other tradesmen sold similar coffee before this but not now. He paid at the rate of 1s. 8d. per lb. for the coffee; the price of best coffee was 2s. per lb. A portion of the coffee obtained from Mr. Cleverley had been sent to the analyst of the Inland Revenue. Mr. W. Foote (magistrate's clerk) proved sending a sample of coffee handed to him by Superintendant North to the authorities of the Inland Revenue, and requested them to make an analysis. A certificate had been received from the commissioners to the effect that it contained 45 per cent. of chicory, leaving 55 of coffee. This certificate was signed by three officials of the Inland Revenue Laboratory. It was mentioned that a second analysis had been received from Mr. Donkin, who now said that the exact proportions were 38 per cent. of coffee and 62 of chicory. Mr. Townsend stated that the manufacturer had informed him that the mixture really consisted of 60 per cent. of the finest coffee and 40 per cent. of the finest chicory, which, they contended, was a perfectly fair proportion, taking into consideration the fine qualities of both the coffee and chicory they used and the expense of putting it up in such small tins. Mr. Townsend said that Mr. Cleverley thought his character was affected, and had a sample of the mixture analysed by Mr. Redwood, of the Pharmaceutical Society of Great Britain, and Public Analyst of Middlesex, and considered to be the first analyst in England; and he certified that it contained thirty-eight parts of chicory in one hundred. Mr. Townsend said he did not rely upon the certificate, but it showed how analysts differed. Before they went into the case, was it necessary to decide upon Superintendent North's evidence if there was any case against Mr. Cleverley? In order to convict Mr. Cleverley they would have to rule that there was no protection in the label. The judges held that if before sale the vendor called the attention of the purchaser that it was an admixture, he was not called upon to tell the purchaser the proportion of the ingredients, and that was sufficient protection. Superintendent North's attention having been called to the fact that it was an admixture, he thought there was no case against Mr. Cleverley. Before they could convict it would be necessary to show that the adulteration was so great that it would be fraudulent for the price charged; for, as Mr. Justice Lush had said, he did not see that it was fraudulent, seeing that the purchaser knew it was there. Mr. Townsend quoted several cases that had been decided by the judges, and said if those cases were binding, the magistrates would have no alternative. In answer to inquiries by the magistrates, Superintendent North said that he first stated that he required the coffee for analysis, and that Mr. Cleverley, if he refused him a sample, would be liable to a forfeit of £10. Mr. Townsend proceeded to read extracts from the law reports, showing that there was no offence if the chicory was not in such quantity as to fraudulently increase the bulk. The shopkeeper, if he knew the relative ingredients, might be as liable as the manufacturers. But he should prove that Mr. Cleverley did not know what were the relative ingredients, and he did no suppose either of the magistrates would say he did. The defendant was then called and examined.

He said he sold coffee at 2s. per lb., and that mixture at 1s. 8d. per lb. No person in the trade could sell the finest coffee at the price he sold that mixture. Had sold the mixture from twelve to twenty years, and his customers had it in preference to any he sold. They asked for that particular coffee. He paid 1s. 4d. per lb. to the wholesale manufacturers for the mixture; almost every grocer sold the same sort of coffee. The Bench retired to consult, and after an absence of nearly an hour they convicted the defendant in £1. Mr. Townsend asked if the justices had found that there was any fraudulent intention on the part of the defendant. He asked the Bench to state a case. The magistrates unanimously decided to do so.

RECENT CHEMICAL PATENTS.

The following specifications have been recently published, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

No 1882	Name of Patentee.	Title of Patent.	Price
759	J. A. Dixon	Purifying Anthrachinone and Alizarines	2d.
1392	D. Graham & H. J. Smith	Incandescent Electric Lamps	2d.
1393	F. B. Rawes	Obtaining Sulphur	8d.
1400	T. E. Gatehouse	Incandescent Electric Lamps	2d.
1405	J. W. Urquhart	Electric Gas Igniting Apparatus	2d.
1412	O. E. Woodhouse & F. Rawson	Electric Lighting	6d.
1444	R. Werdermann	Electric Incandescent Lighting Apparatus	6d.
1455	G. Molloy	Secondary Batteries for Storage of Electricity	2d.
1461	E. Turpin	Manufacture of Explosive Compound	4d.
1462	S. Waters	Electric Lamps	2d.
1464	F. de Lalande	Electric Piles or Batteries	4d.
1548	W. B. Brain	Secondary Batteries	6d.
1556	J. S. Williams	Generation, Storage, &c., of Electricity	1s. 4d.
1561	J. Walter	Purifying Coal Gas	4d.
1570	W. Jeffery	Electric Arc Lamps	6d.
1580	Sir D. Salomons	Electric Lamps	6d.
1587	A. Tribe	Secondary Batteries	4d.
1614	W. R. Lake	Magneto or Dynamo Electric Machines	6d.
1626	J. Munro	Electric Light and Power Appliances	8d.
1630	J. B. Spence and A. Watt	Obtaining Caustic Soda and Chlorine by the Decomposition of Saline Solutions	4d.
1647	St. G. L. Fox	Incandescent Electric Lamps	6d.
1670	J. Jameson	Incandescent Electric Lamps	4d.
1683	L. Mond	Manufacture of Peroxide of the Alkalies, Alkaline Earths and Hydrogen and the Application of the same	6d.
1689	G. S. Young and R. J. Hatton	Electric Lamps	6d.
1690	P. C. Gilchrist & S. G. Thomas	Manufacture of Nickel	2d.
1692	D. T. Piot	Dynamo Electric or Magneto Electric Machines	6d.
1697	Hon. R. Brougham and F. A. Ormiston	Incandescent Electric Lamps	6d.
1721	F. M. Lyte	Manufacture of Lead Peroxide	4d.
1725	F. C. Glaser	Manufacture of Soap	4d.
1728	B. J. Young	Manufacturing Glycerine from Soap Liquor	4d.
1769	J. H. Johnson	Secondary Batteries	6d.
1774	A. Muirhead	Electric Circuits	6d.
1817	J. H. Johnson	Obtaining Crystallizable Sugar from Raw Sugar	2d.
3881	F. R. Welles	Electric Lamps and Conductors therefor	6d.

BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Provisioner; The Practitioner; New Remedies; Proceedings of the American Chemical Society; Le Practicien; The Inventors' Record; New York Public Health; The Scientific American; Society of Arts Journal; Sanitary Engineer of New York; The Chemists' Journal; Weekly Drug News; Sugar Cane; Country Brewers' Gazette; The Medical Record; The Canada Lancet; Gas and Water Engineering; The Grocers' Gazette; Columbia School of Mines Quarterly Magazine London Water Supply, by Crookes, Odling and Tidy; Chemical Review.