

# THE ANALYST

Volume II

1878

W. Heffer & Sons Ltd.  
Cambridge, England  
Johnson Reprint Corporation  
New York 3, New York

*Reprinted photographically in Great Britain by  
Lowe & Brydone (Printers) Ltd. for W. Heffer & Sons Ltd., Cambridge*

*Distributor for North Central and South America  
Hawaii and the Philippines :  
Johnson Reprint Corporation  
New York 3, New York*

The original numbers of *The Analyst* from which this reprint was produced were kindly loaned by T. McLachlan, Esq., D.C.M., A.C.G.F.C., F.R.I.C.

# 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

G. W. WIGNER, F.C.S.,

ONE OF THE

*Hon. Secretaries of the Society of Public Analysts;*

AND

J. MUTER, Ph.D., F.C.S.,

ONE OF THE

*Vice-Presidents of the Society of Public Analysts.*

VOL. II, 1878.

---

LONDON :

Published for the Proprietors, by WM. BAXTER, at the Office of the South London  
School of Pharmacy, Kennington Cross, S.E.; and Sold by Messrs. BAILLIÈRE,  
TINDALL & COX, King William Street, Strand, W.C.; and  
ELLIOTT STOCK, 62, Paternoster Row, E.C.

# INDEX.

## A

	PAGE.
ABEL, Professor, Appointment of as C.B. ...	187
Abingdon, Appointment of W. F. DONKIN as Analyst for .. ...	170
Action by Milkman against Dealer, to recover fines paid for selling Adulterated Milk	185
Adulteration in Bavaria ... ..	31
"    Dublin ... ..	43
Air Analysis ... ..	45
Alcohol in Ether and Chloroform, by A. H. ALLEN ... ..	97
ALLEN, A. H. : On Alcohol in Ether and Chloroform ... ..	97
"    On Detection of Strichnine	111
"    Appointment of, as Analyst for W. R. Yorkshire ...	26
"    On Water Analysis, and Interpretation of Results ...	61
Alum in Bread, Effect of Using...	122
"    Estimation of, by W. C. YOUNG ... ..	13
"    at Somerset House Laboratory	168
"    in Flour, by J. CARTER BELL ...	28
American Hams ... ..	53
Ammonia in Sub-nitrate of Bismuth ...	45
"    in Gas, Conviction for ...	166
Analyses, Tabulated Statement of, made under the Sale of Food and Drugs' Act ...	9
<i>Analyst, The</i> ... ..	1
"    and the <i>Grocer</i> ... ..	36
Analystophobia ... ..	35
Analysts, Competent and Incompetent ...	53
"    Payment of, by Coroners ...	89
<i>Analysts' Reports :—</i>	
J. C. BELL ... ..	203
DR. BERNAYS ... ..	46, 188
DR. C. BROWN ... ..	203

## *Analysts Reports :—continued.*

	PAGE.
A. J. EDGER ... ..	26, 138
J. W. GATEHOUSE ... ..	150
J. HODGES ... ..	150
E. W. JONES ... ..	47, 150, 183
J. PATTINSON ... ..	150
C. H. PIESSE ... ..	122
W. L. SCOTT ... ..	103
E. SERGEANT ... ..	122
STAFFORDSHIRE ... ..	86
W. W. STODDART ... ..	203
F. SUTTON ... ..	26
DR. TRIPE ... ..	51
DR. VINEN ... ..	46
J. WHITMORE ... ..	46
ANGELL, A. : On Sulphuric Acid in Vinegar	183
"    Appointment as Public Analyst for Guildford ... ..	187
APJOHN, Professor, Death of ... ..	121
Arsenic in Sugar, Poisoning by ... ..	86, 141
"    in Tapers, by A. H. CHURCH ...	141
"    in Treacle ... ..	125
Attorney-General v. Gas-light and Coke Co. Sulphuretted Hydrogen Case...	165

## B

Balances Rock Crystal, as beams for ...	72
Bavaria, Adulteration in ... ..	31
Beer, Doctored ... ..	149
"    Glycerine in ... ..	228
"    Salted, Prosecution for Selling	30, 226
"    Salt in, by J. W. GATEHOUSE ...	130
BELL, J. : Enquiry as to Lecture on Food Adulteration, by ... ..	226

	PAGE.		PAGE.
BELL, J., and Mr. A. W. BLYTH, Correspondence as to Somerset House Methods of Analysis ...	204	Butter Analysis and the <i>Pharmaceutical Journal</i> ...	152
BELL, J. C. : On Alum in Flour ...	28	„ Copper in ...	36
„ On Milk Adulteration at Salford ...	33, 47	„ Prosecutions at Cheltenham, by A. H. CHURCH ...	55
„ „ Note as to ...	51	„ „ and Mr. HORSLEY, Correspondence as to ...	59
„ On Milk Analysis... ..	155	„ Fat; its Analysis and Composition, by E. W. T. JONES ...	19, 37
„ Quarterly Report of ...	203	Butterine, and Declaring it According to the Act ... ..	82
BERNAYS, Dr., Quarterly Reports, of ...	46, 188		
„ „ Note as to ...	53	C	
Bismuth, Ammonia in Sub-nitrate of ...	45	Cambridge, Appointment of J. W. KNIGHTS as Analyst for ... ..	204
BISSELL, E. G. : On some Constituents of Hops	195	Canada, Adulteration in ... ..	43
Blood, Glucose in, by Dr. PAVY ...	79	Candle, The Electric ... ..	66
BLYTH, A. W. : On Easy and Rapid Methods for Manipulating Fatty Acids ... ..	112	Capsaicin, The Active Principle of Cayenne Pepper, by J. C. TRESH ... ..	108
„ On Methods of Separating Salicylic Acid ... ..	164	Carbolic Acid, Being Soluble in Water, as to	186
„ On Micro-chemistry as applied to Tea Leaves ...	39	Cardigan, Appointment of Dr. MORGAN as Analyst for ... ..	150
„ and Mr. J. BELL, Correspondence as to Somerset House Methods of Analysis ...	204	Carmarthenshire, Appointment of Dr. MORGAN as Analyst for ... ..	54
„ And the Royal Society ...	224	Carnrick v. Morson, Lactopeptine Case ...	30
„ Appointment of, as Analyst for Totnes ... ..	204	Cassava, Prussic Acid from, by E. FRANCIS... ..	4
Bread, Alum in, estimation of, by W. C. YOUNG	13	Castor Oil Pills, Prosecution for Selling Adulterated ... ..	104, 125
„ Effect of using ... ..	122	„ Note as to ... ..	106
„ Adulterated with Alum, Prosecution for Selling ... ..	50	„ Dr. DUPRE on... ..	146
„ Adulteration in Russia... ..	228	Chancellor of the Exchequer, The, on Gin Adulteration ... ..	170
„ Making by Hand ... ..	88	Chemical Patents 18, 36, 54, 72, 90, 108, 126, 152, 170, 188, 206	228
<i>Brewers' Guardian</i> , The, and Gin Adulteration ... ..	188	Chemical Society, The ... ..	67
Bribe an Analyst, Attempt to ... ..	166	„ Journal of the ... ..	129
„ „ Note as to ... ..	168	<i>Chemist and Druggist</i> , The, On the Analysts Society's Replies to the German Government... ..	204
BROWN, Dr. C. : On Salt in Burton Beers ...	183	„ The, On Salt in Beer... ..	183
„ Quarterly Report of ... ..	203	Chemistry, Treatise on, Roscoe's ... ..	115
Burton Beers. Salt in, 121, 124, 146, 183, 188. 189	199	Chloroform, Alcohol in, by A. H. ALLEN ...	97
„ „ and the <i>Chemist and Druggist</i> ... ..	183	CHURCH, A. H. : On Arsenic in Tapers ... ..	141
Butter, Adulterated, Prosecutions for Selling 50, 69, 82, 83, 84, 185, 201, ..	227	„ On Butter Prosecutions at Cheltenham ... ..	55
„ and Short-weighted ... ..	227	Cinchonidine in Quinine, by Dr. PAUL ... ..	7
„ Warrant of ... ..	50	Citric Acid, A Test for ... ..	182
„ Analysis and <i>Leipsic Pharmaceutical News</i> Prize ... ..	170	CLEAVER, E. L., and Milk Analysis at Somerset House, Note as to ... ..	206
„ „ and the <i>Medical Examiner</i> ...	35	Clocks, Synchronized ... ..	120
		Coffee, Prosecution for Selling Adulterated... ..	83

INDEX.

v.

	PAGE.
Confectionery, Coloured with Chromate of	
Lead, Prosecutions for Selling	50, 82
Copper in Butter ...	... 36
" Food, by Dr. DUPRE'	... 1
" Peas, by Dr. DUPRE'	146, 165
" Peas, by C. H. PIESSE	... 27
" Peas, As to Danger or Otherwise of	72
" Vegetables, by Dr. MUTER	... 4
Copper Salts, Poisoning by ...	... 126
Coroners, Payment of Analysts by ...	... 89
<i>Correspondence :—</i>	
A. ANGELL, On Sulphuric Acid in Vinegar ...	... 183
Dr. BARTLETT, On Organization amongst Chemists ...	... 31
J. C. BELL, On Milk Adulteration at Salford ...	... 33, 47
J. C. BROWN, On Salt in Burton Beers	183
E. L. CLEAVER, On Milk Analysis ...	... 225
Dr. DUPRE', On Drug Adulteration ...	... 14
" On Salt in Beer, &c.	146, 165
"Gamma," On the Chemical Society ...	... 49
O. HEHNER, On Sulphuric Acid in Vinegar ...	... 203
W. KIRK, On Salt in Burton Beers	147, 183
E. H. MOORE, On Milk Adulteration at Brighton ...	... 33
Dr. MORGAN, On Salt in Burton Beers...	121
"One who has been in Practice 20 years," On Organization amongst Chemists ...	... 14
"One who Lives 'by Chemistry," ditto ...	... 48
"One who Wants to Know," ditto ...	... 32
"A Professional Chemist," ditto ...	32, 49
"Public Analyst," On Diseased Milk ...	... 70
"A Public Analyst," as to Mr. J. BELL's Lecture on Food Adulteration ...	... 226
"A Well-wisher," On Organization amongst chemists ...	... 48
W. C. YOUNG, On Sulphuric Acid in Vinegar ...	... 203
Council of Society of Public Analysts, Election of ...	... 194
Court of Appeal, Somerset House ...	... 127
Cream, Adulterated, Prosecution for Selling	198
Crystal Palace, 1877, Gas Bill and the House of Common's Committee ...	... 67
<b>D</b>	
Dangerous Mode of Adulterating Milk ...	... 185
DAVIS, R. H. : On Hederic Acid ...	... 142

	PAGE
" Doctor," The, in a Bakery ...	... 69
Doctored Beer ...	... 149
DONKIN, W. F., Appointment of, as Analyst for Abingdon ...	... 170
DOVE, R. B. : On Willow Bark Acid ...	... 145
Dover, and the Appointment of a Public Analyst ...	... 204
Drug Adulteration, by Dr. DUPRE'	14, 32
" Note as to ...	... 53
Dublin, Adulteration in ...	... 43
DUPRE', Dr. : On Copper in Food	1, 146, 165
" Castor Oil Pills, and Salt in Beer ...	... 146
" Drug Adulteration	14, 32
" Analysis by, of Port Wine, recovered from Royal George	75

E

EDGER, A. J., Quarterly Reports of	26, 86, 183
Effect of Declaring a Compound According to the Act ...	... 83
Electric Candle, The ...	... 66
Electricity, Testing the Purity of Water by...	228
Essential Oils, Test for ...	... 44
Ether in Alcohol, by A. H. ALLEN ...	... 97
Excuse for Water in Milk ...	... 85

F

Fatty Acids, Easy and Rapid Method of Manipulating, by A. W. BLYTH ...	... 112
Faversham, and the Appointment of a Public Analyst ...	... 228
Flour, Alum in, by J. C. BELL ...	... 28
" Adulteration of, for the Russian Army	54
" " Worst case brought in any Court ...	... 227
Fore Milk, Conviction for Selling ...	... 82
FRANCIS, E., On Prussic Acid from Cassava...	4

G

" GAMMA," on the Chemical Society ...	... 49
Gas, Coal, Products of Combustion of, by C. HEISCH ...	... 133
" Products of Combustion of, by G. W. WIGNER ...	... 139

	PAGE.		PAGE.
Gas, Coal, Products of Combustion of, by W. C. YOUNG ... ..	135	<b>II</b>	
Gas, Conviction for supplying impure ... ..	202	Hederic Acids and Ivy Leaves, by R. H. DAVIES ...	142
„ Heavy penalty for impurity in ... ..	166	„ „ by C. T. KINGZETT	143
„ Light and Coke Company's 1877 Bill in Parliament ... ..	67	HEHNER, O.: On Sulphuric Acid in Vinegar	203
„ Light and Coke Co., Attorney General v. ... ..	165	„ On Water Analysis ... ..	177
„ of Paris ... ..	66	HILL, A. B., Quarterly Report of ... ..	86
„ Pure or Impure ... ..	53	HODGES, J. F., „ ... ..	86 150
„ Sulphur in ... ..	118	Honey, Adulterated, Prosecution for Selling	166
„ Works, Action to restrain Nuisance from	165	Hops, Constituents of, by E. G. BISSELL ... ..	195
GATEHOUSE J. W. on Salt in Beer ... ..	130	„ Examination of, by W. E. PORTER	76 176
„ Report of ... ..	150	„ Picric Acid as a Substitute for ... ..	228
German Government, The, and Adulteration	169, 171	HORSLEY, J., and Cheltenham Butter Prosecutions ... ..	59
„ and the Replies to Inquiries of	173	Human Hair, Professor ERASMUS WILSON on	45
„ „ and the <i>Chemist and Druggist</i>	205	<b>I</b>	
Gin v. Gin and Water ... ..	123	Impure Gas, Heavy Penalty for Supplying ... ..	166
„ Dilution of, THE CHANCELLOR OF THE EXCHEQUOR ON ... ..	17	„ Pure or ... ..	153
Gin Adulteration, Effect of recent decisions		Infusoria in Water ... ..	126
„ as to ... ..	186	Inland Revenue Laboratory, Report of ... ..	16
„ Note as to ... ..	168	Inspector, Summons for Refusing to Serve	69 202
„ Objection that Inspector not prejudiced, overruled ... ..	227	Institute of Chemistry, Notes as to the	71 151
„ Prosecutions for 147, 149,	167	Ivy Leaves and Hederic Acid, by R. H. DAVIES...	142
„ ALDERMAN ROOK, on ... ..	187	„ „ by C. T. KINGZETT	143
„ and the ARCHBISHOP OF YORK	26	<b>J</b>	
Glasgow Decision as to "Prejudice of Purchaser," and Abstraction of Cream	189 981	Jalap, Adulteration of, with Nux Vomica ... ..	50
„ „ and the Local Government Board ... ..	221	JONES, E. W. T., On Butter Fat	19 37
Glass Wool ... ..	26	„ Quarterly Reports of	47 183
Glucose in Blood, by DR. PAVY ... ..	79	„ Appointment of, as Analyst for North Staffordshire...	150
Glycerine in Beer ... ..	228	Journal of the Chemical Society, The ... ..	129
Gold and Silver in Sulphides of other Metals	29	<b>K</b>	
Government Grants in aid of Scientific Research... ..	78	KINGZETT, C. T.: On Metallic Compounds in Alimentary Substances	98
„ in support of Science ... ..	88	„ On Hederic Acid from Ivy Leaves ... ..	143
Gravesend, the Analyst for, and the Local Government Board ... ..	15	KIRK, W.: On Salt in Burton Beer	147 183
GREENISH, T.: On Tea Hair ... ..	103	Knight v. Webb, Reduced Spirits Appeal Case	68
GRIFFIN, J. J., Death of ... ..	170	KNIGHTS, J. WEST, Appointment of, as Analyst for Cambridge ... ..	204
<i>Grocer, The</i> , and Adulteration ... ..	87, 186		
„ and <i>The Analyst</i> ... ..	36		
Guildford, Appointment of A. ANGELL as Public Analyst for ... ..	177		





	PAGE.		PAGE.
MORSON, CARNRICK <i>v.</i> Trade Mark Case ...	30	PAVY, Dr. : On Glucose in Blood ...	79
Mustard, Adulterated, at Coventry	69	Peas, preserved, Prosecutions for Selling Adulterated ...	49, 60 69
"    "    Heavy Penalty for Selling ...	26	"    Stopping the Sale of ...	8
"    "    Prosecution for Selling	26	"    On Copper in, by Dr. DUPRE	146
MUTER, Dr. : On Copper in Vegetables ...	4	"    "    by C.H. PIESSE	27
"    On Mares' Milk ...	42	Pepper, Cayenne, on the Active Principle of, by I. C. THRESH...	108
"    On Oleine in Fats ...	73	Personal Attacks on Analysts ...	206
<b>N</b>			
Natural Loss of Milk through Keeping, As to Newport (Mon.), Appointment of J. W. THOMAS as Analyst for ...	227	Peruvian Wine, Why Travellers Dislike ...	203
New York, Milk Adulteration in, ...	28	<i>Pharmaceutical Journal</i> on Copper in Peas and Butter Analysis ...	152
Nitre, Spirits of, Prosecution for Selling diluted ...	85	Pharmacy, Sugar in, by Dr. SIZES ...	119
Nitrogen in Nitrates ...	85	Picric Acid as a Substitute for Hops ...	228
Notes of the Month, 16, 34, 51, 70, 86, 105, 123, 151, 168, 186	205	PIESSE, C. H. : On Copper in Peas ...	27
Numerical Scale for Valuation of Impurities in Water, by G. W. WIGNER ...	208	"    Report of ...	122
Nuisance from Gas Works ...	165	PLIMSOLL, Mr. : On Salt in Beer ...	169
Nux Vomica, Conviction for selling Jalap Adulterated with ...	50	Plymouth, Milk Adulteration at, as to	101 107
<b>O</b>			
Oatmeal, Adulterated with Barley Meal, ...	84	Poisoned Salt ...	123
"    "    Prosecution for selling	84	POLAND, Mr., Opinion of, as to Gin Adulteration ...	151
"    "    Curious ...	104	Police, Summons for Refusing to Serve ...	202
Obituary, PROFESSOR APJOHN ...	121	Poplar, Appointment of W. C. YOUNG as Analyst for ...	18
"    J. J. GRIFFIN ..	70	PORTER, W. E. : On the Examination of Hops	76 176
"    H. D. RUMKORFF	157	Port Wine, Analysis by Dr. DUPRE' of, recovered from the "Royal George" ...	75
Oleine in Fats, by DR. MUTER ...	73	Precipitated Sulphur and Milk of Sulphur ...	85
"    Butter, Conviction for Selling ...	83	"Prejudice of Purchaser" as to Sale of Adulterated Articles for Analysis, being to	198 226
Opium, Assay of, by W. PROCTOR ...	114	"    Objection overruled	227
Organization amongst Chemists, Correspondence, as to 14, 31, 32, 48,	49	"Professional Chemist" on Organization amongst Chemists... ..	32 49
"    Leading Articles ...	91 109	Proteine, Valuation of ...	51
"    Notes as to ...	16, 71 89	PROCTOR, W. E. : On Assay of Opium ...	114
Oxide of Zinc, Adulteration of, with Sulphide of Zinc ...	125	Prussic Acid from Cassava, by E. FRANCIS ...	4
"    Impurity in, by W. W. STODDART ...	113	Public Analyst, Appointment of, for Dover	204
<b>P</b>			
Paris Gas ...	66	"    "    for Faversham	204, 228
"    Wine, Analysis of ...	222	"    Attempt to bribe a	166 168
PAUL, Dr. : On Cinchonidine in Quinine ...	7	"Public Analyst" : On the Microscope and Diseased Milk ...	70
"    On Metallic Compounds in Alimentary Substances ...	98	"    As to Lecture by J. Bell on Food Adulteration	226
		Public Analysts, Appointments as	
		A. H. ALLEN, for W.R. Yorkshire	26
		A. ANGELL, for Guildford ...	187
		A. W. BLYTH, for Totnes ...	204
		W. F. DONKIN, for Abingdon ...	170

*Public Analysts, Appointments as—Continued*

	PAGE.
E. W. T. JONES, for North Staffordshire ... ..	150
J. W. KNIGHTS, for Cambridge ... ..	204
J. M. MILNE, for Fifeshire ... ..	204
J. W. MONTGOMERY, for Cumberland ... ..	204
W. MORGAN, for Cardigan ... ..	150
"    for Carmarthenshire... ..	54
J. W. THOMAS, for Newport (Mon.) ... ..	227
J. A. WOODHAMS, for Rye ... ..	170
W. C. YOUNG, for Poplar ... ..	18
Public Analysts, Position of ... ..	34
"    Powers and duties of ... ..	15
"    Proposal to Examine Suspected Articles for one another ... ..	17
"    Test of Competency of ... ..	206
"    Work during 1877 ... ..	197 220
"    Society of, Position of ... ..	71
"    "    President's Annual Address ... ..	190
"    "    Proceedings of, 1, 37, 55, 93, 172, 190, 207	207
"    "    and Somerset House Analysts 207, 223	207, 223
Publicans and Gin Adulteration ... ..	188
Pure or Impure Gas ... ..	153

Q

Quinine, Cinchonidine in, by Dr. PAUL ... ..	7
--	---

R

Reduced Spirits and the Local Government Board ... ..	65
"    Webb v. Knight ... ..	68
Refusal to serve Inspector, Summons for ... ..	69 202
Replies to German Government's Inquiries ... ..	173
Report of Principal of Somerset House Laboratory ... ..	220
Review, D. Lardner's Natural Philosophy ... ..	31
"    Roscoe and Schorlemmer's Treatise on Chemistry ... ..	115
Rhubarb Pills, Selling for Castor Oil Pills ... ..	104
Rice, Waxed ... ..	152
Rock Crystal as Beams for Balances ... ..	72
ROOK, ALDERMAN, On Gin Adulteration ... ..	187

	PAGE.
"Royal George," Analysis of Wine Recovered from, by DR. DUPRE' ... ..	75
Royal Society, Grants from the ... ..	78
"    and Mr. W. BLYTH ... ..	224
RUHKORFF, H. D., death of ... ..	187
Russian Army, Adulteration of flour for the ... ..	54
"    "    bread " ... ..	228
Rye, appointment of J. A. WOODHAMS as Analyst for ... ..	170

S.

Sale of Food and Drugs Act, Bill to amend ... ..	90 105
"    "    "    Misinterpretations of... ..	189
"    "    "    Statement of Analyses made under, in 1875-6... ..	179
"    "    "    Working of the, by G. W. WIGNER ... ..	11
Salford Analyst's Report ... ..	86
Salt in Beer, DR. BERNATS Report on ... ..	188
"    And the <i>Chemist and Druggist</i> ... ..	183
"    Correspondence as to 146, 147 ... ..	183
"    By J. W. GATEHOUSE ... ..	130
"    MR. PLIMSOLL on ... ..	167
"    Prosecutions for ... ..	199
"    And Schedule to Licensing Act ... ..	169
Salt poisoned ... ..	123
Salts, Copper, poisoning by ... ..	126
Sanitas ... ..	181
Sausages, prosecutions for selling adulterated ... ..	30
SCOTT, W. L., Report of ... ..	103
Seeds, prosecution for selling adulterated ... ..	184 200
SERGEANT E., Report of ... ..	122
SHEA, J.: On Sewage Farm Milk ... ..	117
Silver and Gold in Sulphides of other metals ... ..	29
Society of Public Analysts, position of the ... ..	71
"    President's Annual Address ... ..	190
"    Proceedings of 1, 37, 55, 93, 172, 190 ... ..	207
"    and Somerset House Analysts ... ..	207 223
Soda water, prosecution for selling adulterated ... ..	104

	PAGE.
Somerset House Analysts and the Society of Public Analysts ... ..	207 223
"    And Alum in Bread	168
"    And MR. CLEAVER	206
"    Wording of Certificates from ...	201
"    House Court of Appeal ...	127
"    Laboratory, Report of Principal of ...	189
Spirits, Adulteration of ...	151
"    Opinion of MR. POLAND as to Reduced ...	151 65 68
Spirits of Nitre, Prosecution for Selling Diluted ...	85
Staffordshire Analyst's Report ...	86
"    North, Appointment of E. W. T. JONES as Analyst for ...	150
Strichnine, Detection of, by A. H. ALLEN ...	111
Suet in Butter ...	125
Sugar, Adulterated, as to Beet and Cane Sugar being cause of bad smell of ...	187
Sugar, Arsenic in, Poisoning by ...	86 141
"    In Pharmacy, by DR. SYMES ...	119
Sulphate of Lime, and Milk of Sulphur ...	34
Sulphide of Zinc, Adulteration of Oxide of Zinc with ...	125
Sulphur in Gas ...	67
Sulphuretted Hydrogen in Gas, Conviction for Sulphuric Acid in Vinegar, New Method for Estimation of, by W. C. YOUNG ...	166 163
"    Correspondence as to ...	183 203
Swansea, Appointment of DR. MORGAN as Analyst for ...	54
Sweets, Prosecutions for Selling Adulterated ...	30
SYMES, DR.: On Sugar in Pharmacy ...	119
Synchronized Clocks... ..	120

T

Tallow in Butter ... ..	125
Tea Hair, by T. GREENISH ..	103
"    Prosecution for selling Adulterated ...	50
"    Leaves, Micro Chemistry applied to, by A. W. BLYTH ...	39
"    Pure ... ..	151
Theine, Estimation of, by A. W. BLYTH ...	39
THOMAS, J. W., Appointment of, as Public	

	PAGE.
Analyst for Newport (Mon.) ... ..	227
THOMSON, W.: On Mode of Stating Results of milk Analysis ... ..	94
Totnes, Appointment of A. W. BLYTH as Analyst for ... ..	204
THRESH, I. C.: On Capsaicin, the Active Principle of Cayenne Pepper ...	108
Trade Mark, Injunction to Restrain Infringement of Chemical ... ..	30
Treacle, Arsenic in ... ..	125
TRIBE, DR., Report of ... ..	51

U

United States, Extraordinary Mineral Spring in the ... ..	222
---	-----

V

Vinegar, Sulphuric Acid in, Method for Estimating, by W. C. YOUNG ...	163
"    "    Correspondence as to ...	183 203
VINEN, DR., Report of ... ..	46 52

W

Warranty of Adulterated Butter ... ..	50
Water Analysis and Interpretation of Results, by A. H. ALLEN ...	61
"    by O. HEHNER ...	177
"    and Numerical Scale for valuation of impurities, by G. W. WIGNER ...	197 20g
Water, Testing Purity by Electricity ...	228
Webb v. Knight, Reduced Spirits (Appeal) Case ... ..	68
Weight of Samples, Certificates of Adulteration must state ... ..	190 201
"Well-wisher": On Organization amongst Chemists ... ..	48
Westaway v. Eldridge, Diseased Milk Case ...	67
White Lead Manufacture, Injury to Health by ...	89
"    New Process for ...	89
WHITMORE, DR., Report of ... ..	46
WIGNER, G. W.: On the Working of the Sale of Food Act ...	11

INDEX.

xi.

	PAGE.
WIGNER, G. W. : On Formation of Numerical Scale for Valuation of Impu- rurities in Waters 197	208
Willow Bark Acid, by D. B. DOTT ...	144
Wine, Paris, Analysis of, in ...	222
Wine, Peruvian, Why English Travellers Dislike ...	203
WOODHAMS, J. A., Appointment of, as Analyst for Rye ...	170

Y

York, The Archbishop of, and Gin Adulteration	26
Yorkshire, W.R., Appointment of A. H. ALLEN as Analyst for ...	26

	PAGE.
York, New, Milk Adulteration in ...	82
YOUNG, W. C. : On Alum in Bread ...	13
„ Appointment of, as Analyst for Poplar ...	18
„ On Products of Combustion of Coal Gas ...	135
„ On Sulphuric Acid in Vine- gar ...	163 203

Z

Zinc and Lead Ores, Treatment of ...	117
„ Oxide of, Adulteration of, with Sulphide of Zinc ...	125

# THE ANALYST

---

---

A REFERENCE to our title page will show that we have started on a new year of life under slightly varied conditions. While the proceedings of the Society of Public Analysts and the papers read before them, will as heretofore, furnish a large portion of our matter, and will, we trust, continue to give our subscribers the same valuable information they have hitherto done; a certain portion of our space will be devoted to noticing the progress of general research on subjects interesting to PRACTISING ANALYSTS as a body. We shall also devote a column to some short 'notes,' touching on any questions interesting to analysts generally, which may have occurred during the month, and it will be our strenuous desire to hold the scales of justice evenly, meting out praise where it is due, but fearlessly censuring when necessary. The utmost facilities will be given to correspondents to submit their views on any subject relating to food, drugs, or general analysis; we will willingly pay the usual honorarium for any useful contributions which we may insert from those, who, not being members of the Society of Public Analysts, have not the opportunity of reading their papers before the Society.

## THE SOCIETY OF PUBLIC ANALYSTS.

*An Ordinary Meeting was held at Burlington House, Piccadilly, on 14th March, 1877.*

THE minutes of the last meeting were read and confirmed.

The President, Dr. Dupré, announced that the Council considered that as proprietors of *The Analyst*, the Society was not in a proper position, and they had therefore felt it necessary to make an alteration in reference to it. The Society would in future have no right whatever in *The Analyst* itself, or responsibility for it, but about 12 or 14 pages monthly would be under their control for publication of their proceedings, and the paper would be sent free every month to each member of the Society, in consideration of which, the Society would make an annual payment to the Proprietors of the Journal.

Mr. E. W. T. Jones read a paper "On Butter Fat, its Analysis and Composition."

Dr. Muter, Mr. Hehner, and Dr. Dupré, took part in the discussion which ensued, and Mr. Jones replied.

Dr. Muter read a note "On Copper in Preserved Vegetables," and a discussion ensued, in which Dr. Dupré and Mr. Piesse took part.

Mr. Wigner read a paper "On the Working of the Sale of Food and Drugs' Act," and a discussion afterwards took place on the subject.

## ON COPPER IN FOOD.

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

*Read before the Society of Public Analysts, at Burlington House, on 14th February, 1877.*

AT the hearing of a case of alleged adulteration of green peas by copper, at Marlborough Street Police Court, a short time since, the evidence brought forward for the prosecution, on the one hand, and that advanced for the defence on the other, was extremely conflicting. The magistrate, in consequence, decided to reserve his judgment, stating that

he hoped in the meantime the merits of the case would receive careful discussion. I have, therefore, been induced to bring before you some experiments published by Dr. Odling and myself about nineteen years ago, bearing on this question. These experiments are, I believe, the most comprehensive and most careful yet made on the subject, but having appeared in a paper of but limited circulation, they are not very widely known.

The first question to be decided is, should the presence of copper in an article of food, green peas for instance, be looked upon as an adulteration or not? To answer this satisfactorily, it is clearly necessary in the first place to determine whether copper is or is not a normal constituent of the food in question. Now, there can be no doubt that minute traces of copper are present in almost all vegetable substances that have been examined. In the above mentioned paper, by Dr. Odling and myself, for example, we show that we found copper in 21 out of 22 samples of bread specially examined for copper, in every one of 20 samples of flour examined with the same object, and also in every one of 43 samples of wheat, barley, maize, wheat-straw, barley-straw, mangold wurtzel, swede, turnip root and leaf. In 25 out of these samples we estimated the copper quantitatively, the maximum amount found being 0.024 grains of oxide of copper in 100 grains of wheat ash, corresponding to about 1000 grains of fresh wheat, or 1 grain of copper oxide in 240,000 grains of wheat; the minimum being 0.004 grains in 100 grains of ash (turnip root), corresponding to 17,500 of fresh turnip, or 1 grain of copper oxide in 4,375,000 grains of turnip root.

These quantities are so small, that unless comparatively large quantities of material are taken, and the copper is specially searched for, it may readily be overlooked. A great variety of vegetable substances have also been examined by a number of chemists, with, speaking generally, the same result. If enough material is taken, the copper is almost always found, but in minute traces only. Since the passing of the Adulteration Acts, for example, a good many samples of preserved peas have been examined for copper by various public analysts, generally with negative results, proving that only minute traces of copper are normally present in green peas. One particular brand, however, always yields copper in notable quantities.

We may, therefore, conclude, without the least hesitation, that the copper naturally present is always a minute trace only, rarely amounting to so much as 1 grain in 200,000 grains of substance, and falling generally far short of that.

The first question—ought the presence of copper to be looked upon as an adulteration?—may therefore be answered thus: The presence of copper, in an article of food, when exceeding the proportion of say 1 grain in 100,000, must be looked upon as a decided adulteration, the said food not being of the nature, substance, and quality demanded.

The second question, viz. : what proportion of copper should be looked upon as an adulteration injurious to health? is much more difficult to answer, though we are not quite without facts to guide us even here.

Thus the medicinal doses of sulphate of copper, according to the Ph. B., are—

As an astringent	...	...	...	...	$\frac{1}{2}$ to 2 grains.
As an emetic	...	...	...	...	$\frac{1}{8}$ to 18 "

or, in their equivalent of copper—

As an astringent	...	...	...	...	$\frac{1}{16}$ to $\frac{1}{2}$ grain.
As an emetic	..	...	...	...	$1\frac{1}{2}$ to $2\frac{1}{2}$ "

Now as a rule, no drug or medicine can safely be taken, or in other words, taken without danger to health, unless it is done under the advice and guidance of a medical man. We may therefore fairly require, that in our ordinary articles we are not dosed unawares with medicinal quantities of a powerful drug. Seeing then that one-sixteenth of a grain of copper is already a medicinal dose, the quantity of that metal admissible in the amount of food taken at a meal should at least not exceed this.

Applying this to the case under consideration at Marlborough Street, we are, I think, justified in saying that 1-lb. of green peas should not contain more than from one-eighth to one-quarter of a grain of copper; anything beyond this should be looked upon as an adulteration, and punished as such.

In the paper above quoted Dr. Odling and myself have also given the result of the analyses of 29 samples of animal matters, in almost every one of which we detected the presence of copper. In 10 of these we estimated the amount of copper present, and found, for example, a proportion of copper, amounting to 0.035, and 0.029 grains of oxide of copper in human livers, or in each case about 1 grain of oxide of copper, in 500,000 grains of liver. Kidneys showed rather a higher proportion, or about 1 grain of oxide, in 100,000 parts.

In two sheep's livers bought with an interval of one year between them, we found, however, the extraordinary quantity of 0.513 and 0.590 grains of oxide or about 1 grain in 20,000 parts.

These proportions, which are much higher than those found in any vegetable food, seem to show that copper is, to some extent at least, a cumulative poison, and it becomes all the more imperative to exclude every trace of extraneous copper from all articles of food.

I had hoped to be able, in conclusion, to give the best method to be employed for the detection and estimation of these minute quantities of copper. My experiments are, however, not quite finished, and I must defer the description to some future time; here I will only remark, that the copper was precipitated on a platinum wire by a weak galvanic current, redissolved in nitric acid, and finally weighed as oxide of copper; a method which, since then, has been employed by various chemists.

In the discussion which ensued:

Mr. Dyer said that if the plea that copper was given in medicine was to justify its presence in every article of food, it might just as well be said, that because strychnia was used in medicine, we might not object if it was found in other things.

Mr. Wigner thought the question of injury to health ought not, under ordinary circumstances, to be raised, as in this prosecution; we ought to be content with the Act which directs a penalty of £20 for a conviction under Section 6, and he thought that that penalty was quite sufficient to act as a deterrent without going into the question of injury to health, leaving that to be brought out, not by the certificate, but only by the evidence. With regard to Dr. Dupré's paper, he thought that the maximum limit of copper, one-quarter of a grain in the pound was too high, and that we ought not to go beyond what Dr. Odling and Dr. Dupré have themselves found in vegetable products.

Dr. Muter said that as regards the estimation of copper, he thought that the platinum vessels that had been used were by no means free from reproach. He quoted one case of finding sulphate of copper in bread. A journeyman baker had introduced it as a new idea and two or three more bakers followed, and they afterwards confessed the

whole affair. At that time he found that when he incinerated in porcelain he got copper in his ash. He had lately investigated the amount of copper in Pharmaceutical extracts, and he found nearly all abounded in copper, and he had been obliged to form a standard of how much copper he ought to pass, and he had made the rule that if he did not get more than a milligram from 100 grains of extract he would pass them; if more, he condemned them.

Mr. Piesso said that as to the question of the peas being harmless, there was little evidence. Dr. Evans stated, at the hearing, there were very few cases of poisoning in this country, and he attributed that to the fact that our cooking utensils are made of iron, while in France copper ones are still used. The percentage table there, of accidental poisoning cases, shows over 20 per cent. to be due to poisoning by minute traces of copper, and he considered that owing to copper utensils being used.

Dr. Dupré, in replying, said that Dr. Odling and himself, in making their experiments used one platinum dish, which they afterwards cut up and examined, but found no copper in it.

#### NOTE ON COPPER IN VEGETABLES.

By J. MUTER, Ph.D., F.C.S., &c.

*Read before the Society of Public Analysts, at Burlington House, 14th March, 1877.*

HAVING heard it stated by the agents for the manufacturers, as a plausible reason for using salts of copper in the manufacture of preserved peas, that the ingredients in question were used in all vegetables, being necessary for their preservation, I obtained a tin of "Macedoines" (mixed vegetables) and examined it. I took all the peas and beans together, then the carrots and turnips, then the water, and lastly the pulpy mixed vegetable matter, which could only be separated by filtration, and I obtained the following results:—

Peas and green vegetable contained	...	...	·100	copper
Carrots and turnips	"	...	·010	"
Water	"	..	·005	"
Mixed disintegrated matter	"	...	·015	"
			·130	"
	Total per tin	...	·130	"

It is therefore clear that the green vegetables alone are deliberately cooked in copper pans to give them colour, and that the use of copper for other vegetables is a fiction.

I may mention that I have also examined lately some tins of *champignons*, and also crystallized fruits, but found no copper in anything but some highly-coloured greengages.

#### ON PRUSSIC ACID FROM CASSAVA.

By E. FRANCIS, F.C.S.

*Government Laboratory, Trinidad.*

It is well-known that two species of the tropical plant manioc or cassava are described; one of which is credited with powerful toxic properties, while the other, considered harmless, is cooked and freely eaten throughout the West Indies and South America. The two kinds are named by Tohl, *manihot utilissima*, and *manihot aipi* respectively, but they are commonly known as bitter and sweet cassava.

Observations respecting the poisonous action of bitter cassava upon men and animals have been frequently recorded, and the presence of prussic acid in the juice expressed



from the roots has long been established; although no attempts have apparently been made to determine the quantity of the poisonous acid yielded by the plant.

This point having formed the subject of inquiry, a number of determinations of prussic acid from bitter cassava were made; attention was then directed to the sweet kind, with the unexpected result of finding, that, not only did it yield prussic acid, but the quantity obtained from it often nearly equalled that from the bitter, and in no instance did it fail to furnish a certain amount of the poison.

The results of the examination for prussic acid of a number of samples of each kind of the plant are shown in the following table; the quantities being given in percentages, and also as grains of prussic acid from an avoirdupois pound of the fresh root.

TABLE I.  
Quantity of Prussic Acid yielded by Cassava Roots.

SWEET.			BITTER.		
No. of Sample.	Per cent. of HCN.	Grains of HCN. per lb.	No. of Sample.	Per cent. of HCN.	Grains of HCN. per lb.
1	·0158	1·106	1	·0377	2·639
2	·0121	0·847	2	·0237	1·659
3	·0125	0·875	3	·0142	3·094
4	·0133	0·931	4	·0440	3·089
5	·0113	0·791	5	·0132	0·924
6	·0194	1·358	6	·0209	1·463
7	·0226	1·582	7	·0343	2·436
8	·0199	1·393	8	·0221	1·547
9	·0208	1·456	9	·0133	0·931
10	·0238	1·666	10	·0215	1·505
11	·0202	1·414			
12	·0154	0·933			
13	·0202	1·414			
14	·0149	1·043			
15	·0117	0·819			
Mean.	·0168	1·175	Mean.	·0275	1·927
Highest.	·0238	1·666	Highest.	·0442	3·094
Lowest.	·0113	0·791	Lowest.	·0132	0·924

The samples indicated in the table were obtained from as many sources as possible: some from stalls in the public markets, others direct from the different cultivators, pains been taken to avoid substitution of one kind for the other. The similarity of the plants renders such a mishap possible. Indeed, so close is the resemblance, that opinions are not wanting, expressive of belief that the one is merely a variety of the other, and not a distinct species.\*

The mode of determining the prussic acid requires mention, special treatment being necessary, owing to the starchy nature of the roots. Distillation was requisite to obtain the prussic acid in a form adapted for estimation, but the thirty per cent. of starch, which the roots contain, had to be excluded from the retort. The following method of operating was adopted:—

500 grammes of the root were quickly grated into 500 c.c. of water. The mixture was allowed to stand in a well-closed vessel for about two hours, and the liquid was then

\* See Pharm. Journal, 3rd series iii. 569; M. Paul Lagot, on the Manioc, or Tapioca Plant.

squeezed through a linen cloth into a flask. The flask being corked the starch was allowed to deposit, and then 200 c.c. of the upper portion of the liquid were decanted and distilled. The retort was connected by a caoutchouc joint to the condenser, the end of which dipped beneath the surface of water made alkaline with soda, and contained in a closed receiver.

The quantity of prussic acid found in the 200 c.c. of liquid represented one-fourth of that actually present. This estimate is arrived at in the following manner:—both bitter and sweet cassava were found by a number of determinations to contain close upon sixty per cent. of water. The 500 grammes of root taken, therefore, would furnish, approximately, 300 c.c. of water, which, augmented by the 500 c.c. added, would make an aggregate of about 800 c.c. All the prussic acid yielded by the sample, would, of course, be found in solution in this quantity of liquid. The amount present in the 200 c.c. removed, would thus represent  $\frac{200}{800}$  or  $\frac{1}{4}$  of the total quantity.

The prussic acid in the alkaline distillate was estimated either volumetrically or by precipitating and weighing as silver cyanide. The results were occasionally verified by combining the methods; first determining the prussic acid by volumetry, then adding excess of the silver solution to the same portion, acidifying with nitric acid, and collecting and weighing the silver cyanide produced. Fairly concordant results were thus obtained as shown by the following average examples.

#### I. Prussic acid from sweet cassava.

	Per cent. of HCN.	Grains of HCN. per lb.
Volumetric Method ... ..	·01992	1·3944
Gravimetric „ ... ..	·01924	1·3468

#### II. Prussic acid from bitter cassava.

	Per cent. of HCN.	Grains of HCN. per lb.
Volumetric Method ... ..	·02090	1 4630
Gravimetric „ ... ..	·01996	1·3972

The higher results furnished by volumetry, doubtless, showing the usual error arising from the slight excess of standard solution required to indicate the completion of the process. The silver solution used was nominally decinormal, but, its exact strength was fixed with care.

During the grating of the cassava, which occupied about five minutes, a slight loss of prussic acid was made evident by its odour. Nevertheless, this was certainly too small to seriously affect the correctness of the determinations, since the quantity of prussic acid found in the normal juice, seldom exceeds one part in two thousand of liquid, and such dilute solutions bear moderate exposure without being sensibly altered. Estimations made at intervals of the prussic acid in the diluted juice, showed that, standing in a loosely-covered beaker, it suffered no apparent loss during two hours; but a loss of about one-tenth was found after sixteen hours. When fermentation was in progress, the prussic acid soon diminished, and in six days became reduced to one-fifth of the original quantity.

The juice, although at first nearly neutral, quickly became acid, and was always so at the time of distillation. In some of the earlier experiments, sulphuric acid was added to the contents of the retort, usually after all the free prussic acid had passed over, but the yield was not found to be influenced by this treatment.

The high temperature prevailing in this climate rendered it necessary to prove that prussic acid could be isolated by distillation from dilute solutions without loss. Aqueous

prussic acid, therefore, was prepared, and diluted until 20 c.c. made up to 200 c.c. with water would furnish a solution containing about twice the quantity found in the liquid strained from the roots. Two such mixtures having been made, the prussic acid in one was estimated directly, and in the other after distillation. The following results were obtained :—

		HCN. in 200 c.c. of solution.				
1	Not distilled	...	...	...	...	·06824 gm.
2	Distilled	...	...	...	...	·06744 „

Corrected temperature of water passing from condenser 25·2° c; of laboratory 27° c; this temperature being usual.

A second trial was made by diluting 20 c.c. of the same aqueous prussic acid to 500 c.c. Two portions of 200 c.c. were measured, and the prussic acid in each estimated as before.

		HCN. in 200 c.c. of solution.				
1	Not distilled	...	...	...	...	·02734 gm.
2	Distilled	...	...	...	...	·02726 „

A final experiment determined whether a known quantity of prussic acid added to the *diluted juice* suffered loss by distillation. The juice used had not been distilled, or deprived of the prussic acid naturally present, but this was estimated by a separate experiment and allowed for. The usual quantity was taken, and 100 c.c. of prussic acid, which had been found to contain ·02599 grammes of H C.N. were added. The mixture was distilled.

Total HCN. by distillation	...	...	...	...	·03447 gm.
HCN. natural to juice	...	...	...	...	·00951 „
					·02496 gm.
					·02496 gm.

TABLE II.  
Percentage of Water found in Cassava Roots.

SWEET.		BITTER.	
No. of Sample.	Per cent. of H <sub>2</sub> O.	No. of Sample.	Per cent. of H <sub>2</sub> O.
1	58·73	1	59·40
2	58·33	2	60·80
3	59·13	3	61·80
4	61·31	4	61·24
5	58·25	5	62·07
6	60·65	6	62·79
Mean.	59·40	Mean.	61·35

### PRESENCE OF CINCHONIDINE IN THE QUININE SULPHATE OF COMMERCE.

By B. H. PAUL, Ph.D.

*Pharmaceutical Journal* [3]. No. 347, p. 672.

The samples were dried at 212° F, and weighed in a weighing glass, perfectly closed, so that no moisture could be absorbed. The cinchonidine was separated by dissolving four or five grams of the salt in 80 to 100 c.c. of boiling water, and, after cooling, filtering the liquid, and then shaking it with sufficient ether to leave a distinct layer undissolved. On

the addition of ammonia solution in excess, the alkaloid separated was in most instances only partially soluble in the ether; with the samples containing least cinchonidine, the whole of the alkaloid was at first dissolved by the ether; but after the lapse of a few hours, the cinchonidine was deposited in the form of crystals, which were collected on a filter and weighed.

The quinine sulphate separated on cooling the hot solution, was again re-crystallized in the same way as at first, and the mother liquor was treated as before with ether and ammonia. In this way a further quantity of alkaloid, insoluble in a moderate quantity of ether, was obtained, and by repeating the re-crystallisation of the salt a third time, another smaller quantity was obtained. The mother liquor obtained by a fourth re-crystallisation gave no evidence of cinchonidine, so far as treatment with ether was capable of indicating its presence. The first six samples were taken from scaled ounce bottles, of which only No. 3 had been previously opened. In all these instances the amount of crystallisation water was not much different from that normally appertaining to the salt, viz., : 14.45 per cent.

The smaller amounts of water in the samples Nos. 7, 8, and 9, were, probably, due to some degree of efflorescence, since these samples had been for some time exposed to the air; so that, making allowance for the circumstance, the proportions of cinchonidine sulphate in the original salt would be somewhat less than those stated as the result of analysis. Apart from the loss attending the operation, the amounts of cinchonidine sulphate indicated by these results are to be regarded in all cases as minimum amounts, inasmuch as some cinchonidine still escapes separation by ether.

No.	Water, per cent.	Dry Cinchonidine Sulphate, per cent.			Crystallised Salt, per cent.
(1)	15.05	...	...	7.98	equal to 9.19
(2)	15.51	...	...	7.51	8.64
(3)	14.90	...	...	4.22	4.86
(4)	15.04	...	...	5.92	6.81
(5)	14.20	...	...	.99	1.14
(6)	15.15	...	...	3.16	3.64
(7)	13.67	...	...	4.90	5.64
(8)	8.10	...	...	4.55	5.24
(9)	10.37	...	...	5.44	6.26

A. W. B.

We reproduce the following letter from *The Grocer* of March 24th, in the hope that the trade generally will follow the excellent example of the writer.

SIR,—I think I may presume that upon the clearest medical testimony it has been proved that preserved bright green peas contain a proportion of metallic copper, and therefore are, and should be, unsaleable. And yet in the face of this fact, and after several convictions, these bright green peas are being sold to the public. My pet brand I have had analysed by one of the first in the profession, and the report before me is (per tin) .42 metallic copper, equal to 1.65 grains of sulphate of copper;—the sale of which I have stopped. Now, the question I wish to raise is—Is it wise on the part of the trade to continue to sell an article known to be injurious to health? There can be no excuse for such, from the fact that Messrs. Crosse and Blackwell's Circular, dated March 1st, states:—"Preserved Green Peas.—We beg to remind our friends that the peas and other vegetables prepared by ourselves and Messrs. Philippe and Canaud have always been perfectly pure and uncoloured." These peas are certainly not of so bright a green colour, but in my humble opinion are in size and flavour all that can be desired. My own feeling is, that the sale of the bright peas should at once be stopped; and I say without hesitation that it is a disgrace to the trade to have it said that such peas can be purchased by the public, after the clear medical evidence given.

I am, &c.,

Clapham, March 21st.

E. J. WRIGHT.

RETURNS OF ANALYSES MADE UNDER THE SALE OF FOOD AND DRUGS' ACT IN 103 DISTRICTS DURING 1875 & 1876.

WE have great pleasure in presenting the following Returns to our readers, and in expressing our obligation to those gentlemen who have, at considerable trouble to themselves, enabled us to make them so complete. We feel that special acknowledgment is due to some gentlemen, who, not being members of the Society, have nevertheless favoured us with their reports.

As regards the number of Convictions the table is necessarily incomplete. Analysts, as a rule, know very little if anything of the prosecutions, and it is better that they should not.

The results were laid before the Meeting of the Society on the 14th inst, and considerable interest was taken in them.

	Total.	Adulterated.	Convictions.	Milk.	Groceries.	Drugs.	Spirits, &c.	Bread & Flour.	Sundries.
M. A. ADAMS ... Kent. <i>(Samples collected by Police.)</i>	8	0	—	—	—	—	—	—	—
A. H. ALLEN ... North Derbyshire.	118	23	17	3	7	5	8	—	—
Sheffield.	256	38	6	15	14	7	—	2	—
A. ANGELL ... Southampton. <i>(Samples collected by Police.)</i>	450	96	—	—	—	—	—	—	96
R. APJOHN ..... Cambridge (Borough).	18	13	—	13	—	—	—	—	—
Cambridge (County).	0	0	—	—	—	—	—	—	—
Ely (Isle of).	14	4	—	—	—	—	4	—	—
Huntingdon (County).	1	0	—	—	—	—	—	—	—
W. BAKER ..... Rotherham.	31	8	—	—	—	—	—	—	—
Upper Strafforth and Tickhill.	13	4	—	—	—	—	—	—	—
J. J. BANCROFT Denbighshire. <i>(Act suspended)</i>	0	0	—	—	—	—	—	—	—
J. C. BELL Salford and Cheshire	182	85	30	40	5	10	6	22	2
W. BETTEL Middlesborough	41	4	4	4	—	—	—	—	—
T. B. BLUNT ... Shrewsbury.	18	5	2	3	—	—	—	1	1
Shropshire, and Montgomeryshire.									
J. BRIERLY ..... Southampton.	206	72	21	42	17	5	—	8	—
J. C. BROWN ... Lancaster (County).	412	102	—	85	11	—	5	1	—
Liverpool.	222	73	41	63	7	2	1	—	—
Preston, <i>(Act not enforced till 1877.)</i>	0	0	0	—	—	—	—	—	—
C. A. CAMERON... Carlow.	1	1	—	—	1	—	—	—	—
Cavan.	5	2	1	2	—	—	—	—	—
Clare.	130	18	3	7	—	1	4	—	6
Down.	1	1	1	1	—	—	—	—	—
Drogheda.	20	7	7	7	—	—	—	—	—
Dublin (City).	1576	205	112	162	41	—	2	—	—
Dublin (County).	268	65	46	57	8	—	—	—	—
Fermanagh	26	12	9	8	4	—	—	—	—
Galway	40	16	10	14	—	—	2	—	—
Kerry	18	6	2	3	3	—	—	—	—
Kildare	63	20	12	19	1	—	—	—	—
Kilkenny	17	10	—	8	—	—	2	—	—
Limerick	43	13	—	11	—	2	—	—	—
Leitrim	1	1	—	1	—	—	—	—	—
Mayo	15	9	4	8	—	1	—	—	—
Meath	—	—	—	—	—	—	—	—	—
Queens	10	3	3	3	—	—	—	—	—
Roscommon	40	10	4	6	1	—	3	—	—
Sligo	11	5	5	5	—	—	—	—	—
Tipperary	26	15	8	14	1	—	—	—	—
Waterford	3	0	—	—	—	—	—	—	—
Wexford	—	—	—	—	—	—	—	—	—
Westmeath	—	—	—	—	—	—	—	—	—
Wicklow	7	6	2	5	—	1	—	—	—

		Total.	Adulterated.	Convictions.	Milk.	Groceries.	Drugs.	Spirits, &c.	Bread & Flour.	Sundries.
J. CLARK .....	Paisley.	14	4	—	2	2	—	—	—	—
	Dumbarton.	22	8	—	8	—	—	—	—	—
E. L. CLEAVER...	Kensington.	458	48	46	28	10	—	—	—	10
J. H. COLLINS ...	Cornwall.	—	—	—	—	—	—	—	—	—
W. H. CORFIELD	St. George's, Hanover Sq.	168	20	2	14	6	—	—	—	—
M. CORNER .....	Mile End Old Town.	72	1	—	—	1	—	—	—	—
A. DUPRE'.....	Westminster.	133	13	—	8	5	—	—	—	—
A. M. EDGER ...	Durham.	167	48	—	40	8	—	—	—	—
	Gateshead.	138	21	15	12	6	3	—	—	—
C. ESTCOURT ...	Manchester.	113	50	27	11	19	—	2	18	—
H. GOODE .....	Derbyshire.	66	15	—	4	5	—	6	—	—
J. H. GRAMSHAW	Gravesend.	—	—	—	—	—	—	—	—	—
HASSALL & HEHNER,	Isle of Wight.	106	24	—	1	17	—	6	—	—
C. HEISCH .....	Hampstead.	59	1	—	—	—	—	—	1	—
	Lewisham.	89	11	3	7	4	—	—	—	—
A. HILL .....	Birmingham.	164	60	8	21	27	10	2	—	—
J. F. HODGES ...	Belfast.	252	90	—	—	—	—	—	—	90
J. HORSLEY .....	Gloucester County.	605	37	33	7	27	—	—	—	3
	Ditto City.	73	16	16	4	10	—	—	—	2
G. JARMAN ...	Huddersfield.	82	22	11	10	12	—	—	—	—
H. JOHNSON ...	Shrewsbury.	3	1	—	—	—	—	1	—	—
E. W. T. JONES	South Staffordshire.	712	125	—	46	49	7	21	2	—
	Wolverhampton.	173	15	—	10	2	1	2	—	—
J. R. LEEBODY...	Londonderry City & County.	105	10	—	—	1	—	1	—	8
R. McALLEY .....	Falkirk.	—	—	—	—	—	—	—	—	—
	Stirling.	—	—	—	—	—	—	—	—	—
McCOWAN & BIGGART,	Greenock.	154	25	—	15	2	1	7	—	—
J. M. MILNE.....	Dumferline.	14	1	—	—	—	—	1	—	—
	Kinning.	62	27	—	27	—	—	—	—	—
	Govan (Parish).	60	28	—	26	—	—	—	—	—
E. H. MOORE ...	Brighton, and } East Sussex.	241	23	9	13	8	—	1	—	1
W. MORGAN ...	Swansea	315	69	44	52	5	—	7	5	—
J. MUTER ...	Bermondsey	447	57	—	28	29	—	—	—	—
	Lambeth	456	34	—	24	8	—	1	1	—
	Rotherhithe	119	15	—	9	5	—	1	—	—
	St. George's, Southwark.	27	9	—	2	7	—	—	—	—
	Wandsworth	1014	45	—	14	27	1	3	—	—
C. O'KEEFFE ...	Cork City.	106	26	21	24	1	—	1	—	—
	Cork County.	56	5	—	—	4	—	—	1	—
J PATTINSON	South Shields	13	11	9	11	—	—	—	—	—
	Newcastle	199	43	12	22	20	—	—	1	—
F. T. PAXTON	West Sussex.	6	1	—	—	1	—	—	—	—
W. PROCTER ...	Beverley.	—	—	—	—	—	—	—	—	—
F. M. RIMINGTON	Bradford	247	26	—	23	1	—	—	—	2
E. SERGEANT ...	Bolton.	49	16	8	10	4	—	—	2	—
J. SHEA.....	Reading.	86	2	—	2	—	—	—	—	—
A. W. SMITH ...	Rye.	—	—	—	—	—	—	—	—	—
T. STEVENSON ...	Bedfordshire.	319	37	—	5	20	—	2	10	—
	St. Pancras.	237	60	—	31	10	3	15	—	—
	Surrey.	694	64	—	30	33	—	—	1	—
W. W. STODDART	Bristol and Somerset.	1572	398	—	95	276	—	26	1	—
R. R. TATLOCK	Govan Borough.	30	11	—	10	1	—	—	—	—
J. W. THOMAS	Cardiff.	230	27	—	8	12	—	3	—	4
J. W. TRIPE ...	Hackney.	214	9	9	8	1	—	—	—	—
WALLACE, TATLOCK										
& CLARK	Glasgow.	250	133	—	98	13	3	8	—	11
WM. WALLACE...	Ayr.	9	4	—	2	—	—	2	—	—
	Kilmarnock.	10	5	3	5	—	—	—	—	—
	Rutherglen.	8	1	—	1	—	—	—	—	—
J. WIGGEN .....	Ipswich.									
	Colchester, and } East Suffolk.	1	1	—	—	1	—	—	—	—
G. W. WIGNER	Greenwich and Deptford.	275	42	—	19	9	1	12	1	—
	Plumstead.	213	19	—	12	6	—	—	1	—
	Woolwich.	136	31	—	15	6	2	7	1	—
<b>TOTAL ...</b>		<b>15,989</b>	<b>2895</b>	<b>626</b>	<b>1483</b>	<b>833</b>	<b>66</b>	<b>175</b>	<b>80</b>	<b>—</b>

THE WORKING OF THE SALE OF FOOD AND DRUGS ACT, DURING  
1875 & 1876,

By G. W. WIGNEB, F.C.S.,

*Read before the Society of Public Analysts, at Burlington House, Piccadilly, on the 14th  
March, 1877.*

I HAVE much pleasure in laying before the Society this evening a large number of returns, which have been most courteously communicated by the Members of this Society, and by some Public Analysts who do not yet belong to us, showing the degree of success or otherwise which has attended the working of the present Anti-Adulteration Act.

The returns possess many features of great interest, but the most important point is the percentage of all the samples which were found to be adulterated. During the well-known investigations of the Lancet Commission, Dr. Hassall and others found that about 65 per cent. of the samples purchased were adulterated. Under the Act of 1860, the amount of work done was so small that it would be worthless as a comparison. The Act of 1872 made a change, although it was not universally enforced; yet in the course of some sixteen months nearly 15,000 samples of food were analysed, and even then the striking result was shown that 26 per cent. of the whole number were adulterated. These samples, it must be remembered, were not purchased by private consumers, but in nearly every case by a public official, who was well known and therefore presumably well served.

The returns I hold in my hand show the first results of the Act of 1875, which it must be borne in mind is still simply a permissive, and not a compulsory Act, and, at the first glance, the result is gratifying, for we find that while in 103 districts 15,989 samples have been analysed, only 2,895 have been found to be adulterated, or 18·10 per cent. of the total number, thus showing an improvement of 8 per cent. in two years. The improvement thus shown is probably below rather than above the truth, since the processes in use for analysis have been perfected, and many samples which would have been passed as pure two years since, would now be condemned.

There are, however, some very unsatisfactory features to set against this, for instance the number of samples of adulterated milk has actually increased from 1066 to 1483, in other words from 28·24 per cent. to 51·22 per cent. of the total number of adulterated samples. This would certainly indicate that the milk trade has not thus far been rendered moral by Act of Parliament.

It has not been possible to procure the exact list of samples purchased in each case, but in nearly all the Districts the analysts have kindly furnished the names of the adulterated articles, and calculating these on the *total* number of samples purchased, we find that:—

9·28	per cent. were	Adulterated Milk.	
5·27	”	”	Groceries.
·41	”	”	Drugs.
1·09	”	”	Beer, Wine and Spirits.
·50	”	”	Flour and Bread.
1·55	”	”	Sundries.
<hr/>			
18·10	”	Total.	

During the previous period the adulterated milks were only 7·31 per cent. of the total samples.

On viewing the matter in another light, we find that the adulterated samples alone may be divided as follows:—

Milk	...	...	...	...	51.22	per cent.
Groceries	...	...	...	...	29.15	"
Drugs	...	...	...	...	2.27	"
Beer, Wine and Spirits	...	...	...	...	6.04	"
Flour and Bread	...	...	...	...	2.76	"
Sundries	...	...	...	...	8.56	"
					<u>100.00</u>	

What with watering and skimming therefore, milkmen are responsible for more than half the adulteration which at present goes on; grocers for nearly three-tenths, and even chemists and druggists, though their goods are but comparatively seldom examined (in fact not one-tenth as often as they ought to be) figure nearly as high as the bakers, who expect a periodical visit from an inspector. This state of things is not as it should be.\*

From the general view of the subject we pass to the specific, and here the permissive and, consequently, uncertain character of the Act is well exemplified.

Thus, although competent analysts have been appointed for Cambridgeshire, Denbighshire, Meath, Wexford, Westmeath, Cornwall, Gravesend, Falkirk, Stirling, Beverley, and Rye, not a single sample has been submitted for analysis in any of the eleven districts. While in the Counties of Kent, Huntingdon, Shrewsbury, Shropshire, Montgomeryshire, Down, Leitrim, Waterford, Wicklow, West Sussex and East Suffolk including the towns of Ipswich and Colchester, eleven counties in all, only forty-six samples have been analysed, or a fraction more than four per county. It is not to be wondered at that one third of these samples were adulterated, or that all the four samples submitted from Carlow, Down, Leitrim, and East Suffolk were so. It is not in human nature to avoid selling impure things where the vendors know they will escape, but it certainly appears to me a clear indication of the necessity of altering the Act so as to make some provision for such cases as these.

A careful examination of these returns points out clearly another defective feature in the Act. In the County of Kent only eight samples were taken, but all were pure. The reason is not far to seek, for we find they were all purchased by *policemen in uniform*. In Mile End Old Town, where it is not generally considered we should find the purest articles, only one sample out of 72 was adulterated, at Hampstead, one out of 59, and at Hackney, nine out of 214; in each case the inspectors who purchased the samples were *well known local men*. The remedy is obvious.

Scotland presents an unfavourable figure in the returns, only 633 samples have been examined, but 248 or more than 39 per cent were adulterated.

London (although our returns here are even now incomplete) counts for more than 25 per cent. of the total number of samples, and the percentage of adulteration actually shown is only 10.08 per cent. of the samples of which 219 or 5.32 per cent. are milk.

It is singular that such towns as Salford and Glasgow, although both fortunate in securing the services of competent men as analysts, stand worst in the returns, the former showing 46.70 per cent. adulterated, of which 21.98 per cent. were milk, and the latter 53.20 per cent. of which 39.20 per cent. were milk.

---

\* In reference to the author's remark, we draw attention to a letter from Dr. Dupré appearing in this number.—EDITORS' ANALYST.



From all these figures the inference that the Act needs amendment is clear. It is radically wrong that nearly a third of the counties should be entirely or practically exempted from the action of a salutary Act such as this is.

We also see clearly the evil effect of well known men purchasing samples.

I think two more inferences may fairly be drawn.

1st. The trivial fines generally imposed in milk cases are quite insufficient to prevent adulteration. It is more profitable to dilute and pay the fines, laying the blame on to the man who takes the milk out, than to carry on business honestly.

2nd. Drugs need much more attention than has hitherto been given to them. Of all articles they should be the most pure, yet, I believe, that if I could, in each district, find the number of drugs purchased for examination, the resulting per centage found impure would be startling.

I hope to bring the matter before the Society again at our next meeting, with a view of our making some representation to the Government on the matter.

#### ON THE ESTIMATION OF ALUM IN BREAD.

By W. C. YOUNG, F.C.S.

For a long time past the old "Normandy" or "Soda" process for the estimation of alum in bread, has been condemned on account of the great difficulty experienced in redissolving the aluminic hydrate or phosphate, after its precipitation together with tri-calcic phosphate, &c. This has led to the production of several processes, most of which are very complicated. By a slight modification in the usual method of procedure, the "Normandy" method can be rendered as accurate in its results as any of those which have replaced it. This consists in adding the boiling acid solution of the charred bread to a boiling solution of sodic hydrate, containing a large excess. I proceed as follows:—1,000 grains of bread are burnt down to a small bulk, powdered with about 100 grain measures of hydric chloride, and warmed for a few minutes; about two ounces of water is then added, boiled for five minutes, and filtered, &c. A solution containing about 250 grains of pure sodic hydrate is made in a very little water, and to this solution, when boiling, is very cautiously added the boiling acid solution of the charred bread, the whole boiled for a few minutes, filtered and washed. The filtrate, after the addition of a few drops of a concentrated solution of disodic phosphate, is slightly acidified with hydric chloride, and subsequently rendered just alkaline with ammonic hydrate and boiled. The precipitate is collected, washed, and weighed as aluminic phosphate.

To test the accuracy of this method, I had four loaves of bread made in my kitchen, one with no alum, the others with varying quantities. Care was taken to leave as little as possible of the dough adhering to the sides of the vessel in which it was made, so that each loaf contained, practically, all the alum that was dissolved in the water with which it was made. The loaves were weighed when one day old, and 1000 grains taken of each.

	Weight of Loaf.	Grains of Alum put in.	Weight of Al. PO <sub>4</sub> from 1000 grains.	= grains of Alum in loaf.
1	2 lbs.	0	.07 grains	3.50
2	1½ "	10	.32 "	12.39
3	2 "	20	.46 "	23.80
4	2¼ "	40	.76 "	44.20

It will be seen the method leaves nothing to be desired in point of accuracy, and will favorably compare with any other in respect to simplicity.\*

\*Since devising the above process, I have been informed by Mr. Heisch, that he, and he thinks others, have for many years applied the same principle (viz., the addition of the acid solution to an excess of boiling alkali), to the separation of aluminic hydrate from other gelatinous precipitates, having found it impossible completely to re-dissolve the aluminic hydrate by any amount of sodic hydrate if it were once precipitated.

## CORRESPONDENCE.

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

TO THE EDITOR OF "THE ANALYST."

## THE "ORGANIZATION AMONGST CHEMISTS."

SIR,—Will you grant me a line of your space to ask if it be really true, as I have heard, that by the scheme, as at present proposed, all chemists now in business are not to be admitted, as a matter of course, into the new organization, but that the sapient few who have nominated themselves as judges are to select whom they please to be dubbed "competent." Perhaps some of the leaders of our profession, as they call themselves, will satisfy the curiosity on this point, which is shared by many Analysts throughout England, and by none more so than by

ONE WHO HAS BEEN IN PRACTICE FOR TWENTY YEARS.

TO THE EDITOR OF "THE ANALYST."

SIR.—In order not to allow the important question raised by the letter of Dr. Lowe in the January number of *The Analyst* to drop, without some further discussion, I beg to forward the following account of my experience regarding the purity and strength of the drugs and medicines dispensed in London.

I have, during the last five years, carefully examined 165 samples of drugs and medicines bought at the better class of chemists' shops in all parts of London. With very few exceptions, all these drugs were bought under the Latin name, by which they are distinguished in the British Pharmacopœa (1867) or more directly still as representing the pharmacopœa standard. In many cases the bottles or packets were labelled B.P. or Brit. Pharm.; in some the label stated contains so and so much of such and such as the case might be.

If, under these conditions, the strength of the drug or medicine bought falls considerably below the standard of the Pharmacopœa, I consider the article adulterated, entirely irrespective of the intrinsic harmlessness or otherwise of the substance used for adulterating. The value of a drug or medicine depends in great measure on its really being of the strength it is supposed to be, and any material departure from such a standard is highly injurious.

Well, out of the 165 samples examined no less than seventy-one were found adulterated, some to a very considerable extent. I will give a few examples.

## LIQUOR ARSENICALIS.

Should contain four grains of arsenious anhydride per fluid ounce. Six samples were examined, containing the following proportions of arsenious acid; per ounce, 2·5, 3·2, 3·7, 3·75, 3·8, and 3·9. The first of these proportions presents an adulteration equal to a dilution of 60 per cent., or 100 ounces of true liquor arsenicalis had been made into 160 ounces.

## SCAMMONY.

According to the Brit. Pharm. this should contain 80 or 90 per cent. resin soluble in ether, and should be free from carbonates and starch. Fluckiger and Hanbury give 88 to 90 and state that scammony which does not afford at least 80 per cent. of matter soluble in ether, should be rejected. Six samples examined, ethereal extract in five ranged between 65·2 and 70·3, in one just comes up to 80 per cent. All samples contain chalk, some more than ten per cent.; three contain starch in addition.

## FERRI ET QUINLE CITRAS.

Should contain 16 per cent. of quinine, 20 per cent. of ferric oxide. Seventeen samples examined, six came up to standard, in eleven the alkaloid, not always pure quinine, ranged between 4·1 and 10·3 per cent., the ferric oxide from 19·3 to 33 per cent. I will give the short remarks in my laboratory book with regard to two, at least, of these samples. No. 19 labelled "contains 25 per cent. of citrate of quinine" (which would be correct) contains 4·69 per cent. of quinine, and 2·35 per cent. cinchonine; tartaric acid too much ferric oxide (24·1 per cent.) 10 per cent. carbonate of potassium in ash. Very bad sample.

No. 20 labelled "contains 25 per cent. of citrate of quinine" contains 4·46 per cent. of quinine, and 0·5 per cent. of cinchonine, much tartaric acid, too much ferric oxide (22·6 per cent.) 6·9 per cent. carbonate of potassium in ash. Very bad sample.

But it is useless to multiply examples. My experience may be summed up as follows. Drugs consisting of sugar, well defined chemical compounds, such as bromide of potassium, iodide of potassium, sulphate of quinine, &c., &c., are nearly always found pure. All such, on the other hand, as should

contain a certain proportion of active ingredients, or should be the more or less altered natural product, are frequently adulterated. Thus out of forty-nine samples of the first class, two only were found adulterated, whereas out of 116 samples of the second class no less than 69 were found adulterated.

As Analyst for Westminster, I have examined 359 articles of food and drinks, viz., 135 samples of milk, and 224 samples of bread, tea, coffee, sugar, mustard, butter, ale, porter, gin, port wine, vinegar, pepper, jam, oatmeal, arrowroot. Out of 135 samples of milk, 40 were found adulterated with water, and 8 more had been skimmed, total 48, or a little more than one-third. It is right, however, to state that at first the proportion of samples found adulterated, was considerably higher, while at present, it is considerably lower. Of the remaining 224 samples, 14 only were found adulterated, and in two more adulteration was suspected, but could not be proved; thus of the drugs, 43 per cent. were more or less adulterated, and of other articles, only a little more than 17 per cent. Comment, I think, is needless.

I remain, &c.,  
A. DUPRÉ.

Westminster Hospital,  
March 19th, 1877.

THE following correspondence between the Public Analyst for Gravesend and the Local Government Board is of such general interest, that we reprint it for the benefit of our readers.

TO THE MEMBERS OF THE LOCAL GOVERNMENT BOARD.

January 23rd, 1877.

GENTLEMEN,—On reporting the fulfilment of my duties as Analyst during the past quarter, I find I have had to analyse water three times, and to report on the examination of meat once; this is all.

It is not to be supposed that articles of food sold in the town are all free from adulteration, such, I know, is not the case. It appears to be the duty of no one to bring them for examination, therefore they are not examined. I gather also that my duty does not extend to searching for adulteration, but that I am only to examine what is brought to me by the Inspector, an official complaint having been made.

Milk is almost universally sold mixed with 25 per cent. of water, and confessedly so.

A large quantity of butter called "Irish," is also sold at 1s. a pound, and I could, I believe, find other articles of the same impure character.

May I then ask for information on the following points?

1. Have I the power in my own hands of directing the Inspector to procure specimens of articles I suspect to be adulterated, and to bring them to me for examination?
2. Is it my duty to do this?
3. Have I the power to direct him to procure me water from wells which are complained of, or must I wait for the order of the Water Sanitary Authority, whose officer I am supposed to be, and who pays the whole of my salary?

I believe many wholesale dealers know well in what towns analysis is frequent, and act in their sales accordingly.

I am, yours truly,  
J. H. GRAMSHAW, M.D.,  
Analyst for Gravesend.

LOCAL GOVERNMENT BOARD,

February 6th, 1877.

SIR,—I am directed by the Local Government Board to acknowledge the receipt of your letter, dated 23rd ultimo, with reference to your powers and duties as Public Analyst for the Borough of Gravesend, and in reply, I am to refer you to section 13 of the "Sale of Food and Drugs' Act," 1875, which provides for procuring samples for analysis "under the direction of the Local Authority," and to point out that it is by the Authority, and not by the Analyst, that the direction to procure samples must be given to the Inspector or other officer.

I am, Sir,  
Your obedient Servant,  
W. ROBSON,

Assistant-Secretary.

แผนกห้องสมุด กรมวิทยาศาสตร์  
กระทรวงอุตสาหกรรม

## NOTES OF THE MONTH.

THE report of the Inland Revenue Laboratory, just issued, was the subject of some comments by our President at the last meeting. While not wishing to detract one iota from the merit of gentlemen, who seem to have been sedulously educating themselves for the novel duties thrust upon them, we cannot help thinking that their remarks as to the milk standards adopted by our Society are uncalled for. Are they to set up their hundreds of samples against the collected thousands of the Members of our Society? If so they should in fairness publish their standard, so that we might either work by it or criticise it in a fair spirit. Then, as regards the butter and whiskey cases—in the latter the Society agreed with the Inland Revenue Chemists, and acted upon their conviction in such a decided manner as to cause the removal from their body of the person implicated. On the other hand, in the butter case, there were on one side our present President, one of the Vice-Presidents, and the Secretary, unanimously pronouncing the sample to be “butterine,” and for the defence the Inland Revenue Chemists standing alone. Some degree of self congratulation is taken in the report that magistrates have invariably adopted the Somerset House view of questions in dispute; but in the butter case, those who were in court will remember that Mr. Partridge (the stipendiary magistrate,) specially said *that he felt himself bound by the Act to accept their* DICTUM. So long as the Inland Revenue Chemists pursue the even tenor of their way and continue to strive after the best processes they will have assistance from all, but let them keep out of their reports anything approaching to self adulation. Their will has become law, and let them be thankful for that, and not stoop from the high position in which the legislature has placed them. Above all, when they adopt a standard different from ours, we call on them in all justice to communicate it officially to our Society so as to avoid discrepancies, which are always painful to us, as being bound to be the losing party, and which must also be annoying to them, as gentlemen feeling for their fellow workers in science. Personally, we much respect Mr. Bell and his coadjutors, and we trust they will take our remarks in all friendliness, as an exposition of the matter from the point of view necessarily held by our Society.

---

The scheme for organization amongst chemists is now considered, by its promoters, to be on the fair road to success, inasmuch as the committee appointed by the select nucleus has furnished a definite scheme which has been adopted. If what has, according to our correspondent, (whose letter we print), leaked out in the profession is true, the real working analysts, into whose hands the commercial analyses of the country are now intrusted, will, nevertheless, look upon the scheme with considerable caution before recognizing it. A movement of this kind to be successful, and even honest, must not interfere with existing interests. Would Parliament, for example, ever have passed the Pharmacy Act, unless it had contained the clause providing for the registration of all men actually in business for themselves, within a certain time of the passing of the measure? Yet we hear that there is no such provision in the scheme, but that the new authority is to *choose* whom it shall admit! Suppose in some country town A happens to have obtained a place in the nucleus, is it in human nature to suppose that he will not try his utmost to prevent the election of B, whose practice far outsteps his own, so

that he has no time to look after the organization business, and has, therefore, not been asked to join. Representing, as we do, the real backbone and sinew of the analytical profession, we invite those who are desirous of doing so to make use of our columns for the expression of their views on a subject so vitally important to all analytical chemists throughout Great Britain.

We observe with sorrow the results of some cases of drug adulteration, which have been used by the trade journals as another opportunity to denounce analysts. We would earnestly recommend all Public Analysts, before they give adverse reports respecting a substance of which they have not had much experience, to consult some other member of the Society, who has made a *speciality* of the article. On this point our respected President made some very cogent remarks at the last meeting, which ended in the following excellent proposal. His idea was that each member should state to the Secretaries his willingness to always examine for any Public Analyst, free of charge, any article on which he had written or had made special researches, and in reference to which the Public Analyst proposed to return a certificate of adulteration; the conditions being that the Analyst and the Referee should both send in their results to the Secretaries for publication in this journal. In this way the best analytical skill in our particular branch of chemistry would be brought to bear on anything novel, and if the case should be defended, confirmatory evidence would be available. We shall be glad to receive communications on this subject from any gentlemen willing to co-operate in our President's generous scheme.

Surely there must be some mistake in a report which we reprint in another place, from the *Standard* newspaper, of the proceedings at Brighton in a Milk case. No analyst in his senses would ever be guilty of such a statement as the one *attributed* to our Brighton *confrere*, viz.: that serving milk from a dish, without stirring, would cause the under portion to show 25 per cent. depreciation (*i.e.* water). We invite the gentleman affected by the report to explain what he really said, and meantime we reserve our remarks till we have his statement.

#### BOOKS, &c., RECEIVED.

The Miller; The American Chemist; The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Anti-Adulteration Review; Health; The 15th Report of the Medical Officer of Health for Dublin; The Report of the Principal of the Somerset House Laboratory; Adulteration Returns for Norfolk and Yarmouth, by F. SUTTON; Dr. F. V. HYDEN, on the Use of Salicylic Acid.

We are compelled through want of space to omit for the present the following papers:—

The Qualifications of Public Analysts.

Butter Fat, its Analysis and Composition, by E. W. T. JONES, F.C.S.

Alum in Flour, by J. CARTER BELL, F.C.S.

Copper in Peas, by C. H. PIESSE, F.C.S.

## RECENT CHEMICAL PATENTS.

The following specifications have been published during the current month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
2016	H. E. Newton	Removing extraneous Vegetable Matters fr. Fabrics	6d.
2524	A. M. Clark	Evaporating and Incinerating	1s.
2564	J. Muirhead, Jun.	Electric Telegraphs	6d.
2579	J. Stubbs and J. Corrigan	Gassing and Winding Yarns	6d.
2651	E. T. Hughes	Preserving Wood and Vegetable Fibre	6d.
2685	Duncan & Newlands	Treating Sugar	6d.
2694	T. H. Gray	Manufacture of Starch	8d.
2704	G. W. Von Nawrocki	Uniting or combining Iron and Steel	6d.
2741	S. H. Johnson	Filter Presses	8d.
2747	F. T. Bond	Filtering and purifying Water	8d.
2757	W. Clark	Apparatus for making Tea, Coffee, & other Extracts	4d.
2805	J. Mactear	Furnaces for Manufacture of Chromates	6d.
2815	J. H. Johnson	Extracting Metallic Zinc	6d.
2821	G. Zanni	Magneto-electric and Electro-magnetic Apparatus	6d.
2844	J. H. Johnson	Refining and Condensing Iron, &c.	6d.
2911	W. R. Lake	Cases for Preserved Food	6d.
2938	W. R. Lake	Galvanic Batteries	6d.
2941	J. W. Brown	Electric Telegraphs	6d.
3032	W. R. Lake	Cleaning Cotton Wool, &c.	6d.
3050	R. Reichenheim	Preparing Hare Skins	2d.
3055	A. M. Clark	Producing and applying Heat	8d.
3069	J. Cockshott	Dispensing Apparatus for Chemists	4d.
3078	J. Stuart	Microscopes	6d.
3094	A. M. Clark	Generating and Hydrating Sulphurous & other Gases	6d.
3095	J. W. Slater	Deodorizing and Purifying Sewage	4d.
3107	W. F. Grier	Compound for preserving Food, &c.	4d.
3124	G. Robertson	Apparatus for exhausting Gas, &c.	2d.
3145	E. S. Cathels	Purification of Gas	6d.
3148	L. Swindells and R. Lancaster	Manufacture of Ammonia	2d.
3160	C. Madge	Treating Tin and Terne Plate Scrap	2d.
3169	S. Pitt	Treating Silicates of Copper, Nickel, &c.	2d.
3170	J. Millar	Treating Sewage	2d.
3177	H. J. Haddon	Dressing Tampico and Bristles	6d.
3224	A. D. Wolochoff	Marking Divisions on Scientific Instruments	2d.
3236	B. J. B. Mills	Manufacture of Fecula, Farina, and Starch	2d.
3248	A. Brown	Producing Paintings on Textile & other Fabrics...	2d.

## PROSECUTIONS UNDER THE SALE OF FOOD AND DRUGS' ACT.

**BRIGHTON.**—At the Hove Police-court on March 12th, a milk carrier, named Mockford, was summoned for refusing to sell milk to the inspector appointed to obtain samples of food and drugs. At the time the inspector applied for milk the defendant was going his round, and he refused to serve the inspector because he had received orders to supply only his master's regular customers. The case was then difficult to decide, as it involved a point of law. For the defence it was urged the milk was not exposed for sale at the time whilst the prosecution contended that it was. The magistrates were of opinion that the law had been infringed, and indicted a fine of one shilling.—A dairyman named Brooks was summoned for supplying milk not of the quality asked for. The inspector asked for some new milk, and on what he was supplied with being subjected to analysis it was found to be depreciated to the extent of 25 per cent. The defendant had served several customers before the inspector, and the cream rising to the surface had been served to the first buyers, and this, the analyst said, would cause the depreciation of the milk to the extent of 25 per cent. The magistrates dismissed the case.—*Standard.*

The Election of Public Analyst for the Poplar District took place on the 27th ultimo, when Mr. W. C. Youne was returned.

# THE ANALYST.

## BUTTER FAT, ITS ANALYSIS AND COMPOSITION.

By E. W. T. JONES, F.C.S.

*Read at a Meeting of the Society of Public Analysts, at Burlington House, on 14th March, 1877.*

THERE have been two valuable papers on this subject read before this Society, nevertheless I venture to bring the matter forward again, although not with pretensions to much originality: but first, to draw attention to a few points that appear to have been overlooked by other contributors on this subject; second, to detail a method for the estimation of the soluble and insoluble acids in Butter Fat which combines expedition with accuracy, compiled from the processes of Messrs. Angell and Hehner, and Drs. Muter and Duprè, to all of whom I acknowledge my obligations; thirdly, to lay before you some trustworthy analytical results appertaining to this subject; and fourthly, to offer some remarks suggested by my analyses and work on the matter.

I had thought of restricting myself to the analysis of butter fat, but I find it convenient just to mention the empirical test introduced by Mr. Bell, of the Inland Revenue Laboratory, viz.: taking the sp. gr. of the fat at 100 Fahr. The sp. gr. test is, perhaps, of greater value than the melting point determination towards judging of the genuineness of butter fat, having an advantage over the melting point in that the observation may agree by any number of observers, with due precaution, whereas with the melting point almost every operator has his little idiosyncrasies as to manipulation, and thus results seldom compare favourably, the sp. gr. or the comparative weights of the same bulk of butter fat and water at the same temperature is more definite, and cannot differ with different observers, if done carefully. The reason I am touching this sp. gr. test is to point out the precaution to be observed in preparing a fat for taking its sp. gr. I find that fats must not be kept melted longer than absolutely necessary, or heated higher than 100°, like Dr. Muter recommends for drying butter; beyond being detrimental to the accuracy of the test, I shall show it is a procedure at least superfluous for preparing the fat for further analysis. Having observed that when butter fats were left for some time at a temperature of 50° their sp. gr. became sensibly increased, I left one under such condition during the day, and falling to ordinary temperature at night, for a period of several weeks, the sp. gr. at the commencement was 912·1, and at the end of the time was 915·9. It is highly probable that nearly this sp. gr. was attained long before this time, for I have frequently observed an advance of about 0·5 in a few hours at this temperature, but if exposed to a higher degree the increase in sp. gr. is much more rapid. To try the influence on the sp. gr. of butter fat the plan recommended by Dr. Muter for drying butter, viz., treating to 100°, I took a quantity of filtered butter fat, which I carefully ascertained by two experiments had a sp. gr. 912·1, then exposed it for an hour to a temperature of 100°, using a thermometer as a stirrer, when, upon taking the sp. gr. after such treatment, I found it had increased 1·5°, or instead of being 912·1, it had become 913·6. I therefore look upon Dr. Muter's sp. gravities of butter fat

as somewhat too high. The butter in question, too, had gained weight, 36·5400 grms. became 36·5795. Now this fat had been prepared by simply melting the butter at a temperature under 100°, and, as soon as melted, and the curd, salt, &c., had subsided, decanting and filtering into a clean, dry bottle, the whole process not occupying more than an hour. Here then we have fat in a fit state to have its sp. gr. taken. As soon as possible I proceed by putting the bottle and fat upon the top of my water oven, where the temperature soon falls just below 50°, then fill the sp. gr. bottle, furnished with a thermometer and a lipped neck, which holds a supply of fat for contraction through a capillary on the stopper, when the temperature has descended to exactly 100° Fahr. the superfluous fat is immediately removed, and the bottle cleaned and weighed. I can empty the bottle, refill, and weigh any number of times with a difference of only a milligramme or so, or not at all affecting the first decimal in the gravity. The experiment shewing the effect of further heat on the sp. gr. of butter fat also proves, by no loss of weight being sustained, that the fat was dry, and in a fit state for further analysis, and I have said it was prepared by simply melting and then filtering. Another experiment was made to prove this: 5 grms. of the fat from a butter simply melted and filtered was placed in a flat dish and exposed for two hours to the heat of 100°, the loss on re-weighing was only ·0005 grm.; upon exposure for about eight hours longer, it gained ·0135, or ·27 per cent. The fat wants no special drying, simply melt the butter and filter the supernatant fat, which, IF CLEAR, is ready for general examination; if sp. gr. is to be taken, let the same be done at once, or else the fat kept solid till required.

Saponification I find very easily accomplished at about 50°, or without boiling, at such a temperature fats can be perfectly saponified in less than half-an-hour, by occasional attention and with only a little alkali, thus avoiding any error from loss of volatile acid, pointed out by Dr. Duprè.

The next point, and one of importance, in my estimation, is that the insoluble fatty acids must not be dried in an air bath, however strictly kept to 100° C, for it is impossible to get the weight constant, on account of the evaporation that goes on,—even in a water oven at full boil, a continual evaporation occurs, though not to the same extent. From some butters 5 to 10 milligrammes per hour is lost in a flat dish, with the insoluble acids, from 5 grms. of butter.

The following shews one experiment of prolonged drying:—

1st weight	...	...	...	...	...	...	61·8665
2nd, $\frac{1}{2}$ hour after	...	...	...	...	...	...	61·8635
3rd, 1	„	...	...	...	...	...	61·8600
4th, 1	„	...	...	...	...	...	61·8415
5th, 1	„	...	...	...	...	...	61·8310
6th, 1	„	...	...	...	...	...	61·8310
7th, 1	„	...	...	...	...	...	61·8290
8th, 1	„	...	...	...	...	...	61·8280
9th, 1	„	...	...	...	...	...	61·8205

The weight of the dish was 57·4080.

The percentage of fatty acids according to the 1st weighing, is 89·17 per cent., and by the last 88·25 per cent.

The insoluble fatty acids must be dried with great care, by exposure, during short intervals, in a water oven, the surrounding water preferably only just boiling.



The solutions I employ for the saponification of the fat and estimation of the soluble and insoluble fatty acids are:—

- a. Approximately semi-normal alcoholic potash solution—28 grms., roughly weighed, of the best potassic hydrate, dissolved to a litre with rectified alcohol sp. gr. 840. It is usually cloudy when first made, but if left in the flask for a few hours can be readily decanted clear enough for use.
- b. Approximately semi-normal sulphuric acid—say 25 grms. of the strong acid made to a litre with distilled water. The relative strength of the potash and acid solutions must be ascertained by pipetting off 50 cc. of the potash into a beaker and noting how much of the acid is required for neutrality as a guide to the quantity of acid to be used for the decomposition of the soap.
- c. Deci-normal soda solution of exact strength—

1 cc. containing  $\cdot 004$  Na. HO.  
equal to  $\cdot 0088$  C<sub>4</sub> H<sub>8</sub> O<sub>2</sub>

For the saponification I use flasks from 220 to 250 cc. capacity, which are carefully balanced, then 5 grms. added to the weights, and butter fat quietly poured into the flask from the small bottle into which it was filtered, until the balance shows that a shade over 5 grms. has been poured in. I either ascertain the excess by weights or else remove the same by means of a stirring rod, this latter is really easily accomplished, but, of course, it is a matter quite at the option of the operator whether he takes exactly 5 grms. or approximately such quantity. Having weighed off into flasks 5 or 6 such lots, the next step is to add the alcoholic potash solution, this I do from a fast delivering 50 cc. pipette, great care being required here to deliver an exactly like amount in each case, because an alcoholic solution does not leave the glass like an aqueous one, such difficulty however may be overcome by always allowing the pipette to *drain exactly* the same time, say half a minute. It will be observed that with semi-normal solutions any difference of one drop over or under will only make half the error that would so occur from normal solutions. 50 cc. of the alcoholic potash is delivered into each flask containing fat, and also two lots into two about quarter litre beakers, which are then put aside for telling the exact excess in deci-normal soda of the sulphuric acid used to decompose the soap. The flasks, closed with glass marbles, are now placed upon the top of the water oven, where the fat melts, and, by occasional circular agitation, saponifies at a temperature under 50° C in a short time. After perfect solution has taken place, they are allowed to remain for an hour or so, and then diluted with cold or slightly warm distilled water—the solutions must therefore still remain perfectly clear. With such dilution as I name I find it unnecessary to evaporate off the alcohol. Into each flask, and also into the two beakers containing the amounts of potash, is run from a narrow burette about 1 cc. more of the approximately semi-normal acid than that found to be required for such a quantity. If the potash neutralized 44·6 cc. of the acid, I would run into the soap exactly 46 cc. The excess of the acid over the potash is afterwards carefully found by deci-normal soda, and the two experiments should agree within a tenth or two; this quantity must be deducted from the soda taken when estimating the soluble acids.

By always proceeding in this way, and taking the relative strength of the acid and potash *pari passu* with the experiment, any error is avoided that would otherwise occur by change in the strength of the potash or difference in the temperature of the laboratory, which, too, is important, on account of the alcoholic and aqueous solutions having

different co-efficients of expansion. The flasks, after addition of the acid, are *nearly* filled with water and gently agitated, placed on the water oven till the fatty acids form a clear stratum, they are then allowed to cool, and I find it advantageous to allow them to stand all night, the fat thereby firmly sets and does not so retard the filtration as when filtered in an hour or so after artificial cooling. On the following morning the solutions from the cakes of fat are poured into a filter, the common white filtering paper of greater substance and porosity than the Swedish being preferable. When the whole solution is on the filter the flasks are rinsed with 15 to 20 cc. of cold distilled water, and this is poured off, and about 150 cc. of hot water added, which melts the cake of fat, and a brisk circular motion is given to the contents for a minute or two, then the fat allowed to rise and cool. In the meantime the filters are rinsed with a spray of cold water several times. The fat in the flasks is soon ready to decant from, and the washings pass through the filter very rapidly. The process of washing is again repeated, and final rinsing with cold water and draining leaves the insoluble fatty acids free from acid soluble in water; the filtrate will now amount to about 600 cc. In several experiments I have used another lot of hot water, and filtered this by itself, the acidity was never equal to more than a few tenths of a cubic centimetre of deci-normal soda, I therefore consider that two good washings with hot water and their accompanying rinsings remove practically all the soluble acidity. The filtrates are now treated with deci-normal soda, the amount for excess of sulphuric acid added deducted, the remainder being the index of the soluble acids of the butter, which are calculated as butyric acid.

The insoluble fatty acids in the flasks and the small amount that may have passed on to the filter paper are allowed to remain till the following day, by which time the latter become air dried and in a fit state to rinse with ether; the fat in the flasks is melted and poured, together with the rinsings of ether, into counterpoised flat dishes with perpendicular sides, about 3 inches across and  $1\frac{1}{2}$  inch deep, and the filter papers are also thoroughly washed with ether, the funnels being covered during the process. The dishes are now placed in a warm situation to allow the ether to quietly evaporate; they are then placed on the top of the water oven and a little absolute alcohol added, to cause the drops of water to dissipate, in this warm situation the alcohol goes, and then the dishes are placed in the water oven for half-an-hour, taken out, cooled under a dessicator, and weighed, again put in for 20 minutes or so, and cooled and weighed again, and if only a milligramme or so lost the weight taken as constant.

I have stated my method of proceeding in full detail, even at the risk of being wearisome, because I have found it to work so satisfactorily, any number of repetitions coming out concordant with ordinary care, and the process, too, is exceedingly simple in work. I have frequently conducted six experiments at a time, as well as proceeding with other work.

The following tabulations set forth the results I have obtained with only the ordinary care requisite for any analytical work, and I think they will be found generally consistent and the duplicates practically good. To strengthen my hands I sent one sample to our worthy president, Dr. Dupré, who has kindly taken the sp. gr., and estimated the soluble and insoluble fatty acids. By arrangement our respective results, as under, were made known to each other by a cross post, to be absolutely independent:—

Specific Gravity	Dr. Dupré.		E. W. T. Jones.		
	...	911.1	1st.	2nd.	Mean.
Soluble Acids	...	4.60	4.50	4.39	4.44 per cent.
Insoluble Acids	...	89.00	89.80	89.96	89.88 „

With the exception of the insoluble acids, it will be observed that the results are exceedingly satisfactory. We shall hear whether Dr. Dupré has observed the volatility of the insoluble acids, which otherwise may account for the difference between us on this point.

TABLE I.  
BUTTERS OF KNOWN PURITY.

CLEAR FAT.	A	B	C	D	E
Sp. Gr. @ 100° Fahr. ....	912.3	910.5	911.9	911.2	912.6
Soluble Acids, calculated as } Butyric .....	4.84 4.73	3.76 3.73	5.12 4.98	4.50 4.39	5.51 5.39
Insoluble Acids .....	89.00 88.61	90.44 90.13	88.86 88.82	89.80 89.96	88.64 88.72

CLEAR FAT.	F	G	H	I	J
Sp. Gr. @ 100° Fahr. ....	913.3	913.3	912.2	913.5	912.1
Soluble Acids, calculated as } Butyric .....	5.44 5.41	5.69 5.62	5.19 5.45	4.69 4.54	5.26 5.29
Insoluble Acids .....	88.11 88.18	88.32 88.36	88.79 88.37	89.46 89.63	88.54 88.28

TABLE II.  
BUTTERS, WHICH FROM THEIR HISTORY ARE BELIEVED TO BE GENUINE.

	A	B	C	D	E	F
Sp. Gr. ....	910.8	910.9	910.9	910.9	911.1	911.0
Soluble Acid .....	4.15 4.17	4.66 4.52	4.49 ...	4.91 ...	4.78 ...	4.85 ...
Insoluble Acids .....	90.13 90.07	lost 90.18	89.92 ...	89.64 ...	89.78 ...	89.95 ...

	G	H	I	J	K	L
Sp. Gr. ....	911.3	912.1	911.7	911.4	911.2	912.4
Soluble Acid .....	4.91 4.85	5.17 ...	5.05 ...	4.37 4.61	4.40 4.22	5.19 ...
Insoluble Acids .....	89.68 89.78	89.72 ...	89.96 ...	...	90.82 90.72	89.19 ...

TABLE III.  
BUTTER SUBMITTED UNDER SALE OF FOOD AND DRUGS' ACT.

Description.	A	B	C	D	E	F	G	H
	Salt.	Canadian.	Irish.	Salt.	Salt.	Salt.	Salt.	Salt.
Sp. Gr. ....	913.1	...	...	...	...	...	912.9	912.8
Soluble Acids ...	5.27	5.63	5.45	5.63	5.57	5.17	5.68	5.93
Insoluble Acids	...	...	5.44 88.64 88.56	...	...	...	88.39	88.58

Description.	I	J	K	L	M	N	O	P
	Salt.	Salt.	Salt.	Salt.	Canadian.	?	?	?
Sp. Gr. ....	912.4	911.9	911.3	911.6	911.0	909.6	911.9	911.9
Soluble Acids ...	5.86	5.52	5.52	5.38	5.35	4.73	5.14	5.37
Insoluble Acids	88.63	89.40	89.53	89.53	89.39	90.35 90.24	89.56	88.92

TABLE III.—Continued.

Description.	Q ?	R Fresh.	S ?	T Fresh.	U ?	V Salt.
Sp. Gr.....	Not eno'.	910·1	910·5	909·1	912·0	912·0
Soluble Acids ...	4·54	3·89	4·31	3·32	4·98	5·03
	...	3·85	...	3·29	...	4·91
Insoluble Acids	90·24	90·87	90·58	91·60	89·18	89·43
	...	91·00	...	91·86	...	89·11

TABLE IV.

## BUTTER SUBSTITUTES AND OTHER FATS.

Name of Substance.	A Oleine Butter.	B Margarine.	C Margarine.	D Lard.	E Beef Dripping.	F Mutton Dripping.	G Beef Dripping.	H Pork Dripping.
Sp. Gr. ....	904·3	903·7	904·0	904·6	...	904·1	905·8	910·2
Soluble Acids ...	0·24	0·17	0·33	0·10*	...	0·10*	0·12*	0·07*
Insoluble Acids...	95·44	95·88	95·78	95·36	95·20	95·68	95·26	94·92

Now as to our position for detecting the adulteration of butter with foreign fat. It will be seen that the specific gravity of fat from pure butter may range from 910·5 to 913·5, the former truly is an exceptional case, but cannot be lost sight of. I am of opinion that it would be unwise to make a rule of passing over a butter as genuine, judging solely from specific gravity, whatever it may be in the face of the knowledge that the specific gravity of fats can be raised by being submitted to certain conditions of heating. If a single test is desirable for ascertaining which samples of butter are worth a full analysis, the estimation of the soluble acids is the most reliable, and scarcely less expeditious or tedious than taking the specific gravity; the small quantity of the fat required could be obtained in a few minutes, saponification effected, and, with very little hindrance to other work, the soluble acids obtained to judge of the desirability of making a full investigation, which, I consider, would be due to all butters whose fat gave practically less than 5 per cent. of soluble acid, calculated as butyric acid, but do not let me be understood to say that I should pronounce any butter adulterated, simply because it gave less than that amount of soluble acid, this would be evident folly in the face of my analyses, though I am of firm conviction that amongst them are represented more unfavourable samples than will often be met with; it may be reasonably expected that during the winter months butters are worse than at milder seasons of the year, and it was not wholly unintentionally that this time was chosen, I think it desirable to obtain the worst possible specimens of *pure* butter. I am not without grounds for believing that the soluble acids in genuine butter, made during the summer months, will be always well over 5 per cent., indeed nearer 6 per cent. It is not unworthy of remark that every sample of *salt* butter that I have examined has given over 5 per cent. of soluble acids, a decomposition of the natural butter fat being probably prevented by the salt, for I find that salt butters may be left for a week or two without depreciation, as far as soluble acids are concerned; on the other hand, that it is desirable that "fresh" should be melted at once, and the curd and water allowed to subside, after which the fat may be kept for a long time without depreciation for analyses. I am fully persuaded that the low per centage of soluble acids in some of my samples of genuine butter is due to fermentative changes before churning the cream, which is not so abundant during the winter

\* Experimental errors.

months, and is kept longer. In French butter the soluble acids seldom reach 5 per cent., which may be due to depreciation, the custom in France being for each butter maker to send his butter on to the market in a rough lump, these lumps are purchased by the wholesale dealer, who blends them together to make one quality and colour, during which process it is likely a change may occur. At the farm where B and D, table I., were made, "butter powder," made by a firm of Pharmaceutical Chemists at Lincoln, consisting of bicarbonate of soda, with about 4 per cent. of carbonate of magnesia, is used; this has probably some influence on the composition of the fat.

I have made two or three experiments, proving that butter fat being washed with warm water does not alter in composition.

I have determined the soluble acidity generated by keeping, for a short time, five samples of fresh butter, the extreme outside being rejected. Some of the remainder being treated with hot water gave the following results:—

No. 1, 5 days	...	...	...	Per centage as Butyric Acid	
				On Butter.	On Fat.
" 2, 6 "	...	...	...	·077	·09
" 3, 17 "	...	...	...	·038	·04
" 4, 18 "	...	...	...	·111	·14
" 5, 18 "	...	...	...	·115	·13
" 5, 18 "	...	...	...	·114	·17

It will be remembered that Dr. Muter, in his paper, and also in his remarks on Dr. Dupré's paper, said, he "considered no analysis of butter perfect unless the soluble and insoluble acids together reached 94 per cent." and as Dr. Dupré's figures rarely did so, he looked upon his soluble acids as generally too low; now I am inclined to agree with Dr. Muter, that the soluble and insoluble acids together should amount to about 94 per cent., which, be it observed, is the case with almost every one of my analyses, but, I think, that if anything was wrong with the analyses Dr. Dupré put forth, it was that the insoluble acids were too low. Dr. Dupré himself recognized a difficulty in not getting 100 per cent. when the acids were calculated into their respective glycerides, but considered it due to reckoning the soluble acids as butyric, when some higher acids were present, this is probably a correct explanation for a degree, but, I think, the volatility of a *portion* of the insoluble acids is the main cause of the deficiency. If the mean of my results of the sample sent to Dr. Dupré be calculated into glycerides, they will be found nearly to make the 100 per cent.

In the discussion which took place—

Dr. Muter said that if by his paper he led anybody to suppose that he heated his fat higher than 100°, it was an extraordinary oversight on his part, he strongly repudiated it, and any one who knew his process, which he described, would bear him out that he never had such an intention. In a discussion which took place on a paper by Dr. Redwood at a previous meeting, he especially referred to the change which took place in butter fat by keeping it hot. He thought he could account for Mr. Jones' high soluble acids; he received a sample of the same butter as Dr. Dupré did, and analysed a portion himself for which, therefore, he could answer. What he did was the insoluble acids; he made them 89·00 exactly, so that Dr. Dupré and himself, working independently, agreed. After having poured off the first soluble you have invariably to boil; unless you boil the water, you cannot completely dissolve out the soluble acids. He used an upright condenser, and washed his acids with boiling water—he learnt that from Mr. Wigner—the upright condenser being one of his, Mr. Wigner's, laboratory specialities.

Mr. Hehner considered Mr. Jones had furnished a very great argument against his sp. gr. test, though sp. gr. was not of the slightest use in detecting adulteration. The determination of insoluble fatty acid was a special hobby of his, and he should like to defend it against Mr. Jones, who said it was of little value. He thought Mr. Jones washed with far too small a quantity of water. He thought it was absolutely imperative to wash with boiling water, and not to let it cool. He had made several experiments with regard to the change the acids underwent by being subjected to heat, and he found that a great change does go on; the first four hours the fatty acids keep constant, then they increase and slightly decrease afterwards, but the determination is of little value compared with the determination of insoluble fatty acids.

Dr. Dupré expressed the pleasure he felt at hearing that some one had come round to his opinion that sp. gr. is of no use. As he stated in his paper the gravity is of very great importance as showing adulteration, provided it falls below a certain amount, but it is practically useless if the gravity is high. With regard to the high proportion of insoluble fatty acids, he thought the reason given by Dr. Muter, was the correct one. If the soluble fatty acids are perfectly washed he found there was really no loss by drying at a temperature of 105° for an hour, he had melted, weighed, and heated it for an hour at 104°, and then no loss had taken place. He had never considered the soluble fatty acids as any test for the purity of butter; but as a test for the impurity, he thought nothing was so safe and reliable as the insoluble fatty acids, and he was of opinion that that there was no single test as yet known which could be taken as absolute except it is the estimation of the insoluble fatty acids.

Mr. Jones made a few observations in reply.

---

Mr. A. H. Allen, F.C.S., Vice-President of the Society of Public Analysts, Public Analyst for the Northern Division of the county of Derby and Borough of Sheffield, has been appointed Public Analyst for the West Riding of Yorkshire.

Mr. A. M. Edger, Analyst for Newcastle, reports having examined 155 samples of food, 52 of which were adulterated—these included 42 milks, 1 butter, 2 lard, 1 oatmeal, 1 tea, 1 pepper and 4 spirits.

Mr. F. Sutton, Analyst for Norfolk, reports that out of 17 samples of milk which he examined, 6 were adulterated with from 10 to 60 p.c. of water, one sample of brandy was genuine, and in the borough of Great Yarmouth 16 samples of milk were examined, 11 of which were adulterated and 5 genuine.

---

The following reported statement of the Archbishop of York, at Whitby, will doubtless be read with interest if not amusement.

“The fact of the matter was that a wholesale system of adulteration was going on, and the large profits which were made by the sellers of drink could not be made without adulteration. He found in a book that the receipt for making gin was *glycerine and nitric acid*; he assured them it was quite true—glycerine and nitric acid made a compound called dynamite.”

---

HEAVY PENALTY.—At the Thames Police Court, on the 28th April, Alexander Harryside was fined £5, and 23s. costs, for selling mustard adulterated with 20 per cent. of wheaten flour.

---

We have received samples of Glass Wool from Messrs. Rohde & Co. It appears to us to be a carefully prepared material very suitable indeed for many purposes in the laboratory.

## COPPER IN PRESERVED GREEN PEAS.

BY CHARLES H. PIESSE, F.C.S.

*Read before The Society of Public Analysts on the 14th, Feb. 1877.*

HAVING recently had several samples of French preserved green peas submitted to me for analysis, by the Board of Works for the Strand district, I found in each of the specimens, nine in number, unmistakable evidence of the presence of copper.

The method which I employed to estimate the amount of the copper was as follows: I weighed out about 1000 grains of the peas, and the liquor with which they were mixed, into a porcelain basin, dried and ignited them over the flame of a Bunsen burner, and when they had burned down into a grey ash, this was suffered to cool, and then treated with a little concentrated sulphuric acid, ignited again, and finally the residual carbon burnt off in a muffle. The treatment of the ash with sulphuric acid prevents the loss of copper, which would occur from the presence of sodium chloride in the ash when the residual carbon is being burnt off at the high temperature requisite for its combustion, and it is to be noted that unless the carbon be wholly removed from the ash, the copper cannot be completely dissolved from it. The ash was next boiled with nitric acid, to which some few drops of hydrochloric acid were subsequently added, and again heated to boiling, the dish being covered with a glass lid. The solution so obtained was then carefully evaporated, diluted with water, and made strongly alkaline with ammonia, filtered, and the precipitate washed—the precaution was taken of redissolving and re-precipitating the first precipitate. The filtrates were mixed, evaporated into a small bulk, transferred to a weighed platinum basin, and acidified with hydrochloric acid. The platinum basin was then made the negative electrode of a battery of one of Grove's cells, a strip of platinum dipping into the acid liquid being the positive electrode. A slow evolution of hydrogen at once commenced, and in a couple of hours or so the whole of the copper was separated in a bright metallic film upon the surface of the plate. The liquid was then rapidly poured out, the basin washed with hot water, dried at 100° C. and weighed.

In this way quantities of copper, weighing from 0.02 grain up to ten times that amount were obtained from the above-mentioned weights of the specimens employed.

The method of separating the copper from the acid solution by precipitating it with zinc I did not find so successful, partly on account of the impossibility of obtaining zinc which dissolved without residue. I found that the presence of the copper might be beautifully shown by placing a quantity of the peas themselves in a platinum dish, acidifying them with hydrochloric acid and making the basin the negative electrode of a constant battery; in about twenty-four hours an abundant separation of the copper in a metallic film is obtained, but I have not found that the whole of the copper is separated in that time. I would here suggest a precaution, which I, however, omitted to take, namely, that of mashing the whole of the sample, together with the liquor left for analysis, into a paste with pestle and mortar, and taking an aliquot part of that paste for analysis. The individual results would then be more concordant, though, of course, the results of the analysis of another portion of the "tin" might present the expected divergencies.

## NOTE ON THE DETECTION OF ALUM IN FLOUR.

By J. CARTER BELL, F.C.S.

WEIGH out 50 grammes of flour and mix it thoroughly, by means of a glass rod, with 50 c.c. of distilled water, then add 5 c.c. of logwood solution and 5 c.c. of carbonate of ammonia, prepared according to Mr. Horsley's method. The reason of adding so large a quantity of water is to get an emulsion of flour instead of a dough; if one ten-thousandth part of alum is present the colour of the emulsion of flour will be of a lavender blue, which blue will increase in colour according to the amount of alum present; if alum is absent the colour will be pink.

An approximate estimate of the quantity of alum in the flour may be obtained by having a standard solution of pure alum, one gramme in one litre, and measuring off 5 c.c. or less, or more into the 50 c.c. flask and filling up with distilled water and adding it to 50 grammes of *pure* flour. On adding the ammoniacal solution of logwood, a dark blue lavender tint will be developed which can be compared with the flour which is under examination.

## MILK ADULTERATION IN NEW YORK.

WE have received from Professor C. F. Chandler, of Columbia College, New York, one of the sub-editors of the *American Chemist*, a report of the proceedings in a somewhat remarkable milk case, which was taken as a test case, being one of some 30 which had been instituted in the court of General Sessions of New York, against members of the Milk Dealers' Association, for selling adulterated milk. According to the report, the law of the State of New York in reference to adulterated milk is of an exceedingly stringent character. The Ordinance states that "no milk which has been watered, adulterated, reduced, or changed in any respect by the addition of water or other substance, or by the removal of cream, shall be brought into, held, kept, or offered for sale, at any place in the City of New York, nor shall any one keep, have, or offer for sale in the said city any such milk."

The Counsel for the prosecution, in his speech, stated that the milk supply of New York was 400,000 quarts per day, and that according to reliable statistics in their hands, this was watered to the extent of at least 25 p.c. The most unsatisfactory part of the case is, that the milk appears to have been tested mainly, if not entirely, by means of the lactometer, and it certainly is very unsatisfactory to find that in 1877, an almost exploded method like that should be still in use on the other side of the Atlantic.

The report includes some tabulated statements as to the character of the milk given by certain cows on the farm from which the suspected sample had been taken, which cows were at this time nearly "dried up." Thus we find that eight cows, all which were within about 2 or 2½ months of calving, only yielded a total quantity of 12½ pints of milk, the quantity in one case falling as low as a half-pint, and the maximum being three pints. In only two cases, however, did the milk from these cows fall sensibly below the 100° mark of the lactometer, which, according to the report, corresponds to a gravity of 1029. The least of all was a black cow, age not stated, and the gravity of the milk is reported to have been only 1023, and fortunately we have the full analysis of this milk given. We find that the reaction was strongly alkaline, the amount of cream was doubtful, estimated at 10.50 p.c., fat 1.78 p.c. caseine, albumen and sugar 5.81 p.c., salts, .89 p.c.; this milk therefore shows only 8.48 solids not fat, and estimating this on the



standard adopted by the Society, there is no question but that it would be considered as adulterated with 6 p.c. of water, but we note the opinions expressed in the report by the analysts called for the defence—that is those who wanted to prove that this milk was genuine—who say the milk (?) from the black cow yielded 10.5 per cent. by volume of scum, that is curdy matter, mixed with fatty globules, it also deposited a sediment, and Professor Chandler and Dr. O'Connor, who examined it for the prosecution, state as follows—"After standing a week it exhibited a strong alkaline reaction, and possessed a disagreeable taste. The microscope showed the sediment to contain pus corpuscles; this is an abnormal fluid, *which cannot properly be called milk.*"

We fancy that most reported cases of pure milk of abnormally low quality would be disposed of in the same way if a similar thorough investigation were made as to the state of disease under which the cows are at the time labouring. We remember only one case of the kind in England—that of a milk dealer in London, who was fined £20 for selling milk from a diseased cow. The case is reported in the "Proceedings of the Society of Public Analysts."

#### GOLD AND SILVER IN SULPHIDES OF OTHER METALS.

*The Comptes Rendus de l'Academie des Sciences* of the 2nd of April, contains an important paper by M. Stau Mennier, wherein the author attempts to explain the occurrence of small quantities of gold and silver in the sulphides of other metals. The author's first experiments led him to the conclusion that the native sulphides have the property of reducing metals from solution, galena immersed in a solution of auric chloride is speedily covered with a coat of metallic gold,  $3\text{HS} + 2\text{Au Cl}_3 = 3\text{Pb Cl}_2 + 2\text{Au} + 3\text{S}$ .

If argentic nitrate be substituted for auric chloride, a kind of diana tree is formed,  $\text{PbS} + 2\text{Ag No}_3 = \text{Pb}_2 \text{No}_3 + \text{Ag} + \text{S}$ , while salts of mercury act in a similar manner.

The next series of experiments were made by allowing a solution of sodium sulphide to mix very slowly with a metallic salt, this being effected in the following manner:—two beakers were filled, one with the sodium sulphide solution, the other with the salt to be acted on, the two being then connected by means of a tube filled with water, so that the solution could only mix by diffusion. Argentic nitrate when treated in this manner, is precipitated partly as argentic sulphide, but to a great extent as metallic silver. Salts of copper and gold behave in a similar manner.

From these experiments the author believes that if galena was brought for a sufficient length of time under the influence of sea-water, (which is always argentiferous,) the former might absorb some of the silver. This would also account for the over sulphurization (sur-sulphure) of many galenas, which frequently contain such an excess of sulphur, as to be readily combustible. As the equations show, free sulphur is always formed, though a portion re-combines with the metal. In the same way gold may have been absorbed by iron pyrites.

#### ERRATA.

Dr. Dupré requests us to make the following corrections in his paper and letter published in our last Number.

- p. 2 line 18 from top, for "1,000" read "6,000."  
 3 " 10 " after "adulteration," insert "injurious to health."  
 14 " 16 from bottom, for "either," read "ether."  
 14 " 2 " for "sugar," read "single."

## LAW REPORTS.

CARNRICK *v.* MORSON.THE SAME *v.* MACKAY SELLARS AND CO.

THESE cases which came before the Vice-Chancellor Bacon on March 22nd, were of great interest.

Messrs. Carnrick Kidder & Co. of Great Russell Street, London, applied for injunctions to restrain Messrs. Morson & Son, of Southampton Row, and Messrs. Mackey & Co., of Bouverie Street, from infringing a registered trade mark used by the plaintiffs to designate a digestive compound.

It was proved that the sale of "lactopeptine," already reached £3,000 a month in plaintiffs' hands, and both the defendants had purchased it of them to a considerable amount. Lately, however, both defendants commenced manufacturing somewhat similar preparations labelling theirs "lactopepsine." The main line of defence was comprised in the affidavits of no less than five Analytical Chemists, including the President of the Pharmaceutical Society, Dr. Redwood, and Professor Tuson. These Gentlemen declared the word "lactopepsine," to be the exact scientific term indicating the chemical combination of lactic acid with pepsine, and Mr. Rogers argued that no other word or combination of words would properly describe such a combination. The Vice-Chancellor, in his judgment, however, relied entirely on the counter affidavit of Dr. Bartlett, "which affidavit," said the judge, "remains untouched and unanswered. Admitting that lacto-phosphate of soda has an exact scientific meaning, he denies that 'lactopepsine,' is a scientific combination of words, or at all applicable to precisely describe either of these preparations, which he had analysed and found to contain less than one-fifth of their bulk of these ingredients." The Vice-Chancellor proceeded to say that "this was an infringement of a plain trade mark, as palpable and wilful as ever came before any court," and he granted the injunctions, which were afterwards made perpetual, with costs.

In Durham there have been a number of prosecutions for milk adulterations on the certificate of Mr. Edger. In the first case, a milk dealer named Thomas Milner, was summoned by Superintendent Thompson, for selling milk containing 10 per cent. of water, and the defence was that the milk consisted of strippings, and that it was really richer than ordinary milk; the defendant was fined 20s. and costs. A dealer named Corker was charged with selling milk containing 15 per cent. of water; the defence was that he "turned his cows out once a-day, and they nearly burst themselves with water"; he was fined 30s. and costs. Aaron Thompson was charged with selling milk containing 8 per cent. of water, and in defence said, "the children might have put the water in"; he was fined 16s. and costs. Robert Evans was charged with selling milk containing 14 per cent. of water, and fined 40s. and costs. James Harrison was fined 20s. and costs for a similar offence.

Mrs. Carnell, who keeps a Berlin wool repository, was charged with selling milk from which 40 per cent. of cream had been abstracted. In defence the celebrated journey of Dr. Redwood in a milk cart was again referred to as evidence, and this time with so much success that the bench dismissed the case.

William Clarke, of Red Briars, Pity-Me, was summoned by Superintendent Dunn, for selling milk from which 46 per cent. of cream had been abstracted. In answer to the charge he said that at this time of the year he mixed old milk with new, and he called some of his customers to prove that they had bought his milk regularly for 10 years, and knew it was mixed milk. The bench came to the conclusion that the evidence was "most extraordinary," and that "as the defendant had sold mixed milk for years and had no intention to defraud, they would impose the lenient fine of 10s. including costs."

At Hyde, in Cheshire, a publican has been fined £2 and costs for selling beer containing 80 grains of salt per gallon.

At Manchester there have been two more convictions for the use of poisonous colouring matters for sweetmeats. The analyst, Mr. Estcourt, proved the presence of about  $\frac{2}{3}$ ths of a grain of chromate of lead per ounce. The fine in each case was £5 and costs.

At the Hull police court, on the 19th April, the first summonses under the Sale of Food and Drugs Act were heard. A milkman named Horton was fined 50s. and costs for selling milk adulterated with 33 per cent. of water. A milkman named Shepherd was fined 30s. and costs for selling milk adulterated with 24 per cent. of skimmed milk. In the latter case it appeared that two samples had been procured from the defendant, and that both were mixed in the same way. The stipendiary magistrate, Mr. Travis, said he should probably inflict a fine of £5 in every future case.

## REVIEW.

## THE HAND-BOOK OF NATURAL PHILOSOPHY.\*

By D. LARDNER,

Edited by BENJAMIN LOEWY, F.R.A.S.

On reading this book through, the only point which we see to regret is that Dr. Lardner's name should have been retained on the title page at all. For all practical purposes it is a new work, almost entirely re-written, and as far as we can judge from a careful examination of it, accurately prepared as regards the tabular matter which it contains, and carefully written as regards its facts. We think there is no doubt that it will have an extensive sale, but the circulation would not have been in any way diminished, had it been published as a new work instead of as a reprint of a perfectly obsolete one.

## BOOKS, &amp;c., RECEIVED.

The Miller; The American Chemist; The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Anti-Adulteration Review; The Hand-book of Natural Philosophy; The True System of Wood Pavement.

## ADULTERATION IN BAVARIA.

In Bavaria it appears samples of food are so sharply looked after by the police, that although 4,727 samples of bread, 9,310 of beer, 9,782 of milk, and other articles making a total of nearly 40,000 analyses were made during the past 12 months, yet it was only necessary to take legal proceedings against 272 tradesmen, the greater number of whom were convicted and severely punished. If we may judge from the number of prosecutions we fear there is more adulteration in England than in Bavaria.

## CORRESPONDENCE.

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

## ORGANIZATION AMONGST CHEMISTS.

TO THE EDITOR OF "THE ANALYST."

SIR,—If there is any basis for the suspicions of the gentleman who writes as "One who has been in practice for twenty years," the scheme suggested or adopted for "organization" among chemists is open to still wider objection than appears in the letter in question. In the first place, I think, any protests against this, or any other possible invasion of existing and well-established professional interests, should bear our proper signatures to carry due weight with them. Chemists, of any real standing, need scarcely fear the consequences of being supposed to be left out in the cold by any self-nominated coterie.

Without invitation, and only by right, as a Fellow of the Chemical Society, I was present at a meeting held in the rooms of that Society, for the purpose of promoting organization. To my astonishment, I heard it gravely proposed "that no fees should be recoverable by any person practising as a chemist without the sanction given by the admission of the party to the privileges of the new organization."

Dr. Odling very properly ridiculed the idea, and I am surprised to hear that it has in any way survived the absurdity to which it was reduced at his hands. For myself, as I can also date back my practice for twenty years, and have no reason to be dissatisfied with its results, I am not in the least anxious to be "dubbed competent" by any self-constituted clique of organizers. I no more expect to be hindered or stopped in the exercise of my profession by any Act of Parliament which these gentlemen can apply for, than I anticipate the same fate for all engineers who are not connected with the Institute of Civil Engineers. That measure of justice which was accorded to the existing interests of the medical profession, when the medical Acts of 1815 and 1858 were passed, and still more recently in framing the Pharmacy Act, will, I am convinced, form an essential consideration for all who hope to obtain a similar measure to protect, and not to injure, the interests of professional chemists, among whom I beg to subscribe myself,

Yours &amp;c.,

H. C. BARTLETT.

DUKE STREET, GROSVENOR SQUARE, W.

\*CROSBY LOCKWOOD &amp; Co., Stationers Hall Court, London.

TO THE EDITOR OF "THE ANALYST."

SIR,—I have just been reading through the draft scheme proposed by the Committee for the organization of professional chemists, which bears the signatures of Messrs. Frankland, Abel, Voelcker, Neison, Carteigh, Wright, and Hartley, and there are a few points occurring to me in connection with it to which I should like to call attention.

1st. Who appointed this organization committee? The chemists of England, or even of London, were not invited to do so, and some of those present at the preliminary meeting, and whose names appeared in the signature book at that meeting, did not receive notice of the second meeting.

2nd. However desirable organization may be—and that it is so no chemist can doubt,—it cannot be policy, or even justice, to let ten Fellows by a majority (that is practically six Fellows only) elect the Council for such an important Trades' Union as this must necessarily be.

3rd. What would be the Council's definition of a satisfactory course of three years' training? Would they, for instance, require the School of Mines, or the College of Chemistry, or would they be satisfied with a "postal course"?

4th. Referring to p. 8, what do the promoters of the scheme understand by unprofessional conduct? If rumour is to be trusted—although we know perfectly well that *sometimes* it is incorrect,—there are chemists in practice who undertake the analysis of milk for 2s., water for 5s., or 7s. 6d., who advertise in the daily papers, and who call themselves F.C.S., without any right to do so. Are these unprofessional actions?

One more question and I have done. Is the Institute to include Chemists and Druggists, as well as professional Chemists? It appears to me, from its present constitution, that it is; if so its value must be greatly decreased.

I remain, &c.,

ONE WHO WANTS TO KNOW, YOU KNOW.

TO THE EDITOR OF "THE ANALYST."

SIR,—Having observed that you open your columns to correspondence on the subject of "Organization amongst Chemists," I must say that, in my opinion, analysts would be glad to join a properly constituted scheme. The promoters have only to issue a public notice by advertising, inviting all practising analysts in England to a meeting on the matter.

Hitherto the fault has been that the thing has been too private, so that we in the provinces have not had a chance of putting in our word officially.

If the promoters do this the scheme will be sure to prosper, and we shall hear the last of the talk about self constituted authorities, now so common in the profession.

I am, &c.,

A PROFESSIONAL CHEMIST.

#### ADULTERATION OF DRUGS.

TO THE EDITOR OF "THE ANALYST."

SIR,—I am, so far, well contented to have elicited the two letters in Nos. 355 and 356 of the *Pharmaceutical Journal*, as the writers seem at last to have come to the conclusion, however reluctantly, that manufacturers of drugs are not absolutely immaculate. I even live in hopes that in time they will fully acknowledge the justice of my statements.

Meanwhile I would take this opportunity of recommending the following propositions to the consideration of the Pharmaceutical Society, assuming, as I do, that it is the earnest desire of that Society to insure the purity of all drugs and medicines dispensed, or sold, by any of its members.

Either let the Society instruct the chemists, more or less under its control, to co-operate with public bodies in their endeavour to suppress the adulteration of drugs as well as other articles, or let the Pharmaceutical Society itself take the matter in hand, which, if I mistake not, is quite within its province. Let them exercise some supervision over its members, and prosecute every chemist who manufactures and sells pharmaceutical drugs not of the nature, substance, and quality demanded. In this it will accomplish more real good than by almost any number of prosecutions undertaken against persons practising as Pharmaceutical Chemists without being members of their Society.

In conclusion allow me to state, although considering the wording of my previous letter, such statement should have been unnecessary, that the 165 samples of drugs, &c., &c., mentioned, were *not* examined by me in my capacity of Public Analyst.

Yours, &c.,

A. DUPRÉ.

WESTMINSTER, April 21, 1877.

## MILK ANALYSIS ?

TO THE EDITOR OF "THE ANALYST."

SIR,—On the 21st of February, two samples of milk were brought to me by the inspector, which had been obtained from a milk dealer in Salford. No. 1 was a poor milk, which I passed. No. 2 gave—

Total solids ... ..	11.20	per cent.
Fat ... ..	3.13	"
Solids not fat, from ether, gave ... ..	8.00	"
" " benzoline ... ..	8.00	"

I reported this milk as containing 11 per cent of added water.

On the 28th of February, two samples of milk were brought to the Town Hall, with a request that they should be analysed by me.

No. 1 gave—Total solids ... ..	{ 12.32	per cent.
	{ 12.38	"
No. 2 ,, ,, ... ..	{ 12.40	"
	{ 12.44	"

I gave a certificate that both these milks were pure. These two milks were contained in ordinary medicine bottles, loosely corked, with 100 and 200 marked upon them. When the case of the milk which contained 11 per cent. of water came before the magistrate, the barrister for the defence asked me whether I had not analysed some milk on the 28th of February, and stated that these were parts of the very sample I had analysed on the 21st. I replied I was positive they were not, as the milk which was analysed on the 21st was analysed twice by myself, and twice independently by my assistant. The barrister said I had certified a milk on the 21st to be adulterated, and on the 28th the very same milk to be pure. The magistrate thought there was a doubt, and gave the defendant the benefit of it, but would not allow costs.

The next day after the hearing of the case a letter appeared in the Manchester papers, from the Secretary of the Milk Dealers' Association, charging me with giving incorrect analyses. To clear myself, I asked the Mayor and Town Clerk, in whose custody a portion of the sample was, to have it sent to Somerset House, and I would pay all the expenses of such analysis. This was not done; Dr. Tatham, the medical officer of health, took the bottle of milk to London, and asked Mr. Wanklyn to analyse it, and forward the results of the analysis to the Doctor. In not sending it to Somerset House, why was it not sent to some chemist in Manchester? On the 14th of April, Mr. Wanklyn sends the following analysis:—

Total solids ... ..	10.700
Fat ... ..	3.230
Ash ... ..	.640

He says he is not able to tell from the solids not fat whether the milk has been watered, on account of its age, but, judging from the ash, he should say it is a pure milk.

In Mr. Wanklyn's book on milk, he states that the ash of average country milk is .709, and of town milk .738, or a mean of .72. As he judges from the ash, which in his letter to Dr. Tatham, he says is the only means of knowing whether the milk is adulterated with water, it only requires a simple calculation to see that if .72 equals 100 of milk, .64 can only equal 88 of milk, and according to his own analysis the milk must contain 12 per cent. of water. I wrote to Mr. Wanklyn on April 17th, calling his attention to the strange results which he had deduced from his analysis. I received no reply. I wrote him again on the 22nd, and up to this date (26th) he preserves a judicious silence.

Mr. Wanklyn probably forgot, when he returned my sample of milk as pure, because it contained .64 of ash, that at a meeting of the Society of Public Analysts, on the 14th of June, 1876,\* Mr. Wanklyn in the chair, he proposed, and it was carried unanimously, that Mr. Jones, of Wolverhampton, was perfectly justified in certifying that a sample of milk containing exactly the same amount, namely, .64 of ash, was adulterated with 12 per cent. of water. Comment is needless.

SALFORD, April 26th.

J. CARTER BELL.

TO THE EDITOR OF "THE ANALYST."

SIR,—To a short note apropos to the milk case at Brighton, and containing the following: "No Analyst in his senses would be guilty of such a statement as the one attributed to our Brighton confrère," and inviting my reply, subject to some possible adjudication, permit me to plead not guilty, and in perfect possession of my senses at the time.

The certificate in question was for "deficiency in butter fat," given in all fealty to the Society's minimum of 2 per cent. Water was not mentioned in Court or certificate, and the depreciation (*not adulteration*,) of milk by loss of cream in its retail dipper distribution was, months back, noted by myself in the then organ of the Society, as possibly acting unfairly on the vendor.

Accepting "THE ANALYST" report of the recent Liverpool case, as an obligation on the vendor to a supply of the nature and substance, the Hove magistrates quoted a case which may be of some importance in the future.

You must allow me to say that I do not notice in your reprint of this case any wording that should lead to the absurd deductions conveyed in the note, or one requiring me "to explain what I really did say," and request, as you have received, so you will publish this statement, as you asked for it.

Yours, &amp;c.,

BRIGHTON, 3rd April, 1877.

EDWARD H. MOORE.

\*See *Analyst*, No. 4, page 77.

## NOTES OF THE MONTH.

THE *Pharmaceutical Journal* did us the honor, a few weeks ago, to give us one of those neat little back-handed slaps, so characteristic of Trade Journals when referring to analysts. In an article on spurious citrate of iron and quinine, which it states is now so common, it took occasion to mention Dr. Dupré's letter on drugs, which appeared in our last number, and wound up by expressing a hope that the change in our proprietorship was not to be "synchronous with a series of sensational attacks on chemists, or any other body of traders." We would remind our contemporary that, in common with himself we do not hold ourselves responsible for the opinions of our correspondents, and therefore, the insertion of any letter cannot be construed into a "sensational attack" on our part. When we commence to vituperate traders as strongly as the Trade Journals expend there spleen upon us, then it will be time for them to speak, and meanwhile it would be well for our contemporary to remember the good old adage, which says:—"don't cry out till you're hurt."

---

If the recent decision finally settles milk of sulphur to be sulphur and sulphate of lime, then no one should be more thankful than Public Analysts; when any disputed matter of the kind crops up, the article is sure to be poured into the laboratories by the inspectors, and a moderate analyst, who desires to delay proceedings until a test case has been tried, is certain to be talked at by local wiseacres, urging him to give them certificates of impurity, so as to let them rush into court, only perhaps to turn tail, as hereafter described. Now all that will we hope be over, and the public may be allowed to buy, and the druggists to sell, their sulphate of lime in peace, and above all the analysts will be set free from another *questio vexata*.

Just another moment's reference to the case, not to express any opinion upon its merits (although in this respect we consider that some persons go too far in utterly condemning the sale of an old-established and often useful remedy), but to point out the invidious and unfortunate position in which the Public Analyst is often placed. It cannot be too frequently reiterated that the Public Analyst ought not to have, and by the clear interpretation of the Act has not, any interest either in the collection of samples, or in the proceedings that follow. His duty is simply to receive and examine the articles brought to him by the inspectors, and to render a true account of their contents, and if, on receiving that certificate, the local authorities deem it right to prosecute, he has no *locus standi* to prevent them. Supposing then that the prosecution takes place, it is as a rule left to chance, and often no legal personage is appointed to conduct it, while on the other hand the defendant frequently secures the support of a powerful Trade Society, the best counsel are employed, and trade witnesses interested in perpetuating the manufacture of the article are called by dozens. Then the analyst is subjected to the test of a virulent and in most cases personally-directed cross examination, made purposely as galling to his feelings as possible, as if he were the actual prosecutor, while the defence witnesses are not submitted to any equivalent searching of their testimony. Almost as a matter of course the case fails, and then out come the self-constituted prophets of Israel, and denounce as incompetent, who?—not the inspector who obtained the sample, not the local authorities who insisted on prosecuting and then left the case in the lurch, but the unfortunate analyst, who throughout the whole affair has been only a

passive instrument used by others and thrown over, when convenient, as a sop to the growling wolves outside!

---

We are not ourselves medical men, and therefore we trust that we shall be excused for commending to the notice of that learned body a new form of monomania. It is called *analystophobia*, and its symptoms are more dreadful than hydrophobia, because instead of killing the victim off, they keep him for the rest of his life in a morbid state, always lying in wait to morally bite a victim, and suffering the most maddening suspense of mind, when a suitable pabulum for his literary teeth is not forthcoming. It condemns the wretched sufferer to hunt through every newspaper and watch every turn of events, and what is worse it causes his mind to be so completely engaged that he exists (on the point of analysts) entirely in a region of distortion, and his writings become charged with the most virulent abuse and absurd metaphor. It is bad enough for a man to be obliged to write funny things for bread, when perhaps his heart is heavy, just as Dickens' poor clown went from the bedside of his dying wife to tumble on the stage, but for a man to be so mentally chained, that he must unconsciously provide a continual source of amusement to the very class of men he hates, is one of the direst symptoms of *analystophobia*. We have had to regret lately the absence of the lucubrations of a dear and funny little enemy, but we find that he is still in existence. We are really sorry that we have not space to reprint his last effusion from the *Chemist and Druggist* for the entertainment of our readers, but any analyst who wants a little relaxation of the facial muscles should obtain a copy of his amusingly abusive letter on ourselves in the character of the Analytical Baby.

---

On another page we print a letter from Mr. Moore, of Brighton, in reply to our "note" of last month; we are very glad to have the opportunity of inserting the letter, because it sets at rest the point of what he actually did say in contra-distinction to what he was reported to have said. We are sorry to observe that Mr. Moore appears to have taken offence at our "note" which we thought at the time was very important, and that by eliciting the truth, we were doing him a real service, lest in reading the report, others should have taken a wrong idea as to the nature of his statement. Now that we have the true facts before us, we trust Mr. Moore will excuse us saying that we fancy no dealer in milk would wilfully give away the cream to the first comers, and the skim milk to the last, but would, for his own reputation's sake, stir up his milk every time he served a customer. Putting all this aside, however, is it not contemplated by the Act, that a man who professes to sell milk shall sell it as from the cow, and be bound to take all reasonable precautions to that end? We commend this view of the case to the legal advisers of local authorities, if indeed they think it worth while to waste a precious thought on their duties under the Act.

---

For some reason best known to himself, the writer of the "food reports" in the *Medical Examiner* falls foul of the present system of butter analysis. This gentleman does not think that it has been sufficiently established, that butter never yields more than the prescribed percentage of fatty acids. We were not aware that there was any such positive percentage laid down, except for the purposes of calculation, in cases where the butter exceeded the possible limits given, and fully discussed a year ago in our first number. We should be glad to see the figures upon which this writer bases his

## THE ANALYST.

statement, that "there is some room for suspicion, that exceptionally good butter does not conform well to the test," and until we see these figures, we may be pardoned for preferring the published results of Messrs. Angell, Hehner, Muter, Dupré, and Jones, to his unsupported statement. We remember that when Mr. Wanklyn first published his milk standards, and others carp at them, and brought forward isolated analyses calculated to throw doubt upon the researches, he always answered by simply saying that these results were merely the outcome of bad work. We think that this would be the best answer to the writer in the *Medical Examiner*.

The *Grocer*, of the 21st April, devotes nearly a column to the consideration of "THE ANALYST." We cannot say very much for the article, but still we think it is on the whole the best in the number. It considers that although "THE ANALYST" is not a large periodical, yet its articles are of a profound character, and cheap at sixpence. We really feel flattered.

A correspondent of the *Chemist and Druggist*, who signs himself "Bella Donna," states that a short time since he was at a dairy where churning was going on, and as the butter would not come, a few coppers were put into the churn in the proportion of about one penny to a pound of butter, in order to cause the more rapid separation of the fat, and he also states that he has since been informed it is not an uncommon practice; under these circumstances it is very possible that copper may occasionally be found in butter if the practice is as common as "Bella Donna" supposes.

### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
2755	J. H. Johnson	Balances	6d.
2778	C. H. Gill	Sugar	8d.
2966	F. A. Lockwood	Treating Leather or Hides...	1/2
3006	R. J. Hutchings	Tin Terne and Metal Plate	6d.
3056	E. V. Gardner	Explosive Compounds	6d.
3119	W. R. M. Thompson	Drying Tea	6d.
3125	A. Fryer	Treating Refuse	6d.
3164	P. Brotherhood	Compressing Air	6d.
3173	W. Young	Carburetted Air and Gases	8d.
3209	L. De La Peyrouse	Manufacture of Gas	6d.
3213	J. Witherspoon	Asbestos Paper and Millboard	2d.
3227	T. Baldwin and W. H. Bailey	Pressure Gauges	6d.
3264	A. M. Clark	Dynamo Electric and Magneto Electric Machines	1/10
3342	W. Lord and L. Kaberry	Cleaning Cotton	6d.
3880	W. Weldon	Manufacture of Sulphide of Sodium	4d.
3381	Ditto	Reducing Sulphates of Potash & Soda to Sulphides	4d.
3383	Ditto	Furnaces for manufacture of Alkaline Sulphides	4d.
3384	Ditto	Manufacture of Alkaline Sulphides	4d.
3389	Ditto	Obtaining Carbonate of Soda & Alkaline Carbonates	6d.
3390	Ditto	Manufacture of Soda and Potash	6d.
3465	J. Clark	Coating Metals with Collodion	2d.
3466	D. G. Fitzgerald	Electrical Condensers	4d.
3479	J. T. Loekey	Evaporating Brine	6d.
3551	J. H. Johnson	Treating Iron Residues obtd. in Prfyng. Coal Gas	4d.
3576	W. White	Disinfecting Sewage	4d.
3623	C. W. Harrison	Compounds for Preserving Metals	4d.
3633	E. A. Cowper	Centrifugal Machines	2d.
3640	C. E. H. Rogers	Disinfecting Clothing, &c.	6d.
3674	R. Harris	Purification of Gas	2d.
3693	W. R. Watson	Sugar	6d.
3709	A. T. Becks	Preventing Corrosion in Steam Boilers	2d.
3734	L. Henry	Substitute for White Lead	4d.
4280	H. J. Haddan	Magneto-electric Machines	6d.
4329	T. L. Wadsworth	Converting Loose Granular Sugar into Cubes	6d.
4386	A. M. Clark	Generating Motive Gas, &c.	6d.
4597	E. H. C. Monckton	Electric Motors	8d.



# THE ANALYST.

---

## SOCIETY OF PUBLIC ANALYSTS.

*An Ordinary Meeting was held on the 2nd May, 1877, at Burlington House, Piccadilly.*

THE minutes of the last meeting were read and confirmed.

The names of Dr. James Mitchell Milne and Mr. Wm. Mogforde Hamlet, who applied to be admitted as members, were duly read in accordance with the rules.

The following papers were then read and discussed—

Mr. Wynter Blyth, "On Micro-Chemistry, as applied to the identification of Tea Leaves, &c."

Mr. E. W. T. Jones, "On Butter Fat," being an addendum to his paper on the same subject, read at the previous meeting.

Mr. Allen's paper "On some points in the Analysis of Potable Waters," was postponed till next meeting.

Mr. Wigner postponed his further paper "On the working of the Sale of Food and Drugs Act" till next meeting.

Dr. Muter's paper "On Oleic Acid" was also unavoidably postponed, owing to an unforeseen circumstance.

---

In our April number we published a short paper by Mr. W. C. Young, "On Alum in Bread," which we omitted to state was read before the Society of Public Analysts on the 14th March last.

---

The next Meeting of the Society of Public Analysts will be held on the 13th inst., at Burlington House, when it is expected that, amongst others, papers will be read by Mr. Allen, "On Potable Waters," and Dr. Muter, "On Oleic Acid."

---

### BUTTER FAT.

By E. W. T. JONES, F.C.S.

*Read before The Society of Public Analysts on the 2nd May, 1877.*

It will be remembered by those who were present at our last meeting, that my paper on Butter Fat\* elicited the opinion from several quarters, that my insoluble fatty acids were too high, either from insufficient washing or from the use of ether and alcohol; to the former probable cause I at once dissented, on the ground that an extra washing gave scarcely any more soluble acidity, but since our last meeting I have made one or two experiments to throw light on this point.

Butter fat, sample D, Table I., some of the same that was sent to Drs. Dupré and Muter, was used for the experiments. It will be remembered that Dr. Dupré in "soluble acids" agrees with me within a tenth per cent., but in "insoluble acids" was 0.88 per cent. lower, and Dr. Muter, I understand, found the same amount as Dr. Dupré, this

---

\* See *Ante* pp. 19.

practical agreement in "soluble acids," with a discrepancy of nearly 1 per cent. in the insoluble did not satisfy me as being due to a different degree of washing, which the following experiments tend to shew is really the case.

Five grammes (exactly) of the clear fat were employed in each experiment, and saponified in flasks with the same quantity of semi-normal alcoholic potash solution, acid was then added, and treated exactly as previously described. In all four experiments, after decantation of the first solution, the cakes of fat were rinsed with a few c.c. of cold water and then well agitated with hot, allowed to cool, and the washing in this way once more repeated.

	Amount of the first decantation and the two washings as first described.		Acidity of the same as Butyric Acid after deduction of excess H <sub>2</sub> SO <sub>4</sub> .		"Soluble Acids" per cent.
A	650 c.c.	...	Gramme. 0.2384	...	4.77
B	600 c.c.	...	0.2296	...	4.59
C	565 c.c.	...	0.2314	...	4.63
D	550 c.c.	...	0.2332	...	4.66

The fat from A was treated with hot water three times, cooling and decanting after each treatment, giving a further solution of 530 c.c., having an acidity equal to 0.0132 grammes butyric acid, corresponding to 0.26 per cent. "soluble acids."

B was treated in like manner, and gave a further solution of 490 c.c., having acidity equal to 0.014 grammes butyric acid, corresponding to 0.28 per cent. "soluble acids."

C, this cake of fat was treated with hot water, well agitated in a flask and then poured on to the filter whilst melted and washed thereon with *hot* water, giving a further solution of 310 c.c., having acidity equal to 0.007 grammes butyric acid, corresponding 0.14 per cent. "soluble acids."

D, treatment as foregoing giving solution of 300 c.c., having acidity equal to 0.0058 grammes butyric acid, corresponding to 0.10 per cent. "soluble acid."

The solution from C was titrated whilst hot, and that from D allowed to cool and then titrated, heated nearly to boiling, it then retained its sign of neutrality, no separation of fatty acid occurred on cooling, thus, to my mind, proving that it is unnecessary to filter off hot, a procedure far more troublesome and risky than that of allowing to cool and decanting from the solid fat.

The following figures will shew the influence of this extra washing on the "insoluble acids." For B, ether and alcohol were employed and drying conducted as described on the last occasion, the others were without the employment of alcohol or ether.

	Insoluble fatty Acids.		Soluble Acids calculated as Butyric.		Total quantity of filtrate and washings.
A	88.22 per cent.	...	5.03 per cent.	...	1180 c.c.
B	88.40 "	...	4.87 "	...	1090 c.c.
C	88.44 "	...	4.77 "	...	875 c.c.
D	88.64 "	...	4.76 "	...	850 c.c.

The deductions from the above experiments are that although the extra washing has not a very marked effect upon the "soluble acids" calculated as butyric acids, the

“insoluble acids” are very materially affected thereby, the substances extracted therefore on the last portion of the washings are nothing near represented by the equivalent of butyric acid.

By the further washing, beyond that mentioned in my paper, the insoluble acids are reduced 1.46 and the “soluble acids” only increased 0.42, shewing the great difference between the equivalent of butyric acid on the factor used for the soluble acids and the actual equivalent of the bodies extracted. I look upon the analyses in my first paper as more nearly representing the composition of butter fat than would be the case if washing was carried further.

The use of ether and alcohol has but very little effect upon the amount of “insoluble acids,” the continual loss of weight in the water oven is mainly overcome by the extra washing, the volatility mentioned in my paper being chiefly due to the bodies so removed.

---

### MICRO-CHEMISTRY AS APPLIED TO THE IDENTIFICATION OF TEA LEAVES, AND A NEW METHOD FOR THE ESTIMATION OF THEINE.

By A. WYNTER BLYTH, M.R.C.S., F.C.S.

*Read before the Society of Public Analysts, 2nd May, 1877.*

I HAVE been lately examining tea leaves, with a view of obtaining some chemical test, either peculiar to them, or at all events, restricted to the “Theine” producing plants.

The result of my experiments has been the establishment of a process of great simplicity which will enable anyone in a few minutes to pronounce whether the merest fragment of a plant belongs to the “Theine,” class or not.

The procedure is based upon the well-ascertained fact, that the alkaloid already alluded to, is distributed in the woody tissue, the bark, the stem, the leaf, the flower, in short, in all parts of a “Theine” plant, and this is the more especially true in the case of the various species of *Thea*.

Now this “Theine” has some very characteristic properties; the most useful of these for my present purpose are, that it commences to sublime at the comparatively low temperature of 101° C.; that it sublimes from organic substances in as perfectly pure crystalline state; that the crystals have a very definite easily recognizable form, and that a  $\frac{1}{1000}$  of a milligramme is distinctly seen, and may be identified by the aid of the microscope.

The details of the process I use are as follows:—

(1.) The leaf or fragment, if it is desired to examine it subsequently by the microscope, is boiled in a very small quantity of water, say a cubic centimeter, and the little decoction is transferred to a watch glass, a minute quantity of calcined magnesia added, and the whole evaporated nearly to dryness on the water bath; the extract is next transferred to the surface of a thin circular disc of microscopic covering glass, on this again is placed a thickish ring of glass, which is covered with a second circular disc of thin glass, the whole forming what I will call “the subliming cell,”—the subliming cell is placed on the surface of an iron plate, which carries a cup of mercury in which is inserted a thermometer, and the plate is fitted in the ordinary way to a retort stand.;

---

† I of course claim no originality whatever for this method of sublimation; in all its essential features it is identical with the one proposed and employed years ago by Dr. Guy.

On heating the iron plate, first moisture is given off and condenses on the cover of the subliming cell, and this cover may be removed and replaced by a second. In a very short time after it has become dry, a light mist is seen on the upper disc, and this mist the microscope resolves into beautifully distinct little crystals of theine—they may be identified as “theine” by re-subliming, when it will be found they will rise to the upper disc at about the temperature of  $101^{\circ}\text{C}$ . The subliming temperature of the extract itself is rather variable, the extract should be heated if no mist or crystals become visible up to as high as  $220^{\circ}\text{C}$ , and if still no crystals are obtained, the substance most certainly contains no “theine.” In all my experiments I have always obtained a sublimate from genuine products derived from tea or coffee below  $200^{\circ}\text{C}$ .

(2.) The substance is boiled and treated with magnesia as before, the solution cooled, a bit of dialysing parchment folded and cut into a miniature filter form, and placed in a glass tube, which, as very small quantities are being dealt with, need be no bigger than a thimble, or a porcelain crucible may be used, which being always at hand, will perhaps be more convenient than anything else. The solution is then, by this little dialysing apparatus which I need not further detail, dialysed for twelve hours, a yellow colouring matter and theine are found in the outer liquid, a microscopic examination of this liquid, when evaporated down, will readily discover crystals of theine.

As in the former case, the fragments of the leaf or the leaf itself is uninjured, and can be put to any supplementary examination desired.

(3.) The leaf itself may be first slightly moistened, rubbed with a little calcined magnesia, put in the subliming cell, and heated as described. If the substance is derived from a theine-producing plant, a distinct sublimate of theine will be the result. †

The leaves, &c., of the tea plant also yield, without any preparation whatever scanty sublimate of theine, and coffee gives up a very large proportion of the alkaloid, below  $110^{\circ}\text{C}$ , but at all events in the case of tea it is most certain to operate with magnesia as described.

I may here remark, that if a small quantity, say a gramme, of finely-powdered tea be placed between two watch glasses and heated in the water bath in the usual way, on removing the upper glass, at the end of an hour or so, all round, but within, the edge, crystals of “theine” can be discovered by the microscope. It is then evident that in the ordinary way of taking the hygroscopic moisture of tea, there is some loss of theine, but this is I think too small to be regarded in mere technical processes.

I should also add that the addition of magnesia to a decoction of tea or coffee for the purpose of dialysis is not absolutely essential, since theine (somewhat scantily) dialyses without the addition of any re-agent.

The main objection to the processes I have given is their extreme delicacy, any speck of a tea leaf, which is easily visible to the naked eye, will yield its infinitesimal

---

† NOTE.—Since the above paper was written, I have discarded the rubbing of the dry or slightly moistened leaf with magnesia, and in all cases proceed as follows:—The leaf is boiled for a minute or two in a watch glass with a very little water, a portion of magnesia equal in bulk is added, and the whole heated to boiling and thus rapidly evaporated down to a good sized drop, this drop containing yellow colouring matter, magnesia and theine is poured on to one of the thin discs of glass already mentioned, and then evaporated nearly to dryness on the subliming plate, when it approaches dryness the “subliming cell” is completed by the circle of glass and cover, and in this way a sublimate is readily obtained.

group of crystals to the cover of the subliming cell, hence in the examination of a foreign leaf, any fragment of genuine tea mechanically adhering to it, may give rise to error.

It must, however, be borne in mind that a great many leaves in the vegetable kingdom will yield, by appropriate treatment, micro-chemical evidence as definite as that of tea, and the time may come, when a large proportion of minute vegetable products will be identified, not alone by the shape of their stomata, their epidermal appendages, or the structure of their ultimate vesicles, but by isolating their acids, their glucosides, or their alkaloids, and evolving a microscopical *corpus delicti* from a milligramme of crude material.

*Quantitative determination of Theine.* Struck with the ease and purity with which theine sublimed, it was but natural that I should attempt to work out a quantitative method of sublimation. In this, I believe, I have been successful, and according to my own repeated experiments the process I give here is both quick and accurate.

A quantity not less than 1 gramme, or more than 2 grammes of either tea or coffee, in its undried state is as finely powdered as possible, and treated in a flask with 70 c.c. of water, the flask is attached to a reversed Liebig's condenser, and the liquid boiled for one hour, the decoction, *including the powdered substance*, is transferred to a porcelain dish, about the same weight of calcined magnesia, as the substance originally taken is added and the whole evaporated down nearly to dryness, the powdery extract is now transferred to the iron subliming plate already spoken of, and covered with a tared glass funnel, the edge of which must be accurately ground, and the tube of which must be several inches long. The substance should form a very thin equal layer, within the circle of the funnel, which may be easily accomplished by a series of gentle taps.

The heat at first should not exceed  $110^{\circ}$  C, then when the substance appears thoroughly dry, it may be gradually raised to  $200^{\circ}$  C, and towards the latter stages up to  $220^{\circ}$  C. If the heating has been properly regulated there will be no distillation of empyreumatic products, but the alkaloid sublimes in the cool part of the funnel in a compact coating, cone shaped, of beautifully white silky crystals.

In order to ascertain when the sublimation is complete, the tared funnel may be cooled and weighed at intervals, or a series of tared funnels may be kept on hand, and changed until no more theine is extracted. The funnel as well as the theine, as may be expected, at the end of the process is perfectly dry, and the increase of weight is theine pure and simple.

By the method described I have made numerous determinations of theine, and have afterwards digested the powder remaining, for twenty-four hours in ether, but have failed to obtain any crystalline product; I, therefore, believe that the whole of the alkaloid is sublimed, and that the results with care are accurate.

From 1 to 2 grammes may be considered by some too small a quantity for an accurate assay, and, if so, there is no reason why very much larger weights should not be used, indeed the process is well adapted for working on a large scale, and if there ever should be any great demand for the alkaloid, would probably be employed.

There is yet another micro-chemical test which belongs to pyrology, and that is the presence of manganese in the ash of tea. The ash of a single leaf will give a distinct green manganate of soda bead, and, unfortunately for our purposes, so will the ash of a great many other leaves, but since I have never found any tea leaf without manganese, if

it should happen that a leaf in tea would not respond to this test, I should consider it conclusive evidence of a foreign leaf.

In a short discussion which took place Mr. Hehner said that Mr. Blyth's process had already been adopted on a commercial scale. A very elaborate paper was published two or three years ago on the determination of theine, giving a large number of different processes of theine determinations, and the different results. The safest method was to evaporate the tea-extract with magnesia, and extract with ether or chloroform.

Mr. Jones said if he understood the paper correctly Mr. Blyth took care to use an upright condenser during evaporation of steam, but afterwards evaporated on the open water bath. This seemed to be drawing a very fine line. His opinion was that no chemist would bind himself to swear that a leaf containing no manganese was not tea.

Mr. Wigner said he would. He had examined 600 samples of tea, but had not found one without manganese. He had carefully avoided the determination of theine in criminal cases, as he always had his doubts as to the methods. He thought what Mr. Hehner said about its being used as a commercial process was quite correct. Samples were, he believed, now coming over to this country made in that way.

#### NOTE ON THE COMPOSITION ON MARES' MILK,

By Dr. MUTER.

I WAS recently consulted by the owner of a valuable foal with the view of seeing whether I could account for the cause of a persistent tendency to sickness and vomiting which had attacked the animal. I obtained a sample of the mother's milk and found no signs of pus or other indications of disease, but on analysis it showed:—

Fat	...	...	...	...	...	1.70	per cent.
Sugar	...	...	...	...	...	6.11	"
Casein, &c.	..	...	...	...	...	2.92	"
Ash	...	...	...	...	...	.50	"
						11.23	"

As the milk was far past the colostrum stage, I judged that the sickness must be due to a most abnormally rich secretion, especially in fat. To make the matter certain, I obtained a series of reliable samples of mares' milk, and made analyses of which I found the following to represent the mean:—

Fat	...	...	...	...	...	.50	per cent.
Sugar	...	...	...	...	...	6.74	"
Casein, &c.	...	...	...	...	...	1.67	"
Ash	...	...	...	...	...	.41	"
						9.32	"

Acting on the information thus obtained, the veterinary in charge, by regulating the diet of the mare, succeeded in bringing the milk to its normal condition, and when this was effected, the foal ceased to show the symptoms complained of.

The above analyses are interesting, as proving that mares' milk is normally one of the least rich in fat of the milks secreted by our domestic animals. Its analysis under certain circumstances, is also evidently most important for assisting veterinary surgeons in the judicious treatment of the troubles incident to the infancy of horses. In judging the results of such analysis, the above figures, may, in my opinion, be taken as representing the fair average composition of healthy mares' milk.

## ADULTERATION IN CANADA.

WE have received the Report on the adulteration of Food for the Dominion of Canada, which is the supplement to the Report of the Department for the Inland Revenue for the year 1876. The general results are worse than our returns show to obtain in this country. Thus out of the whole number of samples submitted to the analysts,  $51\frac{1}{2}$  per cent. were adulterated. Pepper and coffee appear to have been particularly bad, for of 19 samples of pepper only 2 were pure, and of 10 samples of coffee only 1 was pure. Perhaps the most noticeable part of the Report, in the present state of things, is that which relates to drugs. We find that of 5 samples of quinine only 1 was genuine, the other 4 being merely potable stimulants, containing only small traces of quinine, but containing a proportion of alcohol as large as is usually found in port or sherry wines. Four sorts of lozenges were, however, found to be composed of ingredients which were fairly represented by the names under which they were sold.

In reference to quinine wine, Dr. Edwards makes the remark that he is not prepared to say the samples were adulterated, inasmuch as they are sold to the public as "nos-trums," and not as "official medicines. We are certainly at a loss to see on what ground he makes this statement.

Three samples of coffee are certainly deserving of a passing notice, for Dr. La Rue reports that they contained only one-eighth of their weight of coffee, the remainder, *i.e.*, seven-eighths, being a mixture of chicory and roasted peas and beans. Six samples of mustard deserve similar notice, as all of them were reported as containing 66 per cent. of wheaten flour, the remainder a mixture of turmeric and mustard. We also read of what seems to us a new adulteration, *viz.*, half ginger and half wheaten flour. This occurs 4 times among the samples of powdered ginge: analysed.

In the tabulated statements of results we notice another unique adulteration, where Mr. Ellis reports a sample of crushed sugar to be adulterated with 10 per cent. of common salt.

## ADULTERATION IN DUBLIN.

WE have received the report of Dr. C. A. Cameron, Medical Officer of Health for the City of Dublin for the past year. We find that the total number of analyses of food made were 975, of which 95, or very nearly 10 per cent. were adulterated; the only adulterated articles were, however, milk, butter milk, coffee and mustard. All the samples of tea, pepper, bread, sweetstuff, soda, arrowroot, and mineral waters, were found to be pure. Dr. Cameron notes one singular instance of adulteration of milk with 90 per cent. of water and 5 per cent. of cane sugar, and it is much to be regretted, that in this case, owing to a technical difficulty, the vendor was not prosecuted. There was one conviction obtained for the sale of rancid butter,—we are glad to see this and hope the same course will be taken in other districts, as the sale of such an article of food certainly constitutes an offence against the Sale of Food and Drugs Act. The total amount of fines and costs during the year was £243. Dr. Cameron goes on, in his

report, to point out the modifications which he considers desirable in the Act, and the defects which he says at present exist in it. He classes the latter as follows:—

1. That magistrates sitting in petty sessions are unable to award more than £1 as costs.

2. The fines imposed when the prosecution is undertaken at the suit of a private person are paid into the imperial exchequer, instead of, as they ought to be, to the local authority, who have to pay the costs of the analysis.

3. That a tradesman is not liable to be fined if his servant refuses to sell an article on the demand of an Inspector, although the tradesman himself may be fined for refusing to serve him.

4. That private persons cannot be permitted to prosecute under sections 6 and 7, without giving notice to the vendor of their intention to have the article purchased analysed.

5. That Section 13 is indefinite and its meaning not clear.

6. That the Inspector cannot prosecute any person who has not sold to *him*—that is, he is unable to take samples of milk from hospitals and other public institutions for the purpose of testing them, but only those samples which he has actually bought from the dealer.

It appears to us that Dr. Cameron and the Dublin police magistrates are certainly labouring under a mistake in reference to No. 3. There have been repeated decisions in London, and we believe also in the country, where a tradesman has been fined because his servant refused to sell to an inspector, and we are inclined to think that if a case were taken to one of the superior Courts, a conviction would be sustained.

We also think Dr. Cameron is mistaken in reference to No. 4. Sections 14 and 15 of the Act certainly prescribe certain formalities in reference to the division of the sample which is purchased, but these formalities are only applicable to the cases in which persons purchase the "article with the intention of submitting the same to analysis." Section 12, which it must be noted is a previous section, states that "any purchaser" of an article of food, "shall be entitled" to have such article analysed, and to receive the certificate of the result of the analysis, and the other sections provide that this certificate shall be evidence, and if the article is adulterated there can be no question that an offence has been committed under the Act. We are, therefore, decidedly of opinion that it is in the power of an independent purchaser who may have been supplied with an article which he afterwards suspects to be adulterated to have it analysed, and if his suspicion turns out correct, to prosecute for it, even though he may not have fulfilled the specific directions contained in sections 14 and 15.

---

#### ESSENTIAL OILS.

DR. E. DAVEY, in a paper read before the Pharmaceutical Society of Ireland, on the 3rd April, suggests the use of a solution of molybdic acid in sulphuric acid, as a test for determining the adulteration of the essential oils, as he finds that most reducing agents and still more markedly, alcohol, when brought in contact with the solution, produces a deep azure blue colouration. According to his experiments the pure oils are apt to



produce this colouration under some circumstances, but by washing the oil in the first instance with water, and running off the wash-water after subsiding from the pipette, and allowing a few drops of this water to fall into a capsule containing a little quantity of sulpho-molybdic acid slightly warmed, the blue colour would be immediately apparent if any alcohol were present. In the case of oils which are heavier than water Dr. Davey suggests an addition of a little sulphate of sodium, so as to make the aqueous solution heavier than the oil.

#### THE PRESENCE OF AMMONIA IN SUB-NITRATE OF BISMUTH.

*Pharmaceutical Journal, 21st April, 1877.*

MR. W. G. Piper draws attention to the fact that small quantities of ammonia are very frequently present in sub-nitrate of bismuth of commerce. He has determined the proportion in four different cases and found it to amount to  $\cdot 06$  per cent.,  $\cdot 05$  per cent.,  $\cdot 008$  per cent., and  $\cdot 076$  per cent. In order to determine the source of it he prepared some sub-nitrate of bismuth according to the pharmacopœia directions, and found that decomposition of the nitric acid took place, and that a certain amount of ammonia was among the products formed, so that in the solution decanted from the first precipitate he found  $\cdot 6$  per cent. of ammonia. It follows from this that much of the ammonia formed is removed by the wash-waters, but at the same time the bismuth still retains an undue proportion; the better the sample is washed the less ammonia it contains.

---

#### AIR ANALYSIS.

THE Health Committee of Glasgow seem to be going rather ahead of the Sanitary Boards of other cities, and we think very wisely so. They are carrying on continuous observations, at different stations in the city, on the variations in the composition of the air, and have expended a considerable sum of money in fitting up a laboratory in order to determine the variations which occur from time to time in the composition of the atmosphere itself, and the character of the floating particles which are present in it. The Committee certainly deserve the utmost credit for taking a step so far in advance of any which has been taken by any ordinary public body.

---

#### HUMAN HAIR.

DR. Erasmus Wilson has been engaged in an investigation of the number of hairs contained in a square inch of the surface of the human head. He estimates that each square inch contains 744 hair follicles, and that as a large number of these give passage to two hairs, the number on a square inch may probably be estimated at about 1,066, and the superficial area of the head being about 120 square inches, this equals about 133,920 hairs for the entire head.

## ANALYSTS' REPORTS.

**SOUTHWARK.**—Dr. Vinen, one of the analysts for Southwark, has reported to the St. Olave's District Board of Works, that during the six months ending March 20, twelve samples of coffee and six of milk were received from the inspector of the district for analysis. All the samples of coffee were found to be genuine. Four of the samples of milk were genuine, but varied in quality. One sample was found to contain 10 per cent. of added water, and one was adulterated with 25 per cent. of added water, and deprived of 40 per cent. of cream. As this was found to have been sold by mistake, he did not recommend that any proceedings be taken, but another quantity would be obtained. He considered the Act had had a deterrent effect, and mentioned with respect to coffee, that on the last examination of samples of that article, two of the sellers were fined for selling it adulterated to the extent of 50 per cent. The samples now obtained from the same vendors were found to be genuine. In the case of the milks, five out of six shopkeepers now reported upon had been fined for large adulterations with water. Three of the samples were now found to be genuine, and two were rich in quality. The chairman of the Board (Mr. G. L. Shand) said that on the whole the report was a satisfactory one, and moved that it be printed in the annual report. This was seconded and agreed to.—*Grocer.*

**CAMBERWELL.**—Dr. Bernays has reported as follows:—Since Christmas last I have examined 30 samples of milk. Of these 30 samples, 10 were distinctly adulterated with water, and I have furnished our inspectors with certificates to that effect. It has been proved to the satisfaction of one of the magistrates presiding at Lambeth, that the milks were delivered in the adulterated state by the wholesale dealer. Now, this is a more serious offence than when milk is mixed with London tap-water, as the quality of the water in the country is often deleterious, and the magistrates thus considered it by imposing a fine of £10, and £2 14s. 6d. costs. In addition to the 33·3 per cent. of milks adulterated with water, No. 234 was a skimmed milk, and I gave a certificate to that effect. I find *the estimation of the ash in milk* to be more and more a necessity, *and although I am the only analyst in London who imposes this necessity upon himself*, and although this estimation is the most troublesome portion of the analysis, I shall continue the practice. In conclusion of the subject of milk, I must be allowed to observe that many of the milks, say nearly one half, were of admirable character and above all suspicion. Next to milk, butters have engaged attention. Since your vestry has given directions not to purchase the cheap butters, I have not had an adulterated butter. The seven butters brought to me were salt, of fair quality, and not admixed with fat other than butter-fat. I have also analysed lards. One of them was very good; the other good until melted, when the smell was very unpleasant. Nevertheless, it was not adulterated. Of a pickled cabbage I have nothing to say beyond the fact that the vinegar was very weak, but otherwise free from all contamination. As to fermented liquors, I have examined six samples: "two beers" and "four porters." As to alcoholic contents they are very much alike, varying only between 7·21 per cent. and 8·91 per cent. of proof-spirit. And also in this they are very much alike—they contain so little hops. I have examined two gins, one rum, one brandy, and one whisky. With reference to alcohol, they may be thus arranged, meaning by alcohol proof-spirit:—No. 243, gin, 69·89 per cent.; 280, gin, 75·51; 275, brandy, 85·38; 276, rum, 88·12; 274, whisky, 92·24. Whether the alcoholic contents of spirits should not be stated by the publicans, by placing a conspicuous mark upon them, is a matter I would venture to press upon your consideration. A whisky like that of 274, although of very good quality, should be labelled "poison," unless mixed with water, and would, taken internally, readily account for the maddening and murderous effects of such drinks. You will not consider these remarks beyond my province, as it is my belief, founded upon knowledge, that we have at present very little idea of the quality of the spirits sold in different houses, and I should regard it as a favour to myself if you would allow specimens to be taken at night, and by different agencies, and on the same night. You would then have a better understanding of the danger to which society is subject, and might assist the Government by supplying facts upon which legislation might be based. In several parts of the kingdom publicans have been fined for selling spirits below a certain alcoholic strength; but, as long as the strength is not fixed, I should never consider it my duty to furnish an inspector with a certificate of prosecution.—*Metropolitan.*

**MARYLEBONE.**—Dr. Whitmore has reported as follows:—"The articles consisted of twenty samples of milk, nine of mustard, four of butter, four of arrowroot, three each of coffee, tea, oatmeal, and cayenne pepper, and one of preserved apples in tins. Of the samples of milk, four were diluted with water, the quantity added varying from 20 to 34 per cent., and two had been skimmed; in three of the cases the vendors have been prosecuted and fined. All the samples of raustrard were genuine. Two of the samples of butter were found to have been adulterated with animal fat; in one instance to the extent of about 80 per cent., in the other 20 per cent. Summonses have been taken out against the vendors in both of these cases, but they have not yet been heard. The samples of arrowroot, were, with one exception, genuine; in the excepted sample potato starch was found. The samples of coffee and tea were all genuine; every sample of the latter contained its full average quantity of extractive matter. No foreign starches were contained

in the samples of oatmeal. The samples of cayenne pepper were all apparently unadulterated. Of the fifty samples of articles of food analysed by me during the past three months about 18 per cent. were more or less adulterated, either by the addition of something less expensive than the article itself, whereby its weight and bulk was increased, or by the abstraction of one or more of its constituents. Milk still continues to be the one article of food above all others that is most frequently adulterated, and unless greater facilities are afforded than the Act of Parliament at present gives for obtaining convictions against those who are primarily responsible for the fraud—I mean the owners of country dairies—the adulteration of this article is likely to continue. With regard to adulterated butters, it is to be regretted that they are sold as butter, and not under a name suggestive of their true composition, as it is certain that most of those compounds into which the fresh fat of mutton or beef largely enters are far more agreeable to the taste and infinitely more wholesome than very many cheap butters, which are, no doubt, genuine, but which are also disgustingly strong and rancid." The report was ordered to be printed.—*Metropolitan*.

**SOUTH STAFFORDSHIRE.**—We give below the following statistics, which Mr. Jones has reported on the number of samples of food, drinks, and drugs, which were submitted during the last quarter, together with the result of his analyses:—

Number of Samples submitted.	Number Examined.	Number Genuine.	Number Adulterated.
District A.....	20	...	...
District C.....	105	...	27
From last quarter .....	1	...	...

Percentage of the samples examined found adulterated, 21·42.

Samples of	Number.	Genuine.	Adultd.	General character of the adulteration.
Arrowroot.....	1	1	0	
Bread .....	22	19	3	with alum 23·51, 34·92, and 27·66 grains respectively per 4-lb. loaf.
Butter .....	23	23	0	
Coffee .....	6	5	1	with 48 per cent. chicory.
Flour .....	3	3	0	
Ginger .....	1	1	0	
Gin .....	4	1	3	none injuriously; simply undue dilution, being 44·8, 44·6, & 44·2 u.p. respectively.
Lard.....	7	7	0	
Mustard .....	2	2	0	
Milk .....	22	17	5	with 13, 18, 17, 13 per cent. added water.
Oatmeal .....	25	12	13	with barley-meal 20, 21, 28, 24, 20, 24, 20, 24, 26, 24, 20, 26, 21 per cent.
Sulphur precipitated .....	3	1	2	contaminated with hydrated sulphate of lime 59·01 & 62·09 per cent. respectively.
Tea .....	7	7	0	

## CORRESPONDENCE.

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

### MILK ANALYSIS.

TO THE EDITOR OF "THE ANALYST."

SIR,—In reference to the disputed milk case which I wrote about in last month's ANALYST, allow me to send the following extract from the minutes of the proceedings of the General Health Committee, held 10th May, 1877.

**BOROUGH OF SALFORD,**

Mr. J. Carter Bell, the Public Analyst for the Borough, brought under the notice of the Committee the circumstances attending the case of John Blackwell, which was heard before the Borough Bench, on the 29th March, for milk adulteration, and stated that a second sample of milk was submitted in evidence by the defendant, who swore it was part of the first sample analysed by Mr. Bell, and declared by him to be adulterated to the extent of 11 per cent. of water. Part of this second sample of milk Mr. Bell had pronounced pure, but he averred it was not the same milk as the first sample. In consequence of the conflict of evidence upon the point the Bench dismissed the case.

In the meantime a portion of the first sample was submitted by Dr. Tatham to Mr. J. Alfred Wanklyn, Analytical Chemist of London, who reported the milk as not having been skimmed, and as not being adulterated with water.

Mr. Bell, however, proved to the Committee that taking the figures of Mr. Wanklyn's analysis, and comparing them with the standards published in Mr. Wanklyn's own book on milk analyses, the adulteration of the milk with water to the extent of 11 per cent. was indisputable.

Mr. Bell had further written to 18 eminent Analytical Chemists in different parts of the country, sending them the figures of Mr. Wanklyn's analysis, and asking them if, taking these figures as correct, the milk was in their judgment adulterated.

Mr. Bell submitted to the Committee the letters received in reply from these gentlemen, who one and all pronounced in favour of Mr. Bell and corroborated his analysis.

The Committee having considered the whole case, it was resolved—

“That this Committee desires to record its unabated confidence in Mr. J. Carter Bell as an Analytical Chemist, and after a full investigation into the facts of Blackwell's case, is satisfied Mr. Bell has proved by abundant and most influential testimony that his analysis of the milk in question was correct.”

Mr. Wanklyn has not yet replied to my two letters which I addressed to him on the subject.

Yours, &c.,

J. CARTER BELL.

#### ORGANIZATION AMONGST CHEMISTS.

TO THE EDITOR OF “THE ANALYST.”

SIR,—I should be very glad if you would use your influence to get this organization scheme worked into a shape which would be generally acceptable to chemists. Although some of your correspondents have pointed out what they consider errors of management on the part of the promoters, yet some such scheme is just what is required to put a stop to the under bidding and working for inadequate fees, which is now so common among chemists. If I cannot honestly and properly analyse a sample of milk for less than 21s., how can I expect to carry on my business when my competitor offers to do the same thing for 10s. 6d., or less.

I do trust it is not yet too late for the promoters to so re-model the scheme that there will be no difficulty in getting every chemist to join in it.

I am, &c.,

A WELL-WISHER TO ORGANIZATION.

TO THE EDITOR OF “THE ANALYST.”

SIR,—Dr. Bartlett's letter is all very well in theory. I quite agree with him that every one should put their names to letters in order to carry due weight, but if Dr. Bartlett, instead of having happily dropped into a London practice, had unhappily dropped into one in a country town, where there is only work enough for two analysts, and where the irresistible tendency of myself and my opponent is to cut down one another's fees, perhaps he would have felt how difficult it is to sign a communication on such a subject with one's own autograph.

Competition in London is a trifle compared with competition in the country, where there are only one or two opponents, and if your opponent happens to be rather more favoured by the Organization Committee than yourself, it will scarcely do to sign your name and injure your prospects.

The whole thing seems to me to come to this—a Trades' Union is wanted, but it is not the part of any score of men, however well qualified they may be, to found this Organization, and even seek to register it as a joint stock company, until they ask everyone to join and give their views on the matter. I wish I could put my name, but as it is must simply sign myself,

Yours, &c.,

ONE WHO LIVES BY CHEMISTRY.

TO THE EDITOR OF “THE ANALYST.”

SIR,—I have just heard a rumour that the promoters of this scheme have, to some extent, altered their views and plans on the subject. I don't know whether this is due to the letters which have recently appeared in your pages, but as this reported change of purpose is in accordance with a suggestion I made in my previous letter, I shall be only too glad if the rumour turns out true. It is said the committee intend to invite all analysts in practice to join the organization. They have, therefore, only to take the other step I suggested, viz. :—to issue a public notice by advertisement, either in your own journal or the *Chemical News*, and invite all practising Analysts in England to a meeting on the matter.

We certainly ought to have some combination, and if this committee cannot succeed in forming one, some other steps will have to be taken. Let them be guided by an opinion which has been pretty widely expressed, and which, as far as I can judge, is the opinion of three out of four Analysts in England, and let the thing be above board, and then it will be accomplished.

I remain, &c.,

A PROFESSIONAL CHEMIST.

### THE CHEMICAL SOCIETY.

TO THE EDITOR OF "THE ANALYST."

SIR,—A few days ago I received a notice of an extraordinary meeting of the Chemical Society, and it has since come to my knowledge that a resolution will be then proposed, which, it appears to me, is of a very strange character. I do not pretend to have such special knowledge in reference to the affairs of the Society as Mr. Tribe has, because I am one of the Fellows who are very seldom able to attend, but all I can say is, that if his resolution is accepted by the Society, and only twenty Fellows are to be elected annually, the Society will, in the course of a little less than ten years, find itself in bankruptcy. If any of the Fellows will take the trouble to refer to the President's exhaustive address at the annual meeting in March last, they will see that the Society has lost during the year by deaths, removals and resignations, thirty members. It is hardly necessary to say that if only twenty new ones are to be elected each year, as the general age of the Fellows will increase, the number of losses by death will also increase, and if any such resolution as that proposed were adopted, we should find the Society by the year 1887 numbering about 760 members, instead of the 1,000 or 1,100 it ought to do.

The actual loss to the Society may be taken in another way. Last year, thanks to a clique, who, according to the learned President's address, never at any meeting numbered more than eight or nine, the number of new members elected was reduced from 103 in the previous year to 65 last year. Accepting, however, the latter figures for the purpose of comparison, and assuming that no increase would, under ordinary circumstances, take place, the loss to the Society would for the first year be £283, for the second year £378, and in ten years £7,087, or an average of £709 per annum. I am no accountant, but I think it needs little more than a glance at the accounts which appear on page 529 of the Society's Journal to see what the result of this must be.

In plain words our privileges, which are already curtailed by the supply of the Royal Society's proceedings being stopped, will then amount to three barren letters after our names and nothing more.

Perhaps this letter is too late to do any real good, but I should not feel justified if I had not raised my warning voice.

Although probably your next number may be published after the meeting has taken place, I nevertheless send it to you in the hope that you will find space for it. I must, however, express my opinion that no such proposition as that alluded to would ever have emanated from the Council, and I would rather call upon the latter to oppose the operations of outsiders when they tend to injure the Society.

Your obedient Servant,

GAMMA.

### LAW REPORTS.

At Liverpool, Messrs. Maughan & Thompson were summoned for selling preserved green peas which had been coloured with copper, Dr. Campbell Brown's certificate stated that the peas contained from 2 to 2½ grs. of crystallized sulphate of copper per tin, and that this amount was equal to half an emetic dose. The defendants' solicitor produced a warranty certifying the peas to be perfectly pure and unadulterated, and on this warranty, Mr. Raffles, the stipendary magistrate, dismissed the summons. On the application of the solicitor for the prosecution the warranty was impounded.

At Garston, near Liverpool, a grocer was summoned for selling mustard, Dr. Brown certified to 25 per cent. of farina, and a fine of 2s. 6d. was imposed.

At Dudley, two grocers were charged with selling adulterated oatmeal, Mr. Jones, the County Analyst, had certified that one sample contained 20 per cent. of barley meal, and the other sample 24 per cent. of barley meal. The defendants were fined 40s. each.

At Coleshill, a sausage manufacturer was charged with selling sausages adulterated with a large percentage of bread. The defence was that the analyst's certificate did not state the percentage of bread, and also that bread is a necessary ingredient in the manufacture of sausages. The case was dismissed.

At the Thames Police Court, a man has been summoned for having in his possession methylated spirit capable of being used as a beverage and as a medicine. The defendant said he purchased the spirit and reduced it with water, sugar, and aniseed, and drank it himself, as he could not afford to buy spirits at a public house. This seems to confirm what we thought was an exploded statement that methylated spirit is in some cases used as a drink.

At Horsley, a grocer was charged with selling adulterated butter, the certificate of the analyst, Mr. Horsley, showed that it contained 20 per cent. of foreign fats; the defendant was fined 1s. and 21s. 3d. costs.

At Cardiff, a grocer was charged with selling adulterated green tea. The certificate of Mr. Thomas stated that it was an inferior sample of damaged black and green tea mixed with tea dust, 48·7 per cent. of it passing through a sieve of wire gauze, having 100 meshes to the square inch. The magistrates, in consideration of the excellent character which the defendant as a tradesman bore, said they would fine him 6s.

At Shoreditch, a baker has been summoned for selling bread adulterated with alum in the proportion of 20 gr. per 4-lb. loaf, and for some reason best known to the authorities the manager of his business was summoned at the same time. The magistrate appears to have thought both persons were guilty, as he fined the master 40s. and costs, and the manager 20s. and costs.

At Liverpool, two persons were summoned for selling confectionery adulterated with chromate of lead, amounting to 1 gr. per sweetmeat—the sweetmeats appearing to have been in the form of sugar oranges. The defendant was fined 20s. and costs.

**ADULTERATED DRUGS.**—At the Sheffield Town Hall, on 17th May, J. H. D. Jenkinson, a chemist and druggist was charged with selling adulterated drugs. Some jalap was purchased at one of the defendant's shops on the 27th ult., and a pennyworth of it administered to two valuable coursing dogs, who died within ten minutes. Some more of the medicine was sent for, and on analysis was found to contain sufficient nux vomica or strychnine to cause immediate death to any person who took it. It was stated for the defendant that the nux vomica was mixed in the jalap by misadventure, and that the owner of the dogs had brought an action against the defendant for damages for £30. The Bench, taking this statement into consideration, imposed a mitigated penalty of £2 and costs.—*Times*.

**PRESERVED PEAS.**—Thomas Pincham and William Beverley appeared at Wandsworth police court to answer adjourned summonses for selling tins of preserved peas mixed with copper, so as to render the same injurious to health. Mr. Corsellis, clerk of the Wandsworth Board of Works, supported the summonses; Mr. Campbell appeared for Mr. Beverley. The summonses had been adjourned, as the magistrate was not satisfied with the form of the certificate from the Analyst, as it did not state that the amount of copper was dangerous to health. Dr. Muter, public analyst to the Wandsworth district, now attended, and in the case of Mr. Pincham, said that the quantity was sufficient to be dangerous, especially if accumulative. Mr. Corsellis stated that the board did not wish to press the case, their only object being to put a stop to the sale. The defendant urged that he had withdrawn the sale. Mr. Campbell contended that 1½ grains in a tin was not sufficient to be injurious to health, and read the certificate of Professor Attfield, who had analysed a certain number of tins of preserved peas from the importers, stating that copper might be taken in small doses as a tonic, and quoting *Periera* to that effect. Mr. Bridge remarked that the same thing might be said of *strychnia*, which, in small doses, was an excellent tonic. Dr. Muter referred to other cases in point, and said several well-known scientific men had given an opinion that this copper was injurious to health. Mr. Campbell wished for an opportunity to call witnesses. Dr. Muter said that they might obtain any number of witnesses on either side. The question turned upon the theory of what amount of copper would kill after a certain time. Mr. Campbell said he should like to have the question finally settled, for at present the importers did not know what to do. Before the Act was passed not any mixture was allowed, now an infinitesimal part was permitted, and the question was whether it was exceeded. Mr. Bridge said an adjournment would only lead to a settlement of the case before him. He suggested that the defendant (Mr. Beverley) should submit to a conviction, and appeal. Mr. Campbell having consulted with the parties, accepted the suggestion, and said they wished to have the case settled, as at present they did not know what course to take. Mr. Bridge then fined each defendant £1, and 12s. 6d. costs, and fixed the amount of sureties in Mr. Beverley's case, himself in £100 and two bail in £100 each, in case the appeal was prosecuted.

**WARRANTY OF ADULTERATED BUTTER.**—A further report was recently submitted from the Hackney Sanitary Committee stating that the Inspector, Mr. Watts, took out a summons against a person in the High Street, Kingsland. The Inspector went and asked for half-a-pound of butter, and paid for it, and on informing the vendor the purpose for which he had purchased it, his attention was called to the following words stencilled on a paper enveloping the article, namely—"Notice. This compound is warranted sold as imported, and declared according to the Act, section 8." The article sold having been found on analysis to contain 33 per cent. of butter fat, 45 per cent. foreign fat, with 22 per cent. of water, salt and curd, the summons was taken out to obtain a decision on the validity of the notice, especially as the analyst believed that the fat could not be added for any other purpose than fraudulently to increase the weight and bulk of the butter. On the hearing, Mr. Bushby decided that the declaration printed on the paper protected the vendor and dismissed the summons. This was an important decision, and the committee thought it right to submit

the question for the consideration of the Board, as unless the Board thought it advisable further to contest the question, no summons would in future be taken out by the inspector in similar cases unless the analyst would certify that such mixtures or compounds were injurious to health. If the Board thought a higher judicial decision should be obtained, a further summons would be taken out, as the magistrate was prepared to grant a case. After discussion, it was resolved by 14 against 9 to refer the question to the Clerk, for consideration as to whether a fresh summons should be issued to try the point of law in a higher court. Dr. Tripe submitted his quarterly report as analyst of the district, but it contained nothing of special interest beyond the fact that he had analysed 30 samples of food, 29 of which were received from the inspector.

---

## NOTES OF THE MONTH.

WE print a communication from Mr. Carter Bell, giving the conclusion of his disputed milk case. No one who has followed the history of the affair, will fail to give Mr. Bell his sympathy. It is surely somewhat remarkable that the person who first brought out the standard of 9.3 per cent. solids not fat, and afterwards opposed in our Society the lowering of it to 9.0 per cent., should be the very man to go against that standard, on the poor excuse of an ash of .64 per cent., which does not even seem to have been examined for possible, and indeed probable, mineral additions, although the use of boracic acid is so common in the milk trade; but alas, *tempora mutantur et nos mutantur in illis*.

---

We observe in the *Sanitary Record*, the details of a process for the valuation of the amount of proteine in vegetable articles of diet, such as flour. It is simply the extension of the well-known albumenoid ammonia process for water, to a mixture of flour and water. The author holds that the amount of ammonia generated from the vegetable albumenous bodies is constant, but he only claims for his process a "*fair approximation*." The importance claimed for the process as distinguishing between flour and starch (arrowroot) by the small per centage of ammonia yielded by the latter, would scarcely be recognised by any analyst expert with the microscope. To give confidence to chemists, the author would have done better if he had detailed the experiments by which he is enabled to "warrant a parallel statement in the case of vegetable proteine," to that he had already made as to animal albumen when proposing his water process. Until we can obtain a method of actual estimation we shall prefer to stick to the present system of combustion.

---

Dr. Mills' Colorimeter is, in its way, a useful instrument, and, as such, received a due notice at our hands when it was first brought out. We now, however, observe that in his paper, the author points out its "*use*" for milk, which, we think, is a pity, as for this purpose it must be really worthless. It is quite possible that, using the same milk, a good approximate guess might be made as to the quantity of water that had been purposely added for illustrating the use of the instrument, but before any real application of the article to the detection of adulteration is attempted, it would be necessary to ensure the presence of a constant number of suspended fat globules in any given bulk of natural milk. Unfortunately we have enough difficulty to persuade some investigators that the standard of 9 per cent. "solids not fat" is fairly constant without trying to work upon so self-evidently bad a conclusion as that the fat is also uniform.

We are sorry that we cannot agree with the remark made by the Chairman of the St. Olave's District Board, as to the satisfactory nature of the Analyst's report, if the paragraph which we reprint from the *Grocer* be correct. Surely something more was contemplated by the legislature than the analysis of 12 samples of coffee, and 6 of milk, during a period of six months, in a populous and poor district of the Metropolis. We hold that Inspectors, to properly perform their duties, should obtain at least one sample per diem, and should, as far as possible, not run upon any one article, but should vary their purchases so as to give every trade a fair share of inspection. Up to the present the milkmen and grocers have had far too great a share of attention, and the other trades who deal in articles of food, drink, and drugs have been neglected, except in some few districts. No doubt this is to a great extent owing to the Analysts having no control whatever over the Inspectors, but we hold that, where an Analyst cannot help noticing that the inspection is not sufficiently extended, he should inform his local board of the fact in his quarterly report. Another point in Dr. Vinen's report, which does not seem to us satisfactory, is that he says, in some cases "he did not recommend that any proceedings be taken." This is quite stepping out of his functions as an Analyst, and he has no right under the Act to "recommend" either one way or the other. It is through such expressions that the public are induced to believe the statements of the persons interested in supporting adulteration, who always try to throw the blame of all proceedings on the Analyst, and represent him as a public informer, so as to prejudice unthinking persons against the Acts regulating the Sale of Food. It cannot be too often repeated that the Public Analyst has no interest whatever in prosecutions, and has no power to either institute or prevent them.

---

The *Pharmaceutical Journal* waxes facetious over the head of some recent prosecutions for copper and chromate of lead in articles of food, saying it is sad to think how persistently the public will continue to demand poisonous articles in spite of the efforts of the Analysts. We were not aware that Analysts were charged with any necessity to make such efforts, and we have always thought that it was the inspectors appointed under the act who looked after the public interests in this matter. We at last fancy we see the meaning of the word "competent" as applied to Public Analysts by the various secret opponents of the present food legislation, viz.: that the "competent" analyst is one who shall shut his eyes entirely, and simply pass over anything found in food short of Strychnia or Prussic acid. It should also be noticed that an ignorant cook or a small child preferring bright green peas and bright yellow sweets, respectively, and buying them when temptingly advertised or exposed for sale, constitutes a persistent demand on the part of the public for poisons, which, if it cannot be openly encouraged in words in a respectable journal, can be secretly supported by attempting to laugh down those who are "incompetent" enough to do their duty.

---

We reprint from the *Times* the report of some proceedings at Sheffield, headed "Adulterated Drugs," which resulted in a druggist being fined £2, for selling jalap mixed with nux vomica. We should suppose that the defence of misadventure set up in the case was true, as the mixture is one which no trader would, we



fancy, deliberately make use of. The occurrence is, however, worth a passing note, seeing that the calling in of the "incompetent analyst," and consequent elucidation of the nature of the jalap, probably resulted, in this instance, in the saving of several human lives. One of our special trade friends, the *Chemist and Druggist*, gave prominence last month to the opinion of the pre-eminently eminent scientific gentleman who conducts the "corner for students," that the aspirants for the prizes offered by the journal had failed so miserably in detecting a mixture of ammonia and potash alum, that even "public analysts could scarcely have done worse." We experience an intense feeling of relief, after such an awful utterance of this Daniel come to judgment, when we find one analyst who can admittedly detect nux vomica in jalap. However, let us not be too sanguine because who knows but what the nux vomica was never there at all, and that the dogs deliberately went and bought strychnia, and thus committed suicide, incited thereunto by the analysts, just to spite the drug trade! We trust, in writing this note, we shall not be understood to advance the absurd proposition that the sacrifice of a few miserable canine, or even human, lives could ever justify the prosecution of a member of the trade over which the *Chemist and Druggist* deigns to throw the light of its protective countenance, and so we may, perhaps, as yet be spared the use of the "padded room," announced in the same journal as being in preparation for the meetings of the Society of Public Analysts. If, however, we lived in Sheffield, where such misadventures may occur at the easy price of £2, we should, when offered a pennyworth of jalap, say, with Macbeth, "throw physic to the dogs, I'll none of it."

---

Dr. Bernays' report, reprinted on another page, contains a most remarkable statement; if it is correctly quoted in the *Metropolitan*, he says, "I find the estimation of the ash in milk to be more and more a necessity, and although I am the only Analyst who imposes this necessity upon himself, and although this estimation is the most troublesome part of the analysis, I shall continue the practice." We feel that we should not be doing our duty if we allowed such a statement as this to pass unchallenged. The estimation of the ash in milk has *always* been a necessity, and we certainly cannot see in what way it becomes more and more so, unless it be that Dr. Bernays suggests, or intends to suggest, that borax and carbonate of soda are used more frequently than they used to be. We must also dissent most emphatically from Dr. Bernays' statement that he is the only Analyst in London who imposes upon himself the necessity of estimating the ash in milk, and until now we were not aware that the taking of an ash was the most difficult part of a milk analysis. However, we live and learn, and are always thankful to receive information.

---

The recent prosecutions for selling American Hams, wrapped in canvas which was colored with chromate of lead, although unsuccessful, appear to have borne good fruit, as the *Grocer* of the 26th May publishes a letter from Messrs. F. A. Ferris & Co., of New York, in which they state that they are "under the conviction that the public will now demand the entire abolition of the use of chromates," and have "decided to abandon the use of colouring matter altogether in canvassing their trade mark hams and breakfast bacon, unless their dealers specifically order to the contrary."

## RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
328	A. M. Clark ... ..	Evaporating Saccharine Juices ... ..	4d.
3429	R. C. Richards ... ..	Uterine Appliances ... ..	4d.
3593	B. Hunt ... ..	Preserving Food ... ..	10d.
3670	C. A. Faure ... ..	Thermo-electric Generators and Electro-motors ... ..	6d.
3703	J. M. Richards ... ..	Apparatus for perforating Pills ... ..	6d.
3719	G. D. Mease ... ..	Steam-power Furnaces for manufacture of Sulphate of Soda and Potash ... ..	4d.
3731	J. B. Orr ... ..	Treatment of Textile Fabrics printed or dyed with Aniline black ... ..	2d.
3743	J. Mc Kendrick and H. W. Ball	Distilling Water ... ..	6d.
3756	F. Wirth ... ..	Treating spent Oxide of Iron to obtain Sulphur and Prussian Blue ... ..	4d.
3759	W. and J. Garroway ... ..	Refining Mineral and other Oils ... ..	2d.
3778	R. Goundry ... ..	Treating Coffee ... ..	2d.
3782	J. L. Pulvermacher ... ..	Appliances for Generating and Applying Electricity ... ..	8d.
3843	J. J. Sachs ... ..	Treating Animal and Vegetable Substances for Impregnation or Exhaustion ... ..	2d.
3849	W. P. Tilton ... ..	Preparing Matters for purifying Syrups, Oils, &c. ... ..	4d.
3894	W. Young, A. Neilson & A. Young	Destructive Distillation of Bituminous Substances ... ..	6d.
3902	M. Lyons ... ..	Medicated Sweetmeats ... ..	2d.
3931	G. Buchanan ... ..	Fibrous Material to be used for Paper Pulp ... ..	2d.
3945	A. L. Briggs ... ..	Preparing Cotton and other Fibrous Substances ... ..	4d.
3949	E. Brook and A. Wilson ... ..	Apparatus for making Gas ... ..	6d.
3965	J. Steel ... ..	Apparatus for Purifying and Condensing Gas ... ..	6d.
3970	R. Kemp ... ..	Microscopes ... ..	6d.
3993	W. Webster, Jun. ... ..	Applying Endosmose Action to Apparatus for detecting presence of Hydrogenous Gases in Mines, &c. ... ..	6d.
4002	J. R. Penning ... ..	Pressure Gauges ... ..	2d.
4021	T. Barrow ... ..	Apparatus for consuming Smoke and condensing Gases and noxious Vapours ... ..	2d.
4048	G. E. Davis and J. B. Aitken ... ..	Treatment of Phosphate of Alumina, &c. ... ..	4d.
4054	R. J. Hutchings ... ..	Revivifying Spent Acid, &c., used for Pickling Metal Plates ... ..	2d.
4069	H. W. Walker & T. L. Patterson	Treating and utilizing Residual Liquids obtained in manufacturing or refining Sugar ... ..	4d.
4107	A. Sauvée ... ..	Treatment of Ozokerit ... ..	4d.
4126	A. M. Clark ... ..	Spray-producing Apparatus for use in Decomposing Water for Fuel ... ..	2d.
4153	J. Cole ... ..	Magnetic Apparatus for curative and remedial purposes ... ..	4d.
4553	E. Schering ... ..	Manufacture of Salycilic Acid ... ..	8d.

## BOOKS, &amp;c., RECEIVED.

The Miller; The American Chemist; The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Anti-Adulteration Review; Report on Food Adulteration, Ottawa.

Mr. W. Morgan, Ph.D., Analyst for Swansea, has been appointed Public Analyst for the County of Carmarthen.

A Contractor in the Russian Army was detected in adulterating flour; he was tried and shot within 24 hours. This is an adulteration act short and effective.

# THE ANALYST.

---

## SOCIETY OF PUBLIC ANALYSTS.

*An Ordinary Meeting was held on the 14th June, 1877, at Burlington House, Piccadilly.*

THE President, Dr. Dupré, F.R.S., in the chair.

The minutes of the previous meeting were read and confirmed.

The scrutineers appointed to examine the ballot papers reported that Dr. James Mitchell Milne, of Glasgow, Public Analyst for Kinning Park and Dunfermline, and Mr. Wm. Mogforde Hamlet, of King's Lynn, Public Analyst for that Borough, had been unanimously elected members of the Society.

Mr. A. H. Allen, F.C.S., read a paper "On some points in the Analysis of Potable Waters," and a discussion ensued, in which Mr. Heisch, Mr. E. W. T. Jones, Dr. Muter, and Dr. Dupré took part, and Mr. Allen replied.

Professor A. H. Church, M.A., read a paper "On some recent Butter Cases at Cheltenham," and copies of correspondence which had appeared in the local newspapers were circulated amongst the members present. A long discussion then took place, in which most of the members joined, and it was ultimately proposed by Dr. Muter, seconded by Mr. E. W. T. Jones, and unanimously resolved

"That this Society having heard Professor Church's remarks, and also reviewed the correspondence which has appeared in the *Cheltenham Examiner* and *Cheltenham Telegraph*, considers Professor Church to be perfectly justified in his stated opinion by the figures of his analyses."

A short note by Mr. Carter Bell, "On a very hard Water used in the Manufacture of Vinegar," was also read.

Dr. Muter's paper "On Oleic Acid," and Mr. Wigner's paper "On the Sale of Food and Drugs Act," were again postponed, as was also a paper by Mr. W. Thomson, "On the incongruity of the mode generally adopted of stating the results of Milk Analyses."

---

In connection with the above resolution we are requested by the Secretaries to state that they have received an intimation from Mr. Horsley that he withdraws from the Society of Public Analysts.

---

## BUTTER PROSECUTIONS AT CHELTENHAM.

BY A. H. CHURCH, M.A., &c.

*Read before the Society of Public Analysts, on 13th June, 1877.*

ON Monday, the 28th May, four cases of alleged adulteration of butter came before the magistrates at Cheltenham. The following account of the proceedings in court is condensed from the *Cheltenham Chronicle*, of May 29th, and the *Cheltenham Examiner* of May 30th.

In the first case, that of the butter bought of Mr. W. Goodhall, Mr. Horsley's certificate stated that the sample was adulterated with foreign fatty matter to the extent of 16 per cent., and with water 24 per cent.; and that butter to be genuine ought not to contain foreign fatty matter, nor more than 8 per cent. of water. In cross examination for the defence, Mr. Horsley stated that "he knew Professor Church, of Cirencester, but he knew nothing about butter, while he (Mr. Horsley) had studied the

question when he was at Cork, at an establishment there. He knew Professor Bell, at Somerset House, and also Professor Culver (?), but they neither of them knew anything about this subject.

The maker of the butter, Mrs. Baker, wife of a veterinary surgeon of Cheltenham, proved the genuineness of the article supplied to W. Goodhall, her dairy woman corroborating her testimony.

Professor Church was then called for the defence. He proved the due receipt of the sample, sealed with the police seal, and gave the results of his analyses. He found in the fatty part of the butter 88.94 per cent. of insoluble fatty acids, and 4.75 per cent. of soluble acids. In the butter itself he found 11.14 per cent. of water, and 1.13 per cent. of salt, fair amounts for fresh butter. He had no means of knowing on which side he was to be called. In answer to Mr. Horsley, Mr. Church said that the use of solvents as the method for the analysis of butter was one no longer recognized by other chemists, and was, he believed, peculiar to Mr. Horsley; no implicit reliance could be placed upon it.

In the face of the conflicting chemical evidence, the magistrates dismissed the case.

Of the other cases the next referred to was that in which Mr. Grice was defendant. Mr. Horsley's certificate was put in by the superintendent of police. It showed:—

Real Butter	...	...	...	...	75 per cent.
Foreign Fatty Matter	...	...	...	...	3 "
Salt and Curd	...	...	...	...	5 "
Water	...	...	...	...	17 "

This butter was condemned as adulterated to the extent of 20 per cent. Mr. Horsley when cross-examined said he could not tell whether the fatty matter was mutton or beef-fat, nor did he think it had anything to do with the question. In asking him the question, the solicitor's object was to obtain a charge of perjury against him. All he would swear was that it was fatty matter, contrary to the composition of pure butter. He believed that it was mutton fat, but he would not swear positively. He did not come there to tell lies. The Bench dismissed this case, mainly on the ground that the Somerset House statistics of genuine butter showed an average of 16 per cent. water.

In a third case a conviction was obtained. Mr. F. Beckingsale was fined 10s. 6d., with £1 1s. 6d. costs, for selling butter adulterated (according to Mr. Horsley's analysis) with 29 per cent. of water.

#### REMARKS ON THE PRECEDING CASES BY MR. A. H. CHURCH.

Two of the above cases seem to me to call for an expression of opinion on the part of this Society.

Mr. Horsley bases his conclusions as to the adulteration of butter with foreign fats solely upon the ether process. This he stated in Court repeatedly, when he exhibited his tubes and specimens. I ask, Can this process, or any other process, depending upon the use of solvents be regarded as satisfactory, especially when unchecked by determinations of the specific gravity of the butter fat and its melting point? Moreover, can any process detect so little as 3 per cent. of foreign fatty matter? Would it be worth anybody's while to incorporate so small a proportion of foreign fat with butter? It is clearly unsafe, if not impossible, to pronounce with certainty upon the existence of so slight an amount of adulteration. And there is another question which ought to be asked here,—can we regard 8 per cent. as the maximum of water which a genuine fresh butter should contain?

Now I should have done nothing further than to call the attention of the Society to the three points named above, had it not been for a letter addressed by Mr. Horsley to the Cheltenham papers, and a controversy which has arisen as to the conflict of evidence in one of the cases described above. Some idea of this paper war may be learnt from the remark in the *Cheltenham Telegraph*, of June 2nd, in which my statement as to the value of the process of butter analysis relied on by Mr. Horsley is called "thoroughly discourteous and wholly unwarrantable," while the *Cheltenham Mercury* of the same date, suggests to Mr. Horsley the propriety of resigning his position of county analyst! The former paper affirms in a leader that Mr. Horsley's reliance upon the ether process is shared by Mr. A. H. Allen, Dr. Campbell Brown, Mr. Wanklyn, Mr. W. W. Stoddart, and Mr. Rugier, a French chemist. I have already learnt from two of these gentlemen, that their authority has been wrongly invoked in favor of a process, which, to say the best of it, is inadequate. But Mr. Horsley's confidence in the ether process, and his acquaintance with more modern methods are so well displayed in a letter of his to the Cheltenham papers, that I cannot refrain from reproducing that communication here, simply premising that my certificate and oral evidence clearly showed that the percentages of insoluble and soluble acids which I gave were obtained, in the usual manner, from the dry fat from the butter, not from 100 parts of the original moist sample. It is inconceivable to me that any member of this Society could make such a mistake as to add the figures of two distinct analyses together, and could then base an unwarrantable attack upon so egregious a blunder of his own. But here is the letter:—

## ADULTERATION OF BUTTER.

To the Editor of the *Cheltenham Examiner*.

SIR,—In reference to the trial at the Police-court, yesterday, having seen the full analysis of Professor Church in this day's *Chronicle*, the discrepancy being so enormously great, it becomes a serious question as to whether the sample of butter Mr. Church analysed was *identical* with that I operated on.

From being deaf I did not hear precisely what he stated until reading his evidence in this day's paper. Therefore I trust you will allow me to place our analyses side by side:—

HORSLEY.			CHURCH.		
		Per cent.			Per cent.
Butter	...	58	Insoluble fatty acids	...	88.94
Fat	...	19	Soluble	...	4.75
Salt and Curd	...	2	Salt	...	1.13
Water	...	24	Water	...	11.16
		* 100			105.98

I cannot for one moment understand how Professor Church has made a statement so totally different from mine, which was confirmed by numerous experiments carefully made.

Unquestionably there has been an error committed in the per-centage given by the Professor, as you cannot make 105.98 out of 100 parts.

I am, Sir, yours respectfully,

CHELTEMHAM, May 29th, 1877.

JOHN HORSLEY, F.C.S.

My certificate of analysis gave the figures separately and properly; I repeated the facts in my evidence in chief; I again made the same statement in an explanation of the meaning of the terms "insoluble and soluble fatty acids," which I gave in obedience to a request from the Bench. More than this, there is no mistake in the newspaper reports of my evidence; the mistake is a peculiar creation of Mr. Horsley's, and one which he has declined to acknowledge or correct, though I privately requested him to do so.

\* The error in the addition appears in the original letter in the *Cheltenham Examiner*. We drew Mr. Horsley's attention to it, but he writes, "As I have withdrawn from your Society there is no necessity for my writing any more." Editors *Analyst*.

A few words as to the experimental evidence on which I passed this sample. Although I had less than one ounce of the butter at my disposal, I made two determinations of insoluble acids and two of soluble acids; I took the specific gravity at 100° F, and the fusing point of the dry fat; and I used the microscope and polariscope. All the indications afforded by these methods were favourable, although the butter was rancid and of disagreeable smell and taste, as stated in my certificate. The specific gravity was .912 at 100° F; the fusing point 92°—93° F, and the traces of crystalline structure were limited to a few points where the butter had been in contact with the tin-box in which it was sent. It will thus be seen that I fortified the deductions drawn from the percentages of insoluble and of soluble acids by several other tests. I continue to think that to place implicit reliance upon the ether test, and to employ it unaided as a quantitative method is perfectly indefensible.

One more last word. Mr. Horsley has followed up his first letter to the Cheltenham papers, by a second which appears in the *Cheltenham Chronicle*, of June 5th, and the *Examiner* of the following day. He asserts that Mr. W. W. Stoddart has just written to him to say, "your process and mine are identical." I do not doubt that Mr. Stoddart will take care of his own reputation, which is too solid to be injured by any misquotation or imperfect quotation of Mr. Horsley's.

Indeed Mr. Stoddart writes to me under date June 5th, "I never rely on the ether test, it is true I use it, but only conjointly with others. \* \* \* \*  
I never yet used the test for quantitative work. \* \* \* \* It would be most foolish to pass a sample because it was soluble; at the same time it would be most rash to condemn one because it was not. In any case I should never condemn one that had so small a percentage as 3 of fat and 8 of water."

Mr. Horsley now writes (*Cheltenham Telegraph*, June 9th) "Stearin, a waxy substance not existing in butter." Comment on such a statement is needless.

Copies of Mr. Horsley's and Mr. Allen's letters to the newspapers had been circulated amongst the members, and Mr. Wigner announced that he had written to Mr. Horsley informing him of the paper which was to be read.

In the discussion which subsequently took place—

Dr. Dupré said they had rather a painful duty to perform, but it was necessary to keep their members up to their work. He knew nothing of the case before that evening, but from what he saw there in the correspondence, it certainly seemed to him that Mr. Horsley was not justified in what he had done, and when they had flattered themselves that after two or three years' work they had placed the analysis of butter in a satisfactory position, it was painful to find one of their members using a process which had been abandoned by nearly every analyst. How little the process could be relied on was clearly shown by Mr. Horsley stating that stearic acid is not contained in butter.

Mr. Allen said he was in a peculiar position. The first he saw of the matter was a report in a newspaper; in a few days he had a letter from Professor Church asking if he (Mr. Allen,) ever had stated what Mr. Horsley had in the *Cheltenham Telegraph* made him say. He at once wrote a letter to that paper giving the real facts, for which letter Professor Church thanked him, as did also Mr. Horsley. Some five years ago, in one of a series of articles contributed to the *English Mechanic*, he said that "animal fats in butter are best detected by shaking a small portion of the sample with a moderate

quantity of ether at the ordinary temperature," and *at that time* that was the best process known. Subsequently, at the time of the well-known "Kelly" butter case at Liverpool, there was a discussion in the *Chemical News* on the subject, and he said in a letter to that journal:—

"The success of the test evidently depends on the sparing solubility of stearin in cold ether. \* \* \* Pure butter sometimes leaves a slight residue. \* \* \* Although the analyst employing the above test may possibly fail in detecting a small admixture of lard, he can scarcely miss dripping or tallow, five per cent. of the latter fat being readily recognised by the method described. \* \* \* Of course the test makes no pretensions to scientific accuracy, but by the use of definite weights of butter and ether it forms a very valuable adjunct to (and in some cases a substitute for) the more elaborate method recently proposed."

The method there referred to was the modified ether method of Dr. Campbell Brown. The saponification method was not then known.

When he made a mixture of butter fat and tallow he could detect the tallow by that plan; they had not, however, to deal with tallow now. A true artificial butter is manufactured, and he was not at all prepared to say that that test could be used now. In fact he doubted whether much of the fictitious butter now sold would not be passed as pure by the ether test, as the treatment to which the animal fats were subjected eliminated the greater part of the stearin.

Dr. Muter said the ether process most decidedly does fail to detect butterine. He knew it because he had tried it. He had a sample of butterine that was tried with the ether test, which failed to show the separation, but when the other test, namely, fatty acids, was applied, it came out 90 per cent. of adulteration. He considered there were circumstances under which the solubility test was really of no use whatever, and it was sometimes dangerous to use it even as a kind of supernumerary test.

Mr. E. W. T. Jones thought from the analysis given by Professor Church that there was no doubt that the sample which he examined was genuine butter.

Mr. Wigner thought Mr. Jones did not go far enough. Looking at Mr. Horsley's letter, in which he adds up the figures in Mr. Church's analysis in an incorrect way, he (Mr. Wigner,) thought that Mr. Horsley was bound to withdraw such a statement as he had made.

After a long discussion the resolution referred to on page 55 was carried unanimously.

With reference to the above matter we reprint from the *Cheltenham Examiner* the following letter from Mr. Horsley. Copies of this letter and other correspondence were distributed at the meeting.

TO THE EDITOR OF THE "CHELTENHAM EXAMINER."

SIR,—In reference to this vexed question it will be perceived that Mr. Church in his evidence stated that there were so much insoluble fatty acids *en gross*, and that he did not find any foreign fatty matter. He does not *define* what those fatty acids were. Had he treated them with cold ether *afterwards* that would have dissolved out the *true butter fat*, leaving the insoluble, which would have rendered the matter *clearer*, as I cannot make out how I could extract so much *stearin* if it had been all *pure butter fat*.

It is here I apprehend where the error lies, but as the thing has been dismissed by the magistrates nothing more can be said about it, only it is hard for me to lay under a kind of ban without means of explanation.

With your permission I now give my process in detail and in plain language. It was only outlined in my original paper published in the *Chemical News* of 1874, which no chemist ever ventured to dispute till now, but although the outlines were then given, it is only recently that I have improved on them for police purposes, being convinced of their accuracy from numerous experiments purposely made by mixing pure butter with mutton and other fats, and I challenge Professor Church or any other chemist to disprove the facts on which my method of analysis is founded.

HORSLEY'S NEW BUTTER PROCESS.

1st.—The weighing. If you have not two glass or earthenware pans attached to your balance, cut out two pieces of paper of equal size and weight, using one as a counterpoise and the other for holding the butter.

2nd.—Weigh out 50 grains of the butter to be examined, then having ready a small test tube on a foot holding about three fluid drams, introduce the butter as carefully as possible with a small spatula so as to be sure of the entire quantity, and pour on two fluid drams of methylated ether of the proper specific gravity mentioned in the author's original published paper (vide *Chemical News*, 1874). Securely cork the tube, and agitate, holding in the warm hand till the butter is dissolved. Put it aside for an hour or two, and note if *any deposit* forms; if small, it may be only a little curd and salt, but if large so as to occupy some height in the tube, *adulteration with fatty matter* may be suspected. Then, to see if anything more is capable of being deposited pour into the clear ethereal solution from 15 to 20 drops or so of spirit of wine, and without agitating the tube simply put your thumb over the mouth, raise or invert it for a second or so and replace it for further observation; possibly within half-an-hour or so a larger deposit may collect, if it has been really adulterated with foreign fat.

3rd.—Separation of extra fatty matter. After standing a day or so at a temperature of say 55 deg. or 60 deg. Fahr., proceed to gently pour off the supernatant bright yellow liquor A, containing the pure butter in solution into a previously weighed and marked porcelain capsule, and put it aside for subsequent operation, taking note of the tare of the vessel by which at any time you may recognise its contents. That which remains in the test tube should now be collected on a small double filter B, and washed with a little ether and spirit of wine, so as to carry through every trace of butter. This filtered liquor may be added to the dish A, and allowed either to evaporate spontaneously or be facilitated by placing the vessel over hot or warm water. When the weight of this golden coloured liquid becomes constant, put the vessel aside in a cool place for the butter to become solid and note the weight of the butter.

4th.—The double filter B, containing the washed deposit of fatty matter, &c., should now be laid open to dry in the air, the deposit scraped off and put into a watch glass. If the paper on drying leaves a greasy stain it is proof of its freedom from butter or oil. Collect this white deposit of adulteration fat into a small test tube and dissolve out the fatty matter with a small quantity of pure cold benzine; that which remains undissolved being a little curd and salt. Next get a small double filter, mark its weight on it, and then pour the clear benzine solution through it, rinsing out the test tube which may yet contain a little salt with ether. Project that upon the filter, and when all has passed through lay open the filter to dry, and weigh the salt and curd. The filtered benzine solution and washings should now be evaporated, and on cooling the melted fat becomes a more or less *hard cake*, according to the nature of the adulterating material used, and it is *in fact stearin, a waxy substance not existing in pure butter*. In all cases where a fatty acid deposit is obtained the dry matter should be again treated in a test tube with a little cold ether, when, if it does not dissolve and remains white or milky looking, it is a certain proof of adulteration with foreign fat or stearin. The bones, so to speak, of the fat used are not soluble in ether, whilst pure butter is entirely soluble, forming a clear liquid at a temperature of say 60 deg. to 65 deg. Fahrenheit. Mutton fat, beef, suet, lard, &c., contain besides insoluble stearin, another element, "Oleine," but as this has become so inseparably amalgamated with the true butter fat, the chemist adopting this or any other method rather underrates adulteration than otherwise. Nevertheless the obtaining of any appreciable or weighable proportion of solid stearin can never deceive him, that being his true indicator.

JOHN HORSLEY, F.C.S.

The following letter appears in the *Cheltenham Telegraph* of the 23rd June.

TO THE EDITOR OF THE "CHELTENHAM TELEGRAPH."

SIR,—By the advice of Dr. Dupré, President of the "Analysts' Society," I beg to withdraw my letter of May 30th, commenting upon Professor Church's figures, which he says ought not to have been added up in that way. This occurred through the percentage of water, salt, and curd having been given, representing that proportion of 100 parts of the sample in question, and the subsequent percentage of soluble and insoluble fatty acids from or out of 100 parts of the butter fat only. Professor Church, however, explained that he meant not the percentage of the *whole* butter submitted to analysis, but of the *dry fats* extracted therefrom.

The matter of pure butter being of such public importance, I never intended to convey anything of a *personal or offensive character* towards Professor Church in my statement, and deeply regret if he should think otherwise.—I am, Sir, yours truly,

Cheltenham, June 19th, 1877.

JOHN HORSLEY.

The following letter has also appeared in the *Cheltenham papers*, and explains Mr. Stoddart's views:—

DEAR MR. HORSLEY—My mode of testing samples of butter is to put 40 grains with 2 drams of ether, and *without allowing the hand to touch the tube or phial* to agitate and lay aside. Genuine butter does not deposit more than salts, water, and curd, and remain in solution. If it does not, or deposits in an hour or two, I suspect something is wrong. I then fill a beaker with the butter, and leave it in the water bath to let the curds, &c., deposit. *The day after* I take the sp. gr. at 100 deg. Fahr. If above .911, and nothing suspicious, it is doubtless butter. I then take 40 gr. of the clarified butter, and try the ether test. If it deposits *as before* I feel sure there is some admixture. To prove this I separate the *fatty acid* and see if they are *soluble in ether*. If butter they do, if not they do *not*. The accepted percentage of the fatty acids alone is in my opinion a *decided failure*. But the ether test, and the sp. gr. at 100 deg. are *very correct*. I find that the foreign butter (?) that is so much about now behaves just as you describe. It dissolves readily at 65 deg. in ether, but deposits in a short time while true fresh butter does not. The deposit too is always a *fatty mass*, not the *stillen crystals* that are deposited on the tube so characteristic of butter. I do not find the addition of alcohol always certain. *I have never been found wrong yet*. But the whole success of the experiment lies in the mode of manipulation.

May 30th, 1877.

W. W. STODDART.



## ON SOME POINTS IN THE ANALYSIS OF WATER, AND THE INTERPRETATION OF THE RESULTS.

BY ALFRED H. ALLEN, F.C.S.

*Read before the Society of Public Analysts, 13th June, 1877.*

I FEEL some diffidence in reading a paper on such a well-worn subject as water analysis, before a Society of Professional Analysts, but my apology is, that while I may occupy the time of the Society with what some of its members will rightly regard as truisms, the facts brought forward are systematically ignored by many water analysts, and discredit frequently brought upon the profession in consequence.

Any chemist who has had experience in the examination of potable waters, will, occasionally have found a difficulty in pronouncing an opinion on the fitness of a sample for domestic use, when neither pains nor time have been spared in gathering *data* to enable him to come to a definite conclusion. The number of cases in which this difficulty occurs, is greatly increased by the fact, that at the present time, water-analysts may be divided pretty sharply into two groups: those who practice the method of Frankland and Armstrong, and those who employ the process of Wanklyn and Chapman.

The use of one process or another is, in many branches of chemical analysis, a matter of comparative indifference; but in water-analysis, it seems often to be understood to imply a distinct belief in one set of "symptoms," with simultaneous *dis-belief* in another set.

This discreditable and unsatisfactory state of things has its origin in unfortunate differences between the authors of what may fairly be called the rival methods of water-analysis.

Of the two methods, it may fairly be said that Wanklyn's is infinitely the more popular, and is the process in general use. On the other hand it is urged that the popularity of Wanklyn's process is due less to its intrinsic merits, than to its rapidity and facility of execution; Frankland's process being admittedly one of the most delicate operations in the whole range of chemical analysis, and, according to its enemies, incapable of giving accurate results, except by accident.

Of Frankland's method of determining the organic carbon and nitrogen in water, I have not myself had any direct experience, and, owing to the small number of chemists employing it, instances of concordant results having been obtained independently, by the analysis of the sample by different chemists, are difficult to obtain. An instance, however, was made public recently, in which duplicate analyses of the same sample were made independently by Dr. Frankland, and by Mr. J. W. Thomas, Public Analyst for Cardiff. The results of the two analyses agreed closely, and I am acquainted with several other unpublished cases in which equally satisfactory agreements have been obtained.\*

It may, however, be fairly open to question, whether Frankland's method would give absolute results in the case of samples containing large amounts of nitrates. It is evidently not sufficient that the sample should give concordant results in the hands of different chemists, but that test experiments should be made on known quantities of some unstable form of organic matter *in presence of a large excess of nitrates*. I am not

\* Among the members of this Society, Drs. Campbell Brown and Hill are well-known to employ Frankland's method.

aware that any results bearing on this point have ever been obtained, or at least published, by Dr. Frankland or his disciples, although the objection has been so repeatedly and forcibly urged by Mr. Wanklyn, that it certainly requires some kind of answer.

As to Wanklyn's method of estimating albuminoid ammonia, the possibility of obtaining by it concordant results in the hands of independent analysts, has been repeatedly proved, and although the fact that the results are only comparative, is now fully recognized, the indications are generally regarded as exceedingly valuable.

The difficulty introduced by the fact that different kinds of nitrogenous organic matter yield different amounts of albuminoid ammonia has been greatly exaggerated; for there is every reason to suppose that the number of kinds of nitrogenous organic matter existing in water is extremely limited, and if that be the case, the amount present ought to be tolerably strictly proportioned to the albuminoid ammonia yielded on distillation. Certainly, the opinion of a very large number of chemists who employ Wanklyn's process, is decidedly in favour of it as a means of discriminating between bad and good water, though probably few place in it so implicit a reliance as its authors contend it deserves.

But although Mr. Wanklyn deserves the thanks of chemists for the introduction of his method of determining albuminoid ammonia, he has unfortunately originated a fertile source of discord, and done much to retard the development of water-analysis, by under-rating the value of the oxidised nitrogen as an indication of contamination.

Unfortunately, Mr. Wanklyn's views on water-analysis are accepted as gospel by a large number of medical officers of health, and other "sucking analysts," and his remarks are too frequently interpreted literally, without the judicious qualifications which Mr. Wanklyn himself would be the first to introduce. Thus, a member of our Society holding two appointments as Public Analyst, has expressed his belief that the determination of free and albuminoid ammonia is all that is necessary for forming an opinion on the quality of a drinking water, and he backs that opinion by pronouncing on samples submitted to him *solely* on the results of those two estimations.\*

On the other hand, few chemists appear inclined to support the extreme view of Dr. Frankland, that the presence of nitrates in water (in more than minute quality) is absolutely positive evidence of previous contamination of the water by animal matter;—a view which has been contradicted by the researches of Boussingault, who found considerable quantities of nitrates in water in which contamination by animal matter was out of the question.

The grave mistake which is made by those who ignore the value of oxidised nitrogen in water as an indication of previous contamination by animal matter is evident, when it is remembered that 97 per cent. of the combined nitrogen of sewage was found by the Rivers Pollution Commissioners to become converted into nitrates during its slow percolation through a gravelly soil only five feet thick. As, therefore, free ammonia, uric acid, and the substances which are represented by albuminoid ammonia, are rapidly changed under favourable conditions, with formation of oxidised compounds of nitrogen, it is evident that the omission to regard the latter as indications of previous contamination is practically to ignore any infiltration of sewage, which is not *very* recent. As we

---

\* It is worthy of notice that the average amount of free ammonia found by Dr. Angus Smith in the rain of country places was upwards of ten times as great as the maximum quality which is found in pure drinking waters, so that average rain-water would inevitably be condemned by the above *sédicant* chemist, being contaminated by sewage.

have good reason to believe that the organisms to which we attribute enteric diseases, resist oxidation far more energetically than dead organic matter, it is evident that all trace of free ammonia, and the greater part of the albuminoid ammonia might disappear and yet the water be dangerous to drink.

There is another circumstance connected with the presence of nitrates, especially in the water of shallow wells, which is too often lost sight of.

According to the researches of Pettenköfler and others, much zymotic disease is due to the *alteration of level* of subterranean water. This, of course, is almost synonymous with the level of the water in shallow wells. In dry weather, when the water is low, sewage filtering through the soil from neighbouring ashpits and cesspools becomes thoroughly oxidised, the nitrogenous organic matter and ammonia being converted into nitrates. But in wet weather, the soil being filled with water, the same oxidation cannot take place, and free and albuminoid ammonia appear in the water of the wells. It is evident, therefore, that a change of weather, or other conditions, may so injuriously effect the water as to change what was possibly safe, though of bad antecedents, into what all chemists agree in regarding as positively dangerous.

As pointed out by Dr. Angus Smith, whose views on water-analysis are too little known and appreciated, it is often interesting and important to distinguish between the nitrogen of nitrous acid, and that of nitric acid. As nitrates contain an atom more of oxygen than nitrites, their presence indicates a more complete oxidation and destruction of the organic matter than obtained in the latter case. If all the combined nitrogen of a water exist in the form of nitrates, it is clear that a very thorough oxidation has occurred, and therefore that the contamination is comparatively old or distant. The presence of nitrites, on the other hand, shows that complete oxidation has not occurred, and therefore that the pollution is near at hand or recent. It has also been found that some kinds of organic matter will abstract oxygen from nitrates, reducing them to nitrites, or even to ammonia. Equally, therefore the presence of nitrites indicates a recent contamination. On this account, in studying the history of a drinking water, it is desirable to ascertain whether the oxidised nitrogen exists wholly as nitric acid or nitrites, or whether nitrites are not also present.

Another point on which I believe the practice of late years has been distinctly retrograde, consists in ignoring the loss on ignition. Because the loss of weight which occurs on igniting the residue left on the evaporation of a water cannot be strictly regarded as organic matter, it has become usual to omit the determination altogether. I believe the actual loss of weight is not without its value, especially when taken in connection with the total solid matter. In a good water the loss on ignition is rarely more than one-fifth of the total weight of the residues, but even if the exact loss be disregarded, the ignition often gives valuable information which can scarcely be obtained in any other way short of an estimation of organic carbon and nitrogen by Frankland's method. Thus in presence of much organic matter, the residue blackens, and if it be of animal origin often gives a distinct smell of burnt feathers. Oxidised compounds of nitrogen of course prevent the blackening, but often give rise to an evolution of red fumes. These and similar indications make the ignition test one which the careful analyst cannot afford to omit, especially as phosphates and lead can be looked for in the ignited residue more conveniently and safely than in any other way.

In the discussion which took place—

Mr. Heisch said that there were several things said by Mr. Allen on which he would gladly have made some remarks, but as that would involve a discussion of the whole subject of water analysis, he would confine himself to one point. Mr. Allen said that he (Mr. Heisch) had introduced a delicate test for phosphoric acid, he (Mr. Heisch) repudiated this. Dr. Frankland found that growths were producible by putting together nitrate of ammonia, phosphate of soda and sugar, but he (Mr. Heisch) denied the identity of these growths, with those which he considered due to sewage. Dr. Frankland only saw his growths after they had assumed the condition of mycelium, in which state they could not be distinguished from many other growths. It was at their first formation that they were most characteristic. One of their great peculiarities was, that they did not require the presence of atmospheric air, the first place in which he had observed them being in a liquid, saturated with carbonic acid. The proper way to try the experiment was, to put about 10 grains of the purest sugar in 5 ounces of the water, in a perfectly clean bottle, which it should quite fill, and stopper it down well, then expose it to day light, at a temperature of about 70°; in the course of about 24 hours certain little bodies could be seen floating about which required carefully looking for; the best way was to put a black cloth against the wall, and look at it through the water, these bodies when examined under  $\frac{1}{4}$  or  $\frac{1}{8}$ th objective, were found to consist of cells, with very brilliant nucleoli. If the bottle was shut up a little longer, these cells would be found to group themselves something like a bunch of grapes. The grouping was very peculiar and very different to anything obtained when the bottle was left open. Ultimately the odour of butyric acid became perceptible. The great point was to exclude atmospheric air, as these germs formed without the presence of air, and in the presence of carbonic acid as well; but the bodies which Dr. Frankland found would not form without the presence of atmospheric air, these were always accompanied by bacteria and not by the formation of butyric acid. He, Mr. (Heisch,) had under his notice recently three waters which came from a place where typhoid fever had broken out; chemically he found little difference between them, but in one, when treated as described, these peculiar bodies were found, and he said if either of the waters had anything to do with the fever it must be that one. The people there were up in arms as this water happened to be a pet one; because it was supposed to come from a spring having its origin in a coppice, and was therefore supposed to be as pure as could be, but the fever increased, and Dr. Guy was sent down by the Local Government Board to examine the question, and ultimately he found the origin of the spring to be immediately under a new workhouse, and not far from the cesspools of that establishment. Of the three waters it was only in that one he (Mr. Heisch) found these bodies.

Mr. E. W. T. Jones, had had considerable experience with both the Frankland and Wanklyn processes, but was not wedded to either. Of course they all thanked Mr. Allen for his paper, though he had not brought forward anything which he (Mr. Jones) had not observed or known before, which he thought would be the case with most of those who had had much to do with water examination. No doubt, as Mr. Allen said, the Frankland organic carbon and nitrogen method was one of extreme accuracy and required the greatest care, and was therefore subject to objections from causes not due to the subject itself. He regarded that as the worst feature of the organic nitrogen method. All the circumstances connected with the determination were such as to make one liable

to errors, which would affect the process considerably, whereas by the Wanklyn albumenoid ammonia method you could with due care show that no error took place during the process of analysis. The solubility of carbonate of lime (which he thought was understood by all of them) is something like 3 in 100,000, but he could not see how it bore upon water analysis; it could not affect one at all unless with a view of getting at the constitution of the mineral matter. He held that the data should be taken *collectively* to see whether they agreed with one another. As to the influence of nitrates upon the determination of organic nitrogen, he thought that had been settled by Frankland and others of his school. He himself had obtained good results in the presence of nitrates, which he thought could be decomposed in the way Dr. Frankland said, although there was a danger of leaving some nitrogen in the residue, but, on the whole, he thought the albumenoid process was preferable.

After a few words from Dr. Muter,

Dr. Dupré said that he never omitted any one of the points mentioned by Mr. Allen. He had never had a water in which he could not detect phosphoric acid. One thing he always did, viz., testing the water itself by permanganate—*i.e.*, by taking half a litre of the water, and adding a very small quantity of permanganate; if that is decolorized a fresh quantity is added until the color remains for 1 hour. The proportion of permanganate added at a time contains 0.08 milligram of available oxygen. Sometimes if the history of a water is not known an analyst might be seriously misled, and condemn a water which he would not do if he had known the history of it, but this simple permanganate test would prevent the mistake being made. He had adopted a plan which might be useful to others. One of the great drawbacks of Frankland's process was that you must always have your Sprengel pump in order or have a room you can set aside for it, but if you have to take your pump, &c., &c., to pieces it is a tedious job. He had some success in estimating the carbon and nitrogen by the ordinary combustion process; he simply estimated the amount of carbon by the old oxide of copper method. He took no precaution about the nitrogen. He passed the gas through a carbonic acid tube which he charged with baryta water, and filtered in such a way that no carbonic acid could get at it, dissolved the barium carbonate in hydrochloric acid, and finally converted it into sulphate, 1 milligram of which corresponded to 0.05 milligram of carbon. The nitrogen he estimated in a separate portion by combustion with soda lime, and, if the amount was very small, determined the ammonia produced by nesslerising. He also considered that no water should be passed without being tested by sulphuretted hydrogen. Dr. Dupré concluded by observing that he hoped no one would be prevented bringing the subject forward again because it was old, for all of them might learn something new at each discussion.

Mr. Allen, in replying, suggested that Mr. Heisch's remarks should be published in "THE ANALYST," so that the members might have an opportunity of seeing them in print.

---

#### REDUCED SPIRITS.

In the House of Commons on the 14th of June, Mr. ISAAC asked the President of the Local Government Board whether sub-sections 1 and 4 of Clause 6 of the Food and Drugs Act, 1875, would not exempt from penalties persons selling spirits reduced with water in the natural and customary course of trade, and without fraud to the purchaser;

whether he was aware that prosecutions had recently been instituted for reducing gin by its admixture with water, and whether, inasmuch as in such case no fraud had been practised or intended, and the sales of gin so reduced had been made at a lower price, such prosecutions were in accordance with the intentions of the Act; and whether, if there existed any doubt as to the interpretation of the Act, he was prepared to introduce an amending Bill to exempt from penalties persons who sell gin, reduced with water and not otherwise adulterated.

Mr. SCLATER-BOOHE.—In reply to the first question, I may say that if the water is added for the preparation of the gin as an article of commerce in a fit state for consumption, the 1st sub-section applies and no offence is committed, and, so far as in the process of distillation a certain amount of water remains mixed with the spirit, the provisions of sub-section 4 would likewise apply in bar of a prosecution. I am aware that recently there have been prosecutions, such as are alluded to in the question. The case of "*Pashler v. Stevenitt*" came before the Judges of Appeal on the 27th ult. In that case it appeared that the Justices in Petty Sessions held that gin at 44 per cent. below proof could not be considered as gin, and the Judges held that the seller was properly convicted. It appeared that gin sold by retailers varies in strength from proof to 20 per cent. under proof. The Judges held that the question was one for the magistrates, who must use their discretion on the facts before them, and that they had rightly decided that a mixture of water so far as 44 per cent. below proof was a fraudulent increase of the measure of the liquid. A decision reported in to-day's newspapers is to the same effect. In reply to my hon. friend's third question, I cannot but hope that the effect of these decided cases will be to put an end to any uncertainty as to the interpretation of the Act, if such exists, and I am certainly not prepared, as at present advised, to introduce any amending Bill on the subject.

---

#### THE ELECTRIC CANDLE.

WE recently had the opportunity of witnessing in Paris the working of Jablochkoff's electric candle, under circumstances which were more than usually favorable, to enable a fair judgment to be formed on the matter. The invention is, without doubt, an excellent one, and there seems no question that it will speedily come into use. The idea of wrapping the carbons of the electric lamp in a sheath of asbestos and placing them side by side in a parallel position, insulated only by the asbestos itself, is certainly one of the most novel contrivances which has recently been introduced into electric apparatus. We have good authority for saying that arrangements are being made for its introduction into several large establishments in Paris. Monsieur Breguet of Paris is also, we believe, making arrangements for further tests in England.

---

#### PARIS GAS.

THE following notes as to the gas supply of Paris will, perhaps, be of interest to some of our readers. The gas was tested in a laboratory close to the Madeleine, on the 22nd, 23rd, and 24th May. Each day it was free from sulphuretted hydrogen; the amount of sulphur in other forms was:—

On the 1st day,	15·6	grains	per	100	cubic	feet
„ 2nd „	15·3	„	„	„	„	„
„ 3rd „	15·1	„	„	„	„	„

On the other side of the Seine, at a place not far from the Luxembourg Gardens, the sulphur, on the average of two days, was 11·5 grains per 100 cubic feet.

G. W. W.

## CHEMICAL SOCIETY.

An Extraordinary General Meeting was held on 31st May last, Dr. Gladstone, F.R.S., in the chair. This meeting had been convened in accordance with a requisition signed by some twelve or fifteen Fellows, in order to consider certain measures which were thought to need amendment in the general rules of the Society. Resolutions complaining of the management of the Publication Committee, and of the mode in which Fellows and Associates were elected, and the way in which the Committee are annually elected, were brought forward by Messrs. Kingzett, Paul, Friswell, and others, and in the end the following resolution was passed:—

“That this meeting thanks the Council for the frank explanations given on the points that have been discussed, and begs to express its confidence in the action of the Council.”

The meeting terminated with a vote of thanks to Dr. Gladstone for presiding.

## LAW REPORTS.

## SULPHUR IN GAS.

HOUSE OF COMMONS COMMITTEE, MAY AND JUNE, 1877.

*The Crystal Palace District Gas Bill.*

*The Gas Light and Coke Company's Bill.*

THE object of these two bills was similar, and they were both referred to the same Committee consisting of Mr. Plunket, Chairman, Mr. Foljambe, Mr. Starkey, and Mr. Courtney. Under the Acts at present in force, the 17th section of the Crystal Palace District Gas Act of 1873, provided that the Gas supplied by that Company, should not contain more than 20 grains of sulphur per 100 cubic feet, in any form, and the promoters sought by this bill to be relieved from that condition.

The Gas Light and Coke Company, are at present working under the Act of 1876, by which referees were appointed whose business it was to fix the maximum of sulphur which should be allowed for the different works of the Company, and as was stated by counsel in opening the case, the result was that these referees had prescribed that in the gas made at Beckton, Bow, and Bromley, the maximum amount of sulphur should be 15 grains per 100 cubic feet in summer, and at the other works of the Company 20 grains in summer, and at the works of the Commercial Company 30 grains. The object of this bill as in the other case, was to relieve the Company from any restriction as to sulphur impurity, and as appeared from the opening speech, to enable them to dispense with the use of lime altogether, and exempt them from liability to penalties.

On the part of the Companies Dr. Odling, Dr. Stevenson, Dr. Tidy, and Dr. Russell were called, as well as Mr. Livesy, the Engineer of the South Metropolitan Gas Company, and Mr. George Wilson Stevenson, the Engineer, and the general purport of their evidence was to prove that the character of the products produced by the combustion of the sulphur present in coal gas was not such as to be injurious to health or furniture when the gas was burned in the ordinary way.

At the request of the Committee the three Gas Referees, viz., Professor Tyndall, Dr. Pole, and Mr. Vernon Harcourt were also called and examined, and the latter described in great detail and apparently fully justified the reasons which had induced the referees to fix the sulphur minimum at the point they had done.

On the other side the chemists called were Dr. Frankland, Mr. Charles Heisch, Mr. Keates, Professor Church, Mr. Pattinson, Mr. Falconer King, and Mr. Wigner, and their evidence was to the general effect that the products of combustion of ordinary coal gas did in part consist of sulphuric acid, and that although at first the sulphur in the gas produced sulphurous acid only, yet the moment this latter acid had passed away from the actual zone of ignition in the burner it became oxidised, and converted into free sulphuric acid, and as such, it was destructive to furniture and injurious to health.

After a very short consideration, the Committee declared that the preamble of the Crystal Palace Gas Bill was not proved, and after an adjournment the Committee received some further evidences as to the character of the gas supply in Paris from Messrs. Heisch and Wigner who during the adjournment had been there on purpose to test it. The Committee then declared that the preamble of the Gas Light and Coke Company's Bill was not proved. Both Bills are therefore thrown out.

## DISEASED MILK.

WESTAWAY *v.* ELDRIDGE.

This was an action to recover the sum of £29 9s. 5d., the value of the milk supplied during the month of October, 1876, the plaintiff being Mr. Westaway, a farmer near Staines, and the defendant a retail milk dealer, of Peckham, named Eldridge. For the defence it was contended that the milk so supplied, was diseased and unfit for human consumption and that it had actually produced illness in cases where it had been used. The result of this was that the defendant had been unable to vend the milk and had thrown away large quantities, thereby

incurring beyond the direct loss considerable damage to his trade and reputation, insomuch that after the 12th October he refused to buy of the plaintiff. In course of his evidence the plaintiff called as witnesses to the good quality of the milk his wife and his head cow-keeper. Mr. Allnutt, a veterinary surgeon, stated that after the defendant's refusal to receive the milk he had examined the cows and found them, generally, in a healthy condition; one of the animals had the posterior portion of the udder dried up, and in cross-examination the witness admitted that this might have resulted from previous inflammation. Professor J. A. Wanklyn stated that he received a sample of milk from the plaintiff, and he entrusted its chemical analysis to his assistant. It proved to have a fairly normal amount of fat, solids not fat, and ash. *The milk was therefore, good and genuine.* In cases of diseased milk he frequently found that the preponderance of solids not fat, was too great. *He had examined the milk also, physiologically, i.e., he had administered a dose of it to his assistant, who was in Court, alive and well. Cross-examined by Mr. Willis: He had not used the microscope, as he had no confidence in it for detecting lacteal disease.* The defendant being called described the condition of the milk, which turned bad very quickly. He deposed that he had remonstrated with the plaintiff and had sacrificed the milk. Becoming alarmed, he asked the Public Analyst for Lambeth to examine it. He (Dr. Muter) informed him that the sample was too far gone for analysis, and he therefore supplied him with a fresh sample direct from the rail. In the result Dr. Muter warned him not to continue dealing in the milk, as some of the cows must be diseased. Defendant accordingly returned the milk to the plaintiff, and declined to receive any more. Several customers of Mr. Eldridge were called to substantiate his complaint as to the quality of the milk, and their evidence showed that the fluid was "slimy" and "smelt." Two female witnesses deposed that their infants were seriously affected by a diet of the milk.

Dr. John Muter, Vice-President of the Society of Public Analysts, and Public Analyst for Lambeth, &c., stated that he had received two samples of milk. The first sample being wholly unfit for analysis, he confined his researches to the second, and had observed under the microscope a quantity of pus and casts from the tubes of the milk glands. He decidedly considered the milk unfit for human food, as the presence of pus was a clear indication of inflammatory disease in one or more of the cows. He agreed with Mr. Wanklyn that the milk was good in fatty constituents, and also that it had not been watered; but it was only by aid of the microscope that the evidence of disease such as he had perceived could be detected. For that purpose ordinary chemical analysis was useless.

Cross-examined by Mr. Wright: *No man having experience in the use of the microscope would mistake natural fat globules of milk for pus globules, which happen to be extremely characteristic.*

Mr. D'Arcy Power, F.L.S., said he was assistant to the last witness. He saw the milk under the microscope, and entirely agreed with Dr. Muter as to the presence of pus and the inadequacy of ordinary analysis to deal with such a case.

Mr. Justice Denman, in summing up, reminded the jury that in face of a direct conflict of evidence they must take into account which of the two sets of witnesses were least shaken in their evidence by the cross-examination. In the scientific evidence they had on one side Mr. Wanklyn, whose analysis was made some days after the return of the milk, and *who admitted that he had not used the microscope*, and, on the other hand, they had Dr. Muter, who stated positively that he had noted certain appearances incompatible with healthy milk, and who explained that in such cases *the microscope was a reliable guide.* After reviewing the evidence in a speech which occupied an hour, he left the facts to the consideration of the jury. Without leaving the box, the jury found a verdict for the defendant, and judgment was accordingly given, with costs.

#### REDUCED SPIRITS.

##### WEBB, APPELLANT, v. KNIGHT, RESPONDENT.

THIS case which was an appeal from a conviction by the Burslem Justices for selling gin adulterated with water, came before Justices Mellor and Lush, on the 13th June. The certificate of the Analyst was that the gin was 43 under proof. The case had been previously before the Court, and had been referred back to the magistrates for a fuller statement as to whether the liquor sold was of the nature, substance and quality of Gin usually sold at the price in the neighbourhood, and the magistrate said he could only refer to other cases of a similar character waiting the decision of the High Court. In these cases the following were the prices paid for the gin, and the percentage of water in each case:—Prices paid, 2s. per pint, 29·8 per cent. of water; 1s. 10d., 35·5; 1s. 4d., 32; 1s., 51·10; 2s., 44·10; 1s. 4d., 40·30; and 1s. 8d., 62·28.

After a full argument the conviction was confirmed, Mr. Justice Lush saying that no doubt gin was a compound article, which had in it a mixture of water, but was it of the quality as well as nature of the article purchased. The purchaser could not for the lowest price, expect a purer and stronger spirit. It was a question of degree and of the quantity of water added, and here the magistrate had in fact found that the quantity added was in excess of what could properly be added. The Court could not contradict that finding nor differ from the decision cited. Mr. Justice Mellor's judgment was practically identical.



At Marylebone, John Merry, cheesemonger, was summoned for selling adulterated butter; the analysts' certificate showed adulteration with fat, other than butter fat. The butter was sold wrapped in a paper, which bore the following label: "This compound is warranted sold as imported, and declared according to the Act, section 8." Mr. Greenwell said the parish did not wish to press the case heavily, and would be content with the costs, 4s. 6d., which the defendant was ordered to pay. Thomas Dowding, cheesemonger, was summoned for a similar offence, and fined 10s.

At Lambeth, Joseph Austin, cowkeeper, Old Kent Road, was summoned for selling adulterated milk, on being asked by the inspector for a pint of milk from a particular vessel, the woman serving said, "oh, that's milk and water." He then bought a pint from another vessel on the counter, which was said to contain milk. The analyst certified it to be adulterated with 9 per cent. of water, Mr. Ellison fined him 40s. and costs. In answer to the court, the inspector said it was the practice when officers asked to be served with milk to be met with the reply: "Its milk and water we are selling." Mr. Ellison said if a case with sufficient evidence to convict was brought before him, he would impose the utmost penalty the law allowed.

At Liverpool, R. Elstone, grocer, was summoned for selling preserved peas, colored with a substance injurious to health. The certificate of the analyst was that they contained 2.6 grains of crystallised sulphate of copper per lb. The defendant was fined 20s. and costs. Sarah Warton and Messrs. Brooks and Beck, were summoned for a similar offence, and the same fine was imposed in each case. The case against another defendant was withdrawn, because he proved that directly the peas had been purchased for analysis, he had for his own information, sent a sample to the public analyst, and finding that they were injurious he had withdrawn them from sale.

At Wednesbury, a grocer was summoned for selling adulterated butter. The certificate of the Analyst, Mr. E. W. T. Jones showed that he found 82 per cent. of fat other than butter fat—this was animal fat but was probably wholesome. The defence was that the butter had been purchased from the market as Jersey butter, but it turned out to be butterine. The defendant was fined £5 and £2 13s. 8d. costs.

At Marylebone, William Hopkins, a milk seller, was summoned for refusing to sell milk to Thomas Reeves Clifford, one of the inspectors of Paddington. On the afternoon of the 22nd ult., the inspector saw the defendant in Hall Park selling milk. He went up to him and asked him for a quart out of a can from which a customer had just been supplied. The defendant said that he could not let him have any out of that can, but he could have some out of another can he had on a barrow. The inspector said that he must have some out of the can he had first pointed out. The defendant said that he had not enough in it. The inspector thereupon opened the lid and saw that it contained about three pints, and he told the defendant that he would take as much as he liked to supply him with. He however refused to let the inspector have any of that milk. The inspector told him who he was, and that he would be summoned. These proceedings were taken out under the 17th section of the Food and Drugs Act, and it says that "if any officer, inspector, or constable as described by the Act shall apply to purchase any article of food or any drug exposed to sale, or to sale by retail on any premises or in any shop or stores, who shall tender the price for the quantity which he shall require for the purpose of analysis, not being more than shall be reasonably requisite, and the person exposing the same for sale shall refuse to sell the same to such officer, shall be liable to a penalty not exceeding £10." Mr. Mansfield thought that the summons must fail, as the milk had not been exposed for sale in a shop or stores. Mr. Hortin observed that he relied on the section as far as the comma at "sale," and contended that the other part of the section referred to a different matter altogether. If this prosecution should fail the Act would be comparatively a dead letter. The question was, no doubt, arguable. The case was adjourned in order that the matter might be looked into. Mr. Mansfield now observed that there was a great deal of ambiguity about the section, but there must be a conviction. The defendant would have to pay a fine of 20s. and the costs.

At Westminster, Francis Baker, milk purveyor, of 29, Commercial-road, Pimlico, was summoned for selling milk not of the substance, nature, and quality demanded by the purchaser. It appeared from the evidence that a pint of milk was purchased by the Nuisance Inspector for 2½d., the price of the best milk, and on analysis by Dr. Corfield was found to contain no less than 30 per cent. of added water. The defence was that the boy who sold it had mistaken the bowl, and had served "skim milk" instead of the best article. The defendant was fined 10s. and 12s. costs.

At Clerkenwell Police Court, a baker was summoned for selling bread adulterated with alum. Dr. Stevenson's certificate was, that it contained 35 grs. of alum per 4lb. loaf, which in his opinion was injurious to health. The defendant's foreman admitted in cross examination that alum was known in a bakery as "the doctor," and that it would give inferior flour the appearance of the "best wheaten;" the defendant was fined 20s. and costs, and a second summons for a similar offence on another day was allowed to be withdrawn on payment of £2 4s. costs.

At Coventry, a farmer was recently summoned for selling milk, from which cream to the amount of one-fourth had been abstracted by skimming. The analysis of Dr. Horace Swete, Public Analyst, showed that it contained 2.22 per cent. of fat, and he stated that the lowest quantity in good milk was 3.2. The defendant and his son and salesmen were examined, and declared that the milk had not been tampered with from the time it was milked to the time it was sold. The bench dismissed the case and allowed the defendant's costs.

## OBITUARY.

OUR readers will regret to see the announcement of the death of Mr. J. J. Griffin, F.C.S., who has been in business for many years as head of the firm of Griffin and Sons, of Garrick-street, Covent Garden. His name appears among the original members of the Chemical Society when it was founded in 1841. He made a considerable number of improvements in different kinds of chemical apparatus, and there is no question that the catalogue of scientific apparatus issued by his firm under the name of "Chemical Handicraft," has been of great assistance to many chemists in selecting apparatus suitable for special researches.

## CORRESPONDENCE.

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

TO THE EDITOR OF "THE ANALYST."

SIR,—Nearly one-half of the prosecutions under the sale of Food and Drugs Act are prosecutions for the sale of adulterated milk, I think, therefore, that it is scarcely possible for us to give too much attention to such an important subject.

In your last number you reprinted several reports of Analysts, and most of them refer in a special manner to milk; you also published a letter from Mr. Carter Bell, referring to milk analysis, not only in a general way, but with special reference to a certificate which is said to have been given by an Analyst, who certainly ought to have been one of the first to uphold the results which are obtained by the present process of milk analysis.

Every Analyst should make it a point of duty to examine the ash of every sample of milk he receives before he gives a certificate of adulteration, and I have no hesitation in saying that no Analyst would be justified, under any circumstances, in giving a certificate of adulteration, unless he had ascertained the percentage of ash which the sample of milk contained, and had also carefully estimated the chlorine present in that ash, and, supposing that the results so far were abnormal, had qualitatively tested the ash in order to find whether any adulterating ingredient had been added.

I will, however, go still further, and say that it is the duty of the Analyst in every case where a milk shows any suspicious signs, to examine the sample carefully under the microscope. Chemical examination, so far as it goes, is valuable and accurate, and there is no doubt that it does determine the amount of dilution with water, within a very small percentage when calculated on the poorest milk, but there is also no doubt that when the milk has come from a diseased cow, the chemical results give no clue whatever to the diseased state of the milk, and therefore no guide to the injury which may be caused by its use. The milk of a cow suffering from foot and mouth disease, which frequently attacks the udder, will show little, if any, deviation from the ordinary chemical standards, *i.e.*, it may still give 9 per cent., or even 9.3 per cent. of solids not fat, and the proportion of fat may be normal, or even in some cases excessive, but yet the milk may be in such a state of disease that its use as food would not only be unpleasant, but attended with probable danger to health.

The Government fully recognized the importance of this fact when they specified that Public Analysts should be possessed of competent *microscopical* knowledge, and I contend that unless an Analyst is competent to examine a sample of food microscopically, as well as chemically, he is not justified in holding a position under the Sale of Food and Drugs Act, where he may be called upon not only to certify whether a sample of milk is adulterated with water, but also, as the Act itself states, whether it is of "the nature, substance, and quality demanded." When a customer asks a milkman for milk, he certainly asks by inference, if not in so many words, for the milk of a healthy cow, and if he is supplied with milk from a diseased cow, the law is certainly infringed. Chemical analysis is quite insufficient to detect this infringement, although it is far more dangerous to the customer than mere adulteration with water. A microscopical examination is therefore absolutely essential.

I have known of cases in which diseased milk has been sold in London, not only to inspectors, but distributed through an entire district, and it is quite impossible to ascertain how much the weekly rate of mortality has been raised by such rascality—I know not what other name to give it.

Yours &c.,

PUBLIC ANALYST.

## NOTES OF THE MONTH.

The prize of 300 marks offered by the *Leipsi Pharmaceutical News* for the discovery of a process of butter analysis, still continues to crop up in various journals, no doubt through the active scissors and paste of the sub-editors. Not the least amusing of these paragraphs is one which winds up with a moral reflection to the effect that our own Chemical Society would be better employed in offering such rewards for useful processes of

analysis, than in subsidising those who entirely direct their attention to the discovery of organic compounds with unpronounceable names. No doubt this is to some extent true, as it is a fact that, at Burlington House, the manufacturer of some rare organic salt certainly holds his head higher (at least in his own estimation) than the humble originator of some process of analysis useful for the guidance of men engaged in commerce, but, unfortunately, the *good* moral is attached to a *bad* illustration. We would suggest that Herr Köhlmann, of Leipzig, should save his 300 marks by investing ten of them in the purchase of back numbers of "*The Analyst*," and therefrom inform his mind on butter analysis.

While on the subject of abstruse organic research *versus* improvements on practical analysis, we may note that the former has many advantages, of which two are especially prominent, viz. :—(1) It may secure an invitation to the debates of the selected few who are going (if they can) to proclaim themselves, and those whom they may choose, the only competent analysts in Great Britain, and (2) It has the grand advantage that a man may say pretty well what he likes, as it is most likely that no one will take the trouble of repeating his experiments!

An awful whisper is going round the laboratories to the effect that the gentlemen who have been privately attempting to form themselves into a proposed Institute of *Professional* Chemists (taking care to keep the power of selection in their own hands, by inviting no one they did not like), are meeting with a most determined opposition, and have already been obliged to drop the word *Professional*, and become simply an "Institute of Chemistry." As the select nucleus contains Pharmaceutical and manufacturing, as well as analytical chemists and *dilettanti*, the *raison d'être* of the whole affair evidently becomes dissipated into misty air. Have we not already a "Chemical Society," admitting every class of persons interested; and, if so, what need is there for an "Institute of Chemists," also receiving Pharmacists and manufacturers? Such a society could scarcely expect to obtain from Government the power to dub analysts competent or not, as they please, and we should fancy that the analysts in practice throughout England would think twice before they permitted their qualifications, and consequent existence, to be submitted to the pleasure of a body of men who have given no public invitation to their meetings, and who are not all themselves even, strictly, chemists.

In pleasant contrast to the hole and corner work of attempted private organisation, stands out the Society of Public Analysts, to which the ground of admission is, that the candidate for membership shall be an analytical chemist in actual practice, known to a certain number of his *confrères*, who can vouch for his knowledge of his professional duties; and that the associates shall be the actual assistants of analysts in practice who may be recommended by the Council. Here is a society with a definite object, strictly and properly limited to actual practising analysts, and therefore entitled to insist on the recognition by the public of the competence of its members, who one and all live by their profession. If, as we shortly hope will be the case, the word "public" be definitely dropped from the title, the Society will be in theory, as it is now in fact, an organisation of purely professional chemists, which no amount of opposition or backbiting has been able to shake, and which will eventually become the true nucleus of the more extended scheme of future examinations or such similar tests of competence as may be adopted. We now possess as members most of the practising analysts in England; let the remaining few come forward and join us, and organisation will at once be *un fait accompli*.

We abstract from the Coventry local paper the report of a milk case. Prosecutions of tradesmen on such results as those reported by our Coventry contemporary are to be much deplored, but they are not to be wondered at, when local Boards go on appointing Medical Officers of Health as Public Analysts, instead of selecting men trained to the profession of practical chemistry by a long course of laboratory work as student, assistant, and afterwards master.

The *Lancet* of 16th June, incidentally refers to a subject which bears a certain relation to this matter. It says, in reviewing the Handy Book of Forensic Medicine by Drs. Tidy and Woodman. "It is certainly not to be expected of the ordinary medical man, that he should be able to carry out the details of the most difficult of all analyses,

"and it is certainly most unfair to the accused that he should attempt to do so." We agree with our contemporary as regards many analyses, besides poison cases, although we have known ordinary medical men undertake even them.

In a recent note to the Berlin Chemical Society, Herr Stein proposes to make the beams, &c., of the balance of the future from rock crystal. The idea is certainly novel, and the lightness and unalterable nature of the substance, appears to recommend it, but how about the cost, seeing that the difficulty of working the crystal must be immense? We should like to know more also about its flexibility.

We reprint an important case of diseased milk, but, under the circumstances, we must refrain from remarks, simply leaving the evidence to speak for itself.

Before our next issue the question as to the permissibility of putting copper into preserved peas will have been settled by a rehearing, on appeal, of a case in which the magistrate convicted. We understand that many of the leading members of our Society and several eminent medical men will give their evidence as to the danger of permitting the sale of vegetables artificially coloured with copper. It will be interesting to note who will respond to the call of the defence, and come forward and swear that copper administered daily is not only quite innocent, but an excellent tonic. We hear that there is one gentleman who has given his opinion to that effect. Suppose he were to begin now, and try it for a few weeks on himself; but then he would, of course, object that theory is one thing and practice another!

#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
3552	R. Applegarth ... ..	Electric Light ... ..	4d.
3830	F. Tomasi ... ..	Hydrothermic motive power engine ... ..	8d.
3885	T. L. Parker ... ..	Treating Tobacco ... ..	2d.
3914	H. C. Ahrbecker ... ..	Fluid Meters ... ..	6d.
3946	A. E. A. Detiaque ... ..	Italian Paste Covers for Enclosing Medicinal Substances	6d.
4006	N. B. Downing & J. E. Hughes	Evaporating Alkaline Solutions ... ..	6d.
4015	E. Reynolds ... ..	Centrifugals, Pumps, and Fans ... ..	8d.
4052	W. A. Carter ... ..	Incinerating Furnaces ... ..	6d.
4075	G. Fahnehjelm ... ..	Explosive Compound ... ..	4d.
4085	J. C. H. Sievier... ..	Manufacture of Gas ... ..	4d.
4111	J. H. Johnson ... ..	Sugar ... ..	6d.
4112	Ditto ... ..	Treating Animal and Vegetable Substances with Hydro-Carbons ... ..	6d.
4204	G. D. Mease ... ..	Furnaces for Decomposing Chlorides of Sodium and Potassium, Manufacturing Alkalies, &c. ... ..	6d.
4239	G. Schaub ... ..	Electro-Magnetic Engines... ..	6d.
4295	T. Shaw and J. Heap ... ..	Annealing Pans ... ..	4d.
4301	J. H. Johnson ... ..	Refining Saccharine and other Liquids ... ..	2d.
4312	A. M. Clark ... ..	Electric-Light Buoy ... ..	6d.
4362	R. Powell and W. Atkins	Manufacture of Hyposulphate of Soda ... ..	6d.
4418	G. W. Von Nawrocki ... ..	Apparatus for Manufacture of Concentrated Sulphuric Acid, &c. ... ..	4d.
4426	C. Rosway and H. Geary ... ..	Treatment of Impure Lead ... ..	4d.
4433	A. M. Clark ... ..	Decolorising and Purifying Saccharine Juices ... ..	4d.
4516	C. D. Abel ... ..	Purifying Sewage and other Foul Waters ... ..	2d.
4573	C. Rands... ..	Treatment of Vegetable Substances to obtain Alcoholic Liquids ... ..	2d.
4577	W. R. Lake ... ..	Salts and Soaps for Preparation of Fabrics ... ..	4d.
4586	H. M. Whitehead ... ..	Preserving Meat ... ..	2d.
4624	J. Harvey ... ..	Preserving Meat, Fish, &c. ... ..	4d.
4912	W. V. Wilson and H. Cant ... ..	Aniline Dyes ... ..	2d.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The American Chemist; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Miller; The Anti-Adulteration Review

# THE ANALYST.

ON THE ESTIMATION OF OLEINE, &c., IN FATS,

BY DR. MUTER, F.C.S.

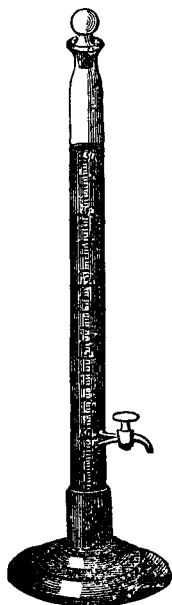
It is a principle well-established and laid down in most works on chemistry, that oleine may be separated from stearine and palmitine by taking advantage of the solubility of oleate of lead in ether, but the best methods of carrying out the separation are not as a rule given. I believe that the ordinary idea is to saponify with oxide of lead and water, dissolve in ether, remove the lead by sulphuretted hydrogen, and weigh the oleic acid, but in practice this is a very undesirable method. A much better way is to follow somewhat closely a commercial process, known in Holland, of separating the oleic acid from the lead by hydrochloric acid in the presence of ether, but there are several important precautions necessary to be attended to so that accurate results may be obtained. In the course of my experience in the analysis of fats, I have noticed several points, and I propose to give them in as short a form as possible, together with a detail of what I have found to be the most simple and accurate processes.

The first important matter is to ensure the formation of a *perfectly neutral* plumbic oleate,  $Pb\ 2\ C_{18},\ H_{33},\ O_2$ , as the slightest quantity of basic oleate will render the analysis inaccurate, owing to its much less degree of solubility in ether. To attempt this by the ordinary method of saponification with plumbic oxide is quite hopeless, but it may be readily attained as follows:—A small quantity (not more than 1.5 grammes) of the fat is saponified by alcoholic potash and then well diluted with boiling water. The solution is carefully treated with acetic acid till feebly acid, and then worked back with dilute potash till just neutral. This can be done without the use of test paper, by adding the acid to the soap solution, at the boiling point, until a decided *permanent* turbidity is produced, and then dropping in the potash with *constant stirring*, until the liquid *just clears again*. The clear solution is then precipitated by plumbic acetate in slight excess, and stirred until the precipitated soap settles thoroughly. The supernatant liquor is poured off, and the soap once washed by boiling with a large volume of water and decanting. By this process we obtain the perfectly neutral lead salts, containing:—

$Pb\ 2,\ C_{18},\ H_{33},\ O_2$	...	...	...	Plumbic Oleate.
$Pb\ 2,\ C_{16},\ H_{31},\ O_2$	...	...	...	Plumbic Palmitate.
$Pb\ 2,\ C_{18},\ H_{33},\ O_2$	...	...	...	Plumbic Stearate.

The first being readily soluble in ether, and the two latter quite insoluble. The soap is scraped from the basin with a platinum spatula and transferred to a flask of 100 c.c. capacity. The basin is rinsed into the flask with absolute ether, and then the flask is filled up with the same solvent, corked, shaken at intervals for some hours, and finally set to subside. The whole is then filtered through white filter paper, and the precipitate washed with ether till the washings cease to blacken with ammonium hydrosulphide. The filtrate and washings (which should not exceed 200 c.c.) contain the plumbic oleate, whilst the palmitate and stearate remain on the filter.

I have proved by many experiments that the solution really does contain pure plumbic oleate, of which I will, however, only notice the one in which I got the greatest divergence from theory; 40 c.c. of the ether solution evaporated yielded 1.162 of residue; another 40 c.c. were then shaken up with hydrochloric acid, mixed with alcohol, and the plumbic chloride formed collected, dried, and weighed on a tared filter. The weight of  $\text{Pb Cl}_2 = .424$ , equal to  $.340 \text{ Cl}_2$  plumbic oxide, thus showing 29.26 per cent. of oxide of lead—theory requiring 29 per cent.



Having thus got a solution of the pure neutral lead soap in ether, it is transferred to a long graduated tube of 250 c.c., graduated from the bottom upwards, and furnished with a well ground stopper and a stop-cock, which is placed at 50 c.c. from the bottom.\* About 20 c.c. of a mixture of one part hydrochloric acid and two parts water is then added, the tube is stoppered, well shaken, and set to subside, when a clear solution of oleic acid remains, the plumbic chloride sinking to the bottom. When sufficiently settled, a fixed portion of the ethereal solution is run off through the stopcock into a tared platinum dish, evaporated and dried at  $212^\circ$ , and the oleic acid is weighed and calculated to the whole bulk. To make sure, it is well to run off

two different quantities and weigh them, so checking the one by the other.†

If it is desired to estimate the stearic and palmitic acids together, the residue should be filtered and the soap remaining on the filter detached and heated for some time (with constant stirring) with dilute hydrochloric acid, which will liberate the acids so that they may be collected and weighed in the usual manner. The filter paper is also to be burned and the ash treated with a drop or two of sulphuric acid, and any lead remaining on the paper weighed as sulphate, 303 parts  $\text{Pb S O}_4$  equalling 568 parts stearic acid.

For those who may not wish to go to the expense of the special tubes, and who do not grudge a little extra trouble, the oleic acid may be estimated in the ethereal solution of plumbic oleate, by simply making it up to a known bulk and taking a fixed portion in a tared platinum dish. This may then be evaporated, dried at 212, and the plumbic oleate weighed. To ensure absolute accuracy, however, (lest by imperfect manipulation any trace of basic oleate be present) it is necessary, in this case, to ignite the weighed residue, and again weigh as  $\text{Pb} + \text{Pb O}$ . This residue is treated with acetic acid to take up the  $\text{Pb O}$ , and again weighed, and the residual  $\text{Pb}$  calculated to  $\text{Pb O}$ . By deducting the weight of plumbic oxide thus obtained from the total plumbic oleate, and allowing for the hydrogen displaced, we get the oleic acid.

I prefer, of course, in all cases to use the tubes, as with them the process is much more rapid and fairly accurate. I give the following selected analysis as showing the extreme divergences from truth that I have obtained at various times.

A sample of butter, yielding 88.5 insoluble acids gave—

Oleic Acid	...	...	...	...	40.4
Stearic and Palmitic Acids	...	...	...	...	47.5
					87.9 total.

\* These tubes are especially made for me by Messrs. Jackson, Barbican, E.C., and can be obtained from them.

† The more fluid drawn off for each weighing of course the less the possible error.

Another sample of butter, yielding 87.1 insoluble acids gave—

Oleic Acid	...	...	...	...	34.8
Stearic and Palmitic Acids...	...	...	...	...	52.1
					86.9 total.

A sample of lard, yielding 95 per cent. insoluble acids gave—

Oleic Acid	...	...	...	...	47.5
Stearic and Palmitic Acids...	...	...	...	...	47.4
					94.9 total.

Two different experiments for oleic acid only in the same sample of fats—

1st experiment.		2nd experiment.	
43.2	...	...	43.8
46.8	...	...	46.6
52.7	...	...	53.0
48.0	...	...	49.0

The worst experiment was done at an early stage of the investigation and represents an amount of error not likely to occur after practice.

I am now engaged in applying the process to the analysis of lard, in the hope of establishing a standard for calculating its adulteration by other fats, but as yet I fear its relative proportions of fatty acids are too variable for much success in this direction.

#### ANALYSIS OF A SAMPLE OF PORT WINE RECOVERED FROM THE "ROYAL GEORGE."

By A. DUPRE, Ph.D. F.R.S., &c.

THE interest excited by the recent publication of an analysis of a sample of very ancient wine by M. Berthelot, leads me to believe that the following may not prove uninteresting to many. In the summer of last year, I received from Dr. Seaton, F.R.S. a small sample of port wine with the following history attached—the bottle from which the sample was taken was originally on board the "Royal George," and went down with that vessel on 29th August, 1782, and when the ship was raised this bottle was recovered from it. The bottle next passed into the hands of Dr. Seaton's father, and thence into the possession of Dr. Seaton, and was opened on July 1st, 1876. It was only partially filled when it passed into Dr. Seaton's hands, and was not quite half full when opened on July 1st. It had not, so far as is known, been recorked after it was raised. The wine was very turbid, had a disagreeable salty taste, and a somewhat unpleasant smell, scarcely reminding one of wine. The sample I received had been filtered; it was clear, of pale amber colour, and very little vinous smell. I had so little that I did not taste it. The analysis, so far as it could be made with so small a quantity, gave the following results:—

Specific gravity	...	...	...	1003.8
Alcoholic strength	...	...	...	6.05 per cent. by weight in volume
Total free acid calculated as tartaric acid	...	...	...	0.45
" fixed acid	"	"	...	0.165
" volatile acid	"	acetic	"	0.228
" dry residue	...	...	...	3.98 per cent.
Containing mineral matters	...	...	...	0.78
" organic	"	...	...	3.20
Amount of Chlorine in wine	...	...	...	0.29
= Chloride of Sodium	...	...	...	0.478
Sugar	...	...	...	0.64

Some of the more striking points of this analysis are the facts that so much of vinous quality has been retained; next, that so much alcohol has disappeared, and yet so little acetic acid has been formed; and, lastly, that so little sea water has found its way into the bottle. Even when taking all the chlorine as derived from sea water it shows an admixture of only about 15 per cent. The alcohol, therefore, cannot have been lost by diffusion while the bottle was submerged, otherwise much more sea water would have got in. The amount of sugar still left, more than half per cent, is also remarkable.

### ON THE EXAMINATION OF HOPS.

By W. E. PORTER, F.C.S., &c.

LATELY I have been trying some experiments with the following method for estimating the essential part of hops, viz., the oil, resin, and bitter principle. I believe the results to be pretty accurate, and to give their value according to the percentage that they yield.

The apparatus I use consists of a modification which I have made of the apparatus figured on page 195 of Church's Laboratory Guide. In this apparatus I extract the oil, resin, and bitter principle from the hops by means of ether vapour, taking care to let the ether boil among the hops.

Hops, after being subjected to this process and dried, are quite tasteless, and if treated with hot alcohol and afterwards with water, yield only tannin\* and gummy extractive matter, showing that the oil, resin, and bitter principle have been taken up by the ether.

I weigh the hops in preference to letting the ether evaporate, as I find the percentage is higher from the evaporated extract, owing, I believe, to the oxidation of the oleo-resin by the air, in fact the Saatz hops gave 22.40 as loss from moisture, oleo-resin, &c., but by allowing the ether to evaporate they gave nearly 3 per cent. more as residue.

The following results were given by hops grown in different localities and of varied qualities. Nos. 1, 2, 3, 4, and 5 were of the finest quality, 6 and 7 medium, and 8 and 9 low. No. 1 were the Saatz, and considered to be the finest that are grown; these are sun-dried hops, No. 2, Worcester, dried by patent kilns; 3, 4, and 5, Kents; 6, Sussex; 7, Kents; 8 and 9, Sussex.

#### No. 1.—SAATZ.

Moisture ... ..	4.75
Oil, Resin, and Bitter principle ... ..	17.65

#### No. 2.—WORCESTER F.

Moisture ... ..	4.95
Oil, Resin, &c. ... ..	15.55

#### No. 3.—KENTS F.

Moisture ... ..	5.50
Oil, Resin, &c. ... ..	14.45

#### No. 4.—KENTS F.

Moisture ... ..	4.90
Oil, Resin, &c. ... ..	13.60

\* Tannin is insoluble in pure ether.



## No. 5.—KENTS F.

Moisture ...	...	...	...	...	5.60
Oil, Resin, &c.	...	...	...	...	14.87

## No. 6.—SUSSEX M.

Moisture ...	...	...	...	...	5.12
Oil, Resin, &c.	...	...	...	...	12.13

## No. 7.—KENTS M.

Moisture ...	...	...	...	...	5.82
Oil, Resin, &c.	...	...	...	...	11.30

## No. 8.—SUSSEX L.

Moisture ...	...	...	...	...	4.23
Oil, Resin, &c.	...	...	...	...	9.15

## No. 9.—SUSSEX L.

Moisture ...	...	...	...	...	5.10
Oil, Resin, &c.	...	...	...	...	9.90

All these hops were grown in 1876, and nine months have elapsed since they were bagged. No doubt fresh hops contain a much larger quantity of oil, which is said to reach about 8 per cent. when new, *but in time most of this oil becomes converted into resin*, which for brewing purposes is probably the best, as the oil must have a tendency to render beers turbid. I do not think the oil in old hops is as high as 2 per cent.

There is a great difficulty in separating the oil from the resin, for I find upon trying to do so the greater part becomes *converted*. What little oil I have separated has an odour like penny royal, but when rubbed on the hands gives the fine aroma of the hop. If left exposed to the air for some time it becomes resinous, and has a valerianic smell.

By treating the fresh resin with boiling water, and filtering, the solution has a strong bitter taste, with a true hop flavour.

I append the following extract from "Beer and Brewing," by Dr. Jules Morel, in the *Brewer's Journal*, June 15th, 1877, which has just been sent to me:—

"For a long time hop oil was considered as containing strongly the aroma which characterises beer, and essences of hop oil (solution of hop oil) have even been sold in commerce to be added to beer in order to increase its aroma. Fortunately this idea was abandoned, as the essence communicated a particular medicinal odour to the beer, which is explained by the hop oil being transformed into valerianic acid. The only importance possessed by hop oil in the preservation of hops is that it preserves the resin with which it finds itself in contact. In fact, resin is modified by the air in such a manner as to become insoluble in the usual solvents. This conversion is hindered as long as the resin remains in contact with the oil. The oil may even, in old hops, be converted in great part into valerianic acid without the resin losing its property of dissolving.

There exists some very erroneous ideas among brewers concerning the part which the essential oil of hops plays in the manufacture of beer, therefore we cannot too often repeat that *the resin indicates the value of the hops*, because it is the resin which imparts the bitter flavour that dissolves in the saccharine liquid; this is again separated by the fermentation, and forms like a varnish round the cells of the ferment in such a manner as to abate fermentation."

## GOVERNMENT VOTES IN AID OF SCIENTIFIC RESEARCH.

THE following list will be read with interest if not with satisfaction. The grants are made on the recommendation of the Royal Society.

## PERSONAL PAYMENTS.

Mr. J. A. Broun.—For Correcting of the Errors in the published Observations of the Colonial Magnetic Observatories, £150.

Dr. Joule.—For Experimental Investigations into the Mechanical Equivalent of Heat, £200.

Prof. Parker.—For Assistance in Researches on the Morphology of the Vertebrate Skeleton and Relations of the Nervous to the Skeletal Structure, chiefly in the Head, £300.

Rev. W. H. Dallinger.—For Microscopic Investigations of Monads, Bacteria, and other low forms of life, £100.

Rev. F. J. Blake.—For compiling and publishing a "Synopsis of the British Fossil Cephalopoda," £100.

Prof. A. H. Garrod.—For Aid in preparing for Publication an Exhaustive Treatise on the Anatomy of Birds, £100.

Dr. Murie.—For completing and publishing three Memoirs:—"Anatomy of the Kingfisher," 4to., with five plates; on "Extinct Sirenia," 4to., with six plates; "Osteology of the Birds of Paradise," folio, three plates, £150.

Mr. H. Woodward.—For continuation of Work on the Fossil Crustacea, especially with reference to the Trilobita and other Extinct Forms, and their Publication in the Volumes of the Palæontographical Society, £100.

Prof. Schorlemmer.—For Continuation of Researches into (1) the Normal Paraffins, (2) Suberone, (3) Aurin, £200.

Dr. H. E. Armstrong.—For Continuation of Researches into the Phenol Series, and into the Effect of Nitric Acid on Metals, £300.

Profs. King and Rowney.—For Researches to determine the Structural, Chemical, and Mineralogical Characters of a certain Group of Crystalline Rocks represented by Ophite, £60.

Mr. W. J. Harrison.—Towards the Expense of collecting and describing Specimens of the Rocks of Charnwood Forest, £50.

## NON-PERSONAL PAYMENTS.

*In aid of Apparatus, Materials, and Assistance.*

Dr. J. Kerr.—For Aid in Electro-Optic and Magneto-Optic Researches, £200.

Mr. J. E. H. Gordon.—For Experimental Measurements of the Specific Inductive Capacity of Dielectrics, £50.

Prof. Guthrie.—For Apparatus and Assistance in (1) the Determination of the Latent Heats of the Cryohydrates and the Vapour Tensions of Colloids; and (2) the Examination of Heat Spectra and Radiant Heat by means of varying Electrical Resistance in Thin Wires, £150.

Mr. J. T. Bottomley.—To aid in carrying out a Series of Experiments for Determining the Conductivity for Heat of Various Liquids and Solutions of Salts, £100.

Sir William Thomson.—For Assistance and Materials for a Continuation of Experiments on the Effects of Stress in Magnetism, £100.

Mr. W. Crookes.—For Assistance in continuing his Researches connected with "Repulsion resulting from Radiation," £300.

Messrs. Rücker and Thorpe.—For a Comparison of the Air and Mercurial Thermometers, £50.

Mr. F. D. Brown.—For an Investigation of the Physical Properties, the Specific Gravity, Expansion by Heat and Vapour Tension, of the Homologous and Isomeric Liquids of the  $C_n H_{2n}$  Series, £100.

Prof. Roscoe.—For Continuation and Extension of the Experiments on the Self-Registering Method of Measuring the Chemical Action of Light, £100.

Sir William Thomson.—For Investigation and Analysis of Tidal Observations and Periodic Changes of Sea Level, £200.

Dr. J. B. Balfour.—For the expense of Illustrations for a "Monograph of the Pandanaceæ," £50.

Mr. H. T. Stainton.—For Aid in publishing the "Zoological Record," £100.

Dr. J. G. M'Kendrick.—For Apparatus for a Research into the Respiration of Fishes, £75.

Prof. Gamgee.—For a more complete Survey than has yet been made of the Physiological Action of the Chemical Elements and their more Simple Compounds, with the Object, in the first instance, of establishing a Physiological Classification of the Elementary Bodies, £50.

Dr. Brunton.—For Researches into the Physiological Action of the most important Compounds of Nitrogen, and into the Action of certain Poisons, and for Apparatus, £80.

Mr. E. Schäfer.—To pay the Wages of an Assistant to give Mechanical Aid in Histological and Embryological Research, £50.

Dr. Burdon Sanderson.—For an Investigation of the Normal Relation between the Activity of the Heat producing Processes and the Temperature of the Body, £70.

Prof. Schorlemmer.—For Continuation of Researches, into (1) the Normal Paraffins, (2) Suberone, (3) Aurin, £100.

Mr. W. N. Hartley.—For Researches into the Photographic Spectra of Organic Substances, into the Phosphates of Cerium, the Conditions under which Liquid Carbonic Acid is found in Rocks and Minerals, the Double Salts of Cobalt and Nickel, and for other Investigations, and for Assistance, £100.

Dr. Burghardt.—For a Research into the Origin of the Ores of Copper and (if possible) of Lead, their Mode of Formation, and the Chemical Connection (if any) between the Ore and its Matrix, £50.

Prof. Church.—For a Research into the Colouring Matters of Colein, of Red Beet, and for the Study of Plant Chemistry, £50.

---

#### DETERMINATION OF GLUCOSE IN BLOOD AND OTHER ORGANIC SUBSTANCES.

DR. PAVY, F.R.S., recently read a paper before the Royal Society on a modification of the methods previously in use for the quantitative determination of glucose in animal substances. There is no doubt that where minute traces of glucose are in question, Dr. Pavy's method introduces improvements which must greatly conduce to the delicacy of such process, and although it can scarcely be considered as practicable in commercial analyses because of the time involved, it must necessarily form a material advance in our methods of procedure where delicate investigations are concerned. The process consists essentially in an adaptation of the old gravimetric process of determination by means of a solution of sulphate of copper and double tartrate of soda and potash, the liquor being, however, in the first instance mixed with an excess of solution of sulphate of soda and boiled, so as to coagulate it. The liquid is then filtered, and the potassio tartrate of copper added to the filtrate. The reduced sub-oxide of copper is then separated by filtration from the liquid, dissolved in a few drops of nitric acid, with a small quantity of per-oxide of hydrogen added to effect oxidation, and the amount of copper present in the precipitate, instead of being estimated as in the old process by direct weighing of the sub-oxide involving the necessary errors due to the presence of the filter ash and to other circumstances, is determined by galvanic deposition of the copper upon the surface of a piece of platinum foil or wire, which is weighed before and after the galvanic action. The results are calculated out according to the old formula, viz., that 1 part of copper equals .5678 of glucose. The author of the paper rightly states, "This application of the copper test solution yields a gravimetric process of analysis instead of a volumetric, and one which has no uncertainty belonging to it. There is nothing for the mind to do, and no opportunity for error of judgment."

Dr. Pavy subsequently read a second paper on this subject before the Royal Society. It is the issue of the application of the above process.

Dr. Pavy dealt with the question of the quantity of sugar in the system under the following conditions:—

1. The amount which exists in blood in its normal condition.
2. The comparative state of arterial and venous blood.
3. The spontaneous change which takes place in blood after its removal from the system.

The author pointed out that the very rapid changes which take place in blood under altered conditions of the system render it essentially necessary that the greatest

precaution should be observed in order to obtain blood in its natural condition. If taken during life the animal should be in a perfectly tranquil state. If after, it should be procured as instantaneously as possible after the death of the animal, so that no opportunity could be afforded for the blood to be affected by the *post mortem* production of sugar in the liver.

The experiments now under notice were made on dogs, sheep, and bullocks' blood, and a series of six, in one case seven, examinations of each kind instituted, and two analyses made for every sample taken.

In quoting Dr. Pavy's figures we are giving the mean of the two separate analyses. It is necessary, however, to state that the extremes of each show but trifling variations, and these are rarely so great as to affect more than the second figure in decimals.

The mean results of seven examinations of dogs' blood showed the amount of sugar which it contained in parts per 1,000, to be as follows:—0.751, 0.786, 0.700, 0.766, 0.786, 0.921, 0.803 respectively. This gives an average of 0.787 on the whole series.

The blood of sheep yielded 0.470, 0.490, 0.517, 0.559, 0.569, 0.526, respectively, or an average of 0.521 parts of sugar per 1,000.

The bullock's blood gave 0.703, 0.525, 0.492, 0.456, 0.499, 0.588, or an average of 0.543.

In each of these experiments every care was taken to secure the blood in such a manner that it was a reliable representation of its ordinary condition during life. Unless such precautions are taken the results obtained will be, in a physiological point of view, worthless and misleading.

This fact was strikingly illustrated by a comparison of results which Dr. Pavy obtained from four bullocks killed in the ordinary way, viz., by felling the animal with a poleaxe, and breaking up the spinal cord by means of a cane. In the first two of these observations the opening into the blood vessels was made as speedily as possible after the animal had been felled. In the next two Dr. Pavy had reason to believe that this necessary condition had not been complied with, and that some little time was allowed to elapse between the felling of the bullock and the opening of the vessels. The effect of this delay in the *post mortem* production of sugar is shown by the following results:—

Blood of the first two bullocks (mean of two analyses) yielded 0.596, 0.688, parts of sugar per 1,000, respectively. In the second two a mean of 1.053 and 1.094 parts of sugar per 1,000 were given.

The conclusions to be drawn from these various experiments are, that the amount of sugar contained in the blood of sheep and bullocks is about  $\frac{1}{2}$  per 1,000 or 1 in 2,000, and in a dog about  $\frac{3}{4}$  per 1,000, or  $1\frac{1}{2}$  per 2,000. Taking the results of the whole series of observations they show a remarkable uniformity and harmony in the amount of sugar contained in the blood of the respective animals.

#### COMPARATIVE STATE OF VENOUS AND ARTERIAL BLOOD.

The author next considered the comparative states of the arterial and venous blood. This part of the subject is one which possesses the greatest importance from a physiological point of view.

One of the effects of anæsthetics on animals is to occasion an abnormal amount of sugar in the blood, in order to attain accuracy, therefore it is indispensable that blood should be taken at a time when the animal is not under such influence.

In the first observation made on the blood of a dog, life had been instantaneously destroyed by pithing, and collections were made immediately after from the jugular vein and crural artery. No time was allowed for the effect of *post mortem* formation of sugar in the liver to influence the blood. The results obtained by this method were as follow: crural artery, ·799, ·791; *mean*, ·795. Jugular vein, ·793, ·791; *mean*, ·792. In order, however, to obtain evidence to which no exception could be taken, Dr. Pavy adopted another method of procedure, which he was enabled to do just prior to the meeting of the society, from having a restriction previously imposed under the Vivisection Act removed. This enabled him to collect the blood under the natural conditions of life, both from the carotid artery and the jugular vein. The animals operated upon were placed under an anæsthetic, during which time the vessels were exposed and a thread placed loosely round each. After they had regained tranquility, and the effect of the anæsthetic passed off, the vessels were drawn forward and openings made into them to allow of the simultaneous escape of blood. So quietly and painlessly was this operation of collection performed, that the animals themselves manifested no signs of consciousness of what was taking place. The analyses of the blood obtained in this manner were commenced before coagulation had time to occur, and the results were as follow: No. 1, carotid artery, ·806, ·817; *mean*, ·811. Jugular vein, ·803, ·788; *mean*, 798. No. 2, carotid artery, ·854, ·873; *mean*, ·863. Jugular vein, 863, 896; *mean* ·879.

From these figures it is clearly evident that no material difference exists in the amount of sugar contained in arterial and venous blood.

#### SPONTANEOUS DISAPPEARANCE OF SUGAR FROM BLOOD.

Turning to the third part of his subject, viz., the spontaneous disappearance of sugar from blood after its removal from the system, Dr. Pavy gave the results of a series of analyses he had conducted, and which are as follows:—

No. 1.	Taken immediately after death	...	...	mean	·786
	„ after 1 hour	...	...	„	·739
No. 2.	Taken immediately after death	...	...	„	·700
	„ after 1 hour	...	...	„	·670
No. 3.	Taken immediately after death	...	...	„	·766
	„ after 1 hour	...	...	„	·751
	„ „ 23 hours	...	...	„	·285
No. 4.	Taken immediately after death	...	...	„	·786
	„ after 1 hour	...	...	„	·728
	„ „ 24 hours	...	...	„	·302
No. 5.	Taken immediately after death	...	...	„	·921
	„ after 1½ hours	...	...	„	·793

Dr. Pavy pointed out that there was nothing new in the suggested discovery that a gradual destruction of sugar takes place with blood after its removal from the system. He himself had brought the fact before the notice of the Royal Society so far back as 1855, when he stated that under the changes of the decomposition of blood normal animal glucose is very readily metamorphosed. The rapidity of the metamorphosis depending on the activity of the decomposition of the animal substances present.

In conclusion the author stated that the evidence adduced in this communication shows that the results which Bernard has obtained by the experimental *modus operandi* he has been recently employing are erroneous, and, consequently, the inferences he has drawn from them are equally in error. The cause of truth and the interests of science demand that what he has recently been advancing should be eliminated from physiological literature.

## MILK ADULTERATION IN NEW YORK.

THE *New York World* has given a list of more than 150 milk dealers who have been convicted for selling adulterated milk, nearly all of them on the certificates of Professor Chandler, of Columbia College. The fines varied from a minimum of 5 dollars to a maximum of 250 dollars, and the total amounted to no less than 8,330 dollars, a sum which seems to us *almost* sufficient to pay the analyst's salary. If milk dealers in London were fined on the same scale, we should soon have a better supply of milk here. It is certainly also very creditable to a New York newspaper to publish in detail like this the names and addresses of the milk dealers, and the number of times each has been fined, in order that the public may have an opportunity of judging from whom they had better purchase their milk.

We note also with particular satisfaction that in three cases the offenders were sentenced to imprisonment, without the option of a fine; thus one was sentenced to a month in the penitentiary, and for a second offence thirty days more, while two others appear to have received sentences of thirty days each, apparently in addition to the fines.

## LAW REPORTS.

## CONVICTION FOR SELLING "FORE" MILK.

A dairy proprietor, Michael Hayden, residing at Clarendon Street, Dublin, has been convicted by Mr. Woodlock, Divisional Police Magistrate, for selling to the Inspector of food, milk which "was not of the nature, substance, and quality" of the article demanded. Dr. Cameron, public analyst, deposed that the milk was either "fore milk," or had been deprived by skimming of a portion of its cream. The defendant admitted that it was "fore milk," and that he had sold the "stripping" as cream, believing that he was allowed by law to do so. The magistrate expressed his opinion that milk should be sold whole," *i.e.*, with both fore milk and strippings, and fined the defendant £10.

COLOURED CONFECTIONS—At the Sheriff's Court, Glasgow, on the 30th June, before Sheriff Lees, William Caldwell, confectioner, 619, Gallowgate Street, was charged with having sold 1lb of confections known as "Coloured Imperials," which were "mixed, coloured, stained or powdered," with chromate of lead, etc. A plea of guilty was tendered, the accused explaining that he was not aware the confections contained any injurious ingredients. The sheriff imposed a fine of £2, and explained that, legally, the want of knowledge did not remove culpability. Mr. Tatlock, one of the public Analysts for Glasgow, made the analysis in this case, and found .54 grains of chromate of lead per lb of the yellow confections.

At the Southwark Police-court, recently, Mr. John Morris, cheesemonger, 152½, Blackfriars-road, was summoned before Mr. Benson by Mr. John Edwards, Sanitary Inspector of St. George's Vestry, for selling as genuine butter a compound containing not a particle of butter. William Connor, assistant to Mr. Edwards, said that from directions he received from him on May 29, he went into defendant's shop and asked for half a pound of fourteenpenny butter as marked in the window, which was served to him. He paid 7d. for it, and instantly handed it to Mr. Edwards in the presence of the manager. Mr. Edwards said he was appointed by the Vestry under the Adulteration of Foods Act, and owing to complaints he had received, and seeing the "butter," marked at fourteenpence a pound, he was positive it could not be genuine. He accordingly directed his assistant to purchase half a pound; this was done in his presence, and the "butter" handed to him. Witness then entered the shop and divided the butter into three portions, one of which he took to Dr. Muter for analysis. The compound when handed to witness was wrapped up in ordinary paper, and there was no label or other mark on it. Mr. Benson asked if he had received any particular information. Witness replied that he had not. It was a large shop and things were marked up too cheap to be genuine. On those grounds chiefly he visited the shop. Witness here handed in Dr. Muter's certificate. Mr. Benson after perusing the latter, observed that the result of Dr. Muter's analysis was that it was nothing but animal fat made to resemble butter, but it was not injurious to health. It was, in fact, not butter at all. The defendant's manager, who attended, said that it was not sold as butter. He handed in to his worship an old brief-sheet, on which was marked: "Notice.—This compound

is sold as imported, and declared according to the Act, 1875, cap. 63, sec. 8." Mr. Benson told him that if the butter or compound was wrapped up as stated by him, that label did not assist him, and asked where the stuff was manufactured? The manager said he did not know. They bought it of a wholesale house. It cost 1s., and they sold it for 1s. 2d. per lb. Mr. Benson told him he must not sell such stuff as butter. He might describe it as a foreign compound equal to butter, or superior to butter. If he did so he would not be punished. The manager said that only 28lbs. of it had been sold, and no more would be offered. Mr. Benson fined defendant £5, and 12s. 6d. costs.

At the Petty Sessions, Southampton, the sitting magistrates being the Mayor (H. Abraham, Esq.), Dr. Hearne, Alderman Tucker, J. H. Cooksey, and S. M. Emanuel, Esqs., Mr. William Henry Rogers, grocer, of Queen's Road, was summoned for selling adulterated butter. Evidence of the purchase having been given, the analyst's report stated the butter in question to be adulterated with foreign fat to the extent of 74 per cent., but the article was not injurious to health. Dr. Hearne said the statement coming from a non-medical man that this butter was not injurious to health he could not accept. Mr. Rogers pleaded guilty to the charge, but he said he was perfectly innocent that he was selling an adulterated butter, he having bought it from a respectable London firm as genuine Normandy, and retailed it at 1s. per lb. The Bench said there were extenuating circumstances, and if the defendant had obtained a warranty he would have had a remedy against the merchant he purchased it from, or, if he had described it to his customers as an adulterated article, he would have complied with the Act and escaped the penalty. As it was, he would be fined 10s. and costs.—Mr. Richard Odell, grocer, of Cambridge-terrace, was also summoned for selling coffee not being of the nature, substance, and quality demanded. The certificate of Mr. Collis, the Borough analyst, described it to contain chicory in quantity amounting to 32 per cent. Defendant pleaded guilty, but said he sold the article as he had received it. The magistrates told him if he bought it as pure coffee (the seller representing it as such), under the Act he had a remedy against the person he purchased it of; but if he was aware that he was selling a mixed article he should have labelled it as such. The Bench inflicted a fine of 10s. and costs.

At the Hull Police-court, before T. H. Travis, Esq., stipendiary magistrate, Thomas Stainton Cartwright was summoned for selling a quantity of butter which was not of the nature, substance, and quality of the article demanded by such purchaser. Mr. Todd, town clerk, prosecuted. It appeared that on the 28th ult., Mr. Dale, nuisance inspector, obtained from the defendant 1lb. of butter for analysis. He asked for butter, and was served with a quantity, for which he paid 1s. After the purchase was made the inspector said that it was for analysis, and the defendant said, "Oh, dear me! It is butterine. What can I do?" and added, "It's no use kicking against the pricks." The analyst reported that the compound did not contain any real butter, but was a manufactured article to imitate butter. It also contained iron, probably from the colouring matter used. 95.43 was insoluble fatty acids in fat. Mr. Todd said that he was told that about a million hundredweight of the compound, which was called butterine, had been imported from America. It was made from the refuse of cottonseed, so he was given to understand. In its normal state it was frightful to look at, but by certain processes it was converted into a beautiful compound, like lard, and, being coloured to look like butter, it was sent to this country. Mr. Todd added that the defendant admitted the offence. In the course of the case Mr. Travis read some extracts from a circular which had been handed to him. It stated that the "extreme scarcity and consequent high prices of butter rendered 'Normandy Oleine Butter' in largely increased demand. . . . It was almost unaffected by the weather, and had no strong wintry rankness, inevitable in the lower qualities of Normandy butter, being always alike sweet and uniform, leaving no tailings as with the irregular Canadian or States shipments. Its keeping qualities were better than those of common butter; the more salted brands of the cheaper sorts would stand quite good for two months and longer. The shade of colour could always be easily adapted to the requirements of a district, from the pale straw colour to the deep lively shade of Irish. . . . The Oleine butter was cleanly and taking to the eye, easily manipulated on the counter, and lastly, though not the least important, if sold to the consumer as 'Oleine butter,' according to most eminent counsel's opinion—it was strictly in accordance with the requirements of the Food and Adulteration Act, and no retailer had ever yet been convicted for thus selling it." The circular created much amusement in court. After reading it, Mr. Travis told the defendant that he had not only acted illegally, but foolishly, for he had not even followed the directions of the wholesale dealer, which told him how to evade the law. The defendant said that the circular was not his, and he had never seen it. He was fined 60s. and costs.

Robert Coulson, provision merchant, was also summoned for a similar offence. Mr. Todd prosecuted and Mr. Summers defended. Mr. Todd said that on the 25th ult. Mr. Dale, the inspector, visited the defendant's shop, with his assistant, Mr. Osborne, for the purpose of obtaining butter for analysis. Defendant's son was in the shop, and on Mr. Dale asking for a pound of butter he said that they had no butter in the place. The inspector looked round, and saw a tub marked "Oleine Butter." He obtained a pound of it, for which he paid 10d. The defendant came in at

the time. On analysis the article was found to contain  $91\frac{1}{2}$  per cent. of foreign fat, and the analyst described it as butterine of a very low character. Mr. Dale deposed to these facts. Cross-examined by Mr. Summers, witness said defendant's son told him that he did not sell the article for butter, but for "butter and what was in it," and the defendant said that he had no butter he could guarantee. There was a label on the tub bearing the words, "Normandy Oleine Butter," and a placard in the window stating that the article could be obtained inside the shop. Defendant also said that he did not sell any Oleine butter without enclosing it in paper, on which was printed "Finest Butterine." Dr. Holden, the medical officer of health, deposed to seeing a fixed board, between defendant's shop and the next one, on which were the words, "Coulson's noted shop for choice ham, bacon, butter, and lard," and on a bill posted in the window, "Prime grass butter, a shilling a pound." By Mr. Summers: He did not know whether the board and bill were exhibited on the 23rd ult. After some evidence from Mr. J. Baynes, jun., analyst, who said that  $8\frac{1}{2}$  per cent. of the article was genuine, Mr. Summers addressed his Worship for the defence, contending that the defendant had not misrepresented the butter, but that he had properly described it. Mr. Travis said that he was of opinion that in defendant selling the butter as "Normandy Oleine butter" he was attempting to deceive; and, secondly, that he had no right to use the words to a thing which contained  $91\frac{1}{2}$  parts of foreign fat. If they wanted to sell these things let them sell them under names which could not deceive. They had no right to say "Oleine butter" or any other kind of butter unless the article was in a great part genuine butter. He was of opinion that in that case the article was not of the substance demanded. If defendant sold the article he must describe it by a name which would not deceive. To sell it properly defendant must put up a notice, "Not sold as butter." He respited judgment. Mr. Summers said the case was one of great importance, to manufacturers particularly. He did not know what instructions he might receive from his client, but he might have to ask for a case. His Worship said that whilst judgment was respited he could not grant a case, but if the defendant persisted in selling the article as he had done, calling it butter, he would fine him the full amount the law allowed, and then grant a case if asked for.

William Shaw, provision merchant, was summoned for selling as a pure article 1lb. of "Irish butter," the same consisting of two parts of butter and one part foreign fat. The town clerk prosecuted. Mr. Laverack defended, and admitted that it was sold to Mr. Dale as genuine Irish butter. The defendant expected it was so, inasmuch as he had bought it as being a pure article, and paid the highest market price for it. Mr. Laverack said he had a telegram from the seller in Ireland, which offered "extra fine lumps of Irish butter." Evidence was called to prove that in the trade those words were looked upon as being a guarantee of the purity of the butter purchased. The question was raised on behalf of the defendant as to whether the telegram amounted to a written warranty; if so, Mr. Laverack contended that he was entitled to be dismissed. Mr. Laverack further said that if the Court did not think that it amounted to a written warranty the defendant still had the power of proceeding against the original vendor. It was stated that the butter cost the defendant 1s. 1d. per lb., and he sold it at 1s. 2d. per lb. Mr. Travis said he thought the defendant practically had a right to offer the butter as a genuine article on the strength of the telegram. His Worship dismissed the summons.

**ADULTERATED OATMEAL.**—The adjourned case of summons against Mr. E. Heelis, of West Bromwich, for selling adulterated oatmeal, came on for hearing before Mr. James Watson, Mr. Williams, and Mr. Ralph Heaton, the sitting magistrates, on the 7th ult. It will be recollected that this prosecution was instituted by Mr. Horder, and the analysis of Mr. Jones showed that the oatmeal contained 24 per cent. of meal, chiefly barley. A reference to the authorities at Somerset House was asked for, and granted. On Saturday last the certificate of Mr. Bell and others showed that there was 22 per cent. of meal (not oat) in the article. The magistrates fined the defendant 10s. and costs. Mr. Tanner explained to the Bench that Mr. Heelis had purchased the meal in the good faith that it was pure, and the millers who had sold it also considered it good oatmeal; but the defendant had determined not to purchase any more without a guarantee, neither would he continue to sell it.

At the West Hartlepool County Police Court on Monday, John Cranston was summoned for selling adulterated oatmeal. Mr. Marley proved purchasing one pound of oatmeal at the defendant's shop, on the 10th inst., a portion of which he forwarded to Mr. Edger, the County Analyst whose certificate, showing that the article was adulterated with 4 per cent. of barley, he now produced.—Mr. Cranston said he sold the oatmeal as he purchased it, and inquired if he had any remedy against the merchants.—The Bench replied not, unless he had a written warranty from the vendor, which they advised him and other tradesmen to obtain when buying articles liable to adulteration. As the case was not a serious one, the Bench imposed a fine of 1s. and costs only.—Mr. R. C. Black was then charged with a similar offence. The certificate of the Analyst was put in, showing that the oatmeal in this case was adulterated with ten per cent. of barley. In answer to the charge Mr. Black said that since receiving the summons he had communicated with the parties from whom he purchased, who guaranteed the purity of the article, and who requested an adjournment in order to contest the case. The application was agreed to.



At the adjourned hearing it was stated by the defendant that since the first hearing he had sent two samples to be analysed, but had been advised to ask the Bench to have it analysed first.—This Mr. Superintendent Marley said had been done, as had been proved last week when it was stated that the amount of adulteration was 10 per cent.—Mr. Black said that he had sold the oatmeal just as he bought it, and he wished that the Bench would deal with the case as they saw fit; and their Worships, believing that the defendant had not been guilty of act of fraud personally, thought a nominal fine of 10s. and costs would fully meet the justice of the case.

**ANOTHER EXCUSE FOR WATER IN MILK.**—At a recent meeting of the Nenagh Board of Guardians the wife of the late milk contractor to the workhouse sent in a declaration with regard to the purity of her milk from water, though Dr. Cameron, on analysis, pronounced a sample sent to him to contain 10 per cent. of adulteration. She further declared that if by analysis or testing, her milk showed any portion of water, it must have been produced by the milch cows having been fed in the early part of April on mangold wurtzel. The defendant was fined £2 10s. and 10s. costs, on the production of the certificate of Dr. Cameron, that the milk supplied contained 10 per cent. of water. Commenting on this case, the *Nenagh Guardian* says—"We are aware that the leaves of the mangold are much relished by cows, and produce an abundant flow of milk without any bad flavour, though its richness may be doubted, but we never before heard or read of mangolds as a water adulterant."

At Belfast there has been a conviction for the sale of milk of sulphur under the name of precipitated sulphur, and after a long argument the bench imposed a penalty of £20. On being subsequently appealed to, however, the bench reduced this to £2 10s.

**AT MARYLEBONE** John Gillman, of 10, Dorset Street, Joseph Miller, of 139, Seymour Place, Charles Lewis, of 113, Crawford Street, and Frederick Ubee, of 18, Spring Street, were summoned for selling milk diluted with water. Mr. Greenwell, solicitor, and Clerk to the Vestry of St. Marylebone, prosecuted; Mr. Ricketts defended Miller. Ubee's case was adjourned, as he was not in attendance. The water added in the other cases was not large, and the defence set up in each instance was that the milk was sold in the same state as it was received from the wholesale dealers. Mr. Cooke told the defendants that that was no excuse, as they were liable under the Act. It was somewhat hard upon them, as they were made answerable for that which in a certain degree they could not control. The defendants were each fined 5s. and costs.

At the Bradford Borough Court three persons were recently prosecuted for the sale of diluted sweet spirit of Nitre. The defendants were Stephenson Brothers, grocers, George Batty, herbalist, and J. R. Lund, chemist. The three samples tested contained respectively 26 per cent., 27 per cent., and 20 per cent. of water more than the standard. They were almost tasteless, and gave but very faint indications of the presence of nitrous ether. For the defendant Lund it was argued that a weaker spirit of nitre than the standard was a regular article of sale. This had been sold at 2½d. per ounce, at which price the standard article could not be obtained. The magistrates imposed a fine in each case of £1 and £3 10s. costs.

*The Estimation of Nitrogen in Nitrates.*—The method recommended by Thorpe, in his *Quantitative Chemical Analysis* for the determination of nitrogen in nitrates, has been examined by S. W. Johnson, of Yale College. The plan referred to consists in reducing compounds containing nitric acid to the form of ammonia by the use of strips of zinc covered with copper, by the "couple," in short, devised by Gladstone and Tribe. The author gathers from Thorpe's paper, that "the results are such as apparently establish its great exactness, while in simplicity and ease of execution it would seem to be quite superior to the similar methods which have been previously proposed." The first determination which Johnson made by Thorpe's process showed a deficiency of 45 per cent. In a second experiment nitric oxide was evolved, "the standard acid not only not being neutralised by ammonia, coming from reduction, but made more acid by the reaction of nitric oxide upon the oxygen and water of the condensing vessels." In the third and fourth experiments the results were equally unsatisfactory. The author then made three determinations by Bunsen's method with zinc-iron couples and caustic potash, and obtained concordant and perfectly satisfactory results, the numbers, it should be stated, being uniformly 0.3 to 0.6 per cent. under that required by theory.—*American Journal of Science.*

**ANALYSTS' REPORTS.**—At the Staffordshire Sessions on the 2nd inst., it was stated that 192 samples had been delivered to the county analyst in pursuance of the Sale of Food Act, and of these articles fifty-three were reported to be adulterated. In the prosecutions, numbering thirty-three, only seventeen had been sustained.

At the Warwickshire Midsummer Sessions, on the 3rd inst., Dr. Bostock Hill, the county analyst, reported that he had analyzed samples of food supplied to him by the inspector for the Meriden District. The teas were all genuine, but six out of seven samples of coffee were adulterated with chicory. The samples of cocoa were such only in name, consisting almost entirely of sago, starch, and sugar. Mustard samples were all of good quality, excepting two which were adulterated. Of eleven samples of pepper, only one was a little adulterated. Flour, bread, butter, oatmeal, sweets, and biscuits were all genuine. Ale was found to be genuine, except one sample, which contained a small quantity of salt. Two samples of brandy were genuine, and two under proof. The sample of rum was 30° under proof. Port wine, sherry, and peppermint were all genuine. Of eighty samples, fourteen were adulterated, the percentage being 17·5 per cent., as compared with 17 per cent. in the last quarter. These results, the analyst stated, were obtained in the district of Meriden, but he believed that a greater degree of adulteration prevailed in other districts. The report was quietly laid on the table, and did not elicit a single remark.—

The quarterly report of the Salford Borough Analyst states that, among others, seven samples of butter and three of pickles were examined, and of these, three samples of butter were found to be adulterated.

Dr. Hodges, of Belfast, reports that he has analyzed 131 samples from the borough of Belfast this year, and 96 samples from the County of Antrim; among other cases mentioned, a druggist has been fined £10 for refusing to sell sulphate of quinine.

Mr. A. J. M. Edger of Newcastle, reports having examined 180 samples during last quarter, of which 52 were adulterated viz. 10 samples of milk, 1 of butter, 1 of lard, 11 of oatmeal, 9 of pepper, and 20 of spirits.

---

#### THE SALE OF DISEASED MEAT IN DUBLIN.

A DISPUTE has lately arisen between the Guardians of the North Dublin Union and Dr. Cameron, the City Analyst. The facts of the case are that the Guardians' Inspector authorised the sale of the carcase of an animal slaughtered for pleuro-pneumonia, and that Dr. Cameron condemned the meat as unfit for food. At a recent meeting of the Guardians it was stated that beasts slaughtered in different stages of pleuro-pneumonia were sold in London as food under the Cattle Diseases Act. To this absurd statement Dr. Cameron gave a positive denial. The Chairman seemed to consider that the opinion of a veterinary surgeon as to the wholesomeness or unwholesomeness of the flesh of an animal more or less diseased was of equal weight with that of a physician. The majority of the Guardians agreed with their Chairman, and resolved, by a majority of 9 to 2, that it was desirable that a referee should be appointed to decide between the Inspector and Dr. Cameron, in cases where they differed in opinion. So the matter stands at present, but we understand that the whole subject will be brought before Parliament by Dr. Cameron, M.P. for Glasgow. The conduct and opinions of the majority of the Guardians cannot be too strongly condemned, and it is fortunate that the magistrates of Dublin, when dealing with cases in which diseased meat has been offered for sale, prefer the opinion of a physician who is withal a competent man to that of a veterinary surgeon.

---

#### POISONING OF FOURTEEN MEN BY SUGAR CONTAINING ARSENIC.

ABOUT ten days ago, our readers will remember, the Glasgow papers published the report of the officials of the Board of Trade who had been appointed to enquire into the circumstances attending the deaths of six of the crew of the ship *Crown Prince*, and the dangerous illness of eight other men on board that vessel, from suspected poisoning during her voyage from London to various ports on the coast of South America in the latter part of last year. Their report attributed the illness of the men to their having eaten some semi-putrid pork, a barrel of which was proved to have been served out to them about the time of their illness. This theory failed to account fully for the circumstances of the case, inasmuch as one of the men who died was sworn never to have touched the pork, and several other persons on board also suffered from the symptoms of irritant poisoning without having eaten any of it. The captain attributes the illness and deaths to something in the sugar used by the men, stating that none but those who had partaken of the sugar had ever been affected. In consequence of this statement of the captain, before the opening of the Board of Trade inquiry the owners of the vessel requested Mr. Tatlock, the city analyst, to make an examination of the sugar, and, on doing so, he found there was mixed up in it a large amount of arsenic. On a further analysis, so great was the proportion of that poison found to be that a pound of sugar

contained nearly  $13\frac{1}{2}$  grains of arsenious acid, or about enough to kill two men. The theory of arsenical poisoning by means of this poisoned sugar perfectly explained some of those facts in the case which were not in accordance with that of poisoning by putrid pork. It explained, for example, how those who used the cabin supply of sugar, which was pure, had not been affected, while every one who had partaken of the fore-castle supply had suffered. It explained how the cook and his wife had sickened through partaking of some sauce sweetened with this fore-castle sugar, and it explained how a crew shipped at Monte Video had suffered from sickness, although the bad pork had not been served up to that time. It further explained how one member of the crew who used no sugar had escaped altogether. The result of Dr. Tatlock's analysis was, we believe, communicated to the Board of Trade officials, who for some reason or another in their report, although incidentally referring to the captain's allegation that the sugar used by the men was poisonous, make no further allusion to the matter, and, as has been said, attribute the fatalities entirely to bad pork. Dr. Tatlock, in consequence of their report, put himself in communication with the officials of the Board of Trade, who replied to him that they had forwarded his statements to London, along with their report. Many days having elapsed, however, and nothing further having been heard of the case (possibly owing to the absence of the President of the Board of Trade from his office, in consequence of his recent bereavement), Dr. Tatlock communicated with the members for the city, requesting them to take what steps they considered proper in the matter. In consequence of Dr. Tatlock's letter, Mr. Anderson yesterday had an interview with Mr. Stanhope, Secretary to the Board of Trade, who, we believe, at once put himself in communication with the Board of Trade officials in Glasgow, and the probability is that the inquiry will be re-opened.—*North British Daily Mail.*

---

#### NOTES OF THE MONTH.

We reprint the report of a case of oatmeal mixed with barley which is especially interesting as showing a wonderful concordance in two separate analyses. Mr. Jones reports "24 per cent. of meal chiefly barley," and the inland revenue chemists find "22 per cent. of meal not oat." This is the more satisfactory when we consider that in such microscopic determinations there is really room for considerable divergence of opinion as to quantities.

---

Here is a delicious little piece of ingenuousness from a trade journal: "In fact the analytical star has not shown very brilliantly of late, and *the more it is obscured the more we shall like it.*" No doubt, Mr. Grocer, because it is evident to the meanest comprehension that turning the honest penny by selling chicory and flour for the price of coffee and mustard respectively is really a remunerative undertaking. If by the analytical star shining our friend means convictions for adulteration, then we would respectfully suggest a simple and efficient means of making it set altogether. Let him persuade the persons he represents to stick to the letter of the law, and always sell that which they pretend. If the traders would only do this, no body of persons would be more thankful than public analysts, who do not relish wasting their time in police courts more than is absolutely necessary for the carrying out of the duties imposed on them by the state.

---

Listen to the latest scoundrelism of that worst of monsters the Public Analyst. Not content with honestly seeking his prey, "it is observed," says the Grocer, "that, as a rule, samples are taken from the shops of the smallest traders, it being apparently presumed that there will be less trouble with them than with those in a more substantial position." It is really a pity that such a profound and masterly exercise of the talent of observation should stop short of noticing the fact that the monster has nothing whatever

to do with the collection of samples, and cannot, even to satisfy his terrible greed for victims, in any way interfere with the work of the inspectors, who are perfectly independent officers, and would resent his slightest hint as to the performance of their duties.

---

We are not so sure, after all, that Government support of science is an unmitigated blessing. Earnest workers, at their own cost, will always be found, but immediately it becomes a question of giving away money, so soon does jealousy and all uncharitableness arise in the breasts of those interested. The tendency of any Government is to dispense its favours to those best known to the men in power, and consequently we have certain persons eating the oyster while only the shells fall to their less fortunate brethren. It is not to the poor and struggling man of science that the prizes fall, but to those already enriched, and who for the time become poor on paper, and, like the eminent head of the Challenger expedition, unable to earn any money by "literary or other employment." Those interested in fairly considering the matter should read the articles which have lately appeared in the *Echo*, and we think that on the broad question, and putting aside all discussion as to jobbery in any particular case, they will agree with us that science were better left to be self-supporting, than subsidised for the benefit of the few and the neglect of the remainder. It is not to the credit of men of science that a journal should even have a *prima facie* case to call forth such comments as those invoked by the Challenger expedition and by the doings at South Kensington. The list we publish of fortunate recipients of a portion of the £5,000 granted by the Government will very probably call forth further remarks.

---

If only a tithe of the terrible letter which has appeared in the *Medical Examiner* of 12th July be true, then the present system of making bread is, to say the least, utterly repulsive. The picture of half-naked men throwing cockroaches and other even more disagreeable insects at each other in play, and then plunging half-naked and all dirty into the dough, while they add to it flavouring ingredients in the shape of perspiration, and neglect the use of pocket handkerchiefs, is not at all appetising. No wonder that, after making the dough in such dens of dirt, the bakers are tempted to add a little alum to whiten the sepulchre. Surely bread-making by machinery would be demanded if the public understood the case, and meantime have we no Government provision for the inspection of bakehouses, so as to at least ensure ventilation and cleanliness?

---

It is, of course, acknowledged by everyone that the process of manufacturing white lead is necessarily an objectionable one, and dangerous to health, but it is really astonishing to find what singular inventions are brought forward from time to time with the object of preventing its injurious effects. Among the latest of these we have seen is a process invented by a Mr. Thompson, who, with a cool ingenuity which is quite refreshing, and an equally remarkable ignorance of the process which really takes place in a white lead stack, seems to think that all that is necessary in order to make white lead is to bring metallic lead into contact with carbonic acid. Consequently he builds a gas-tight chamber, with doors at each end, and a line of rails running through it. On these rails a carriage runs, and the metallic lead, in some way not very clearly defined, has to be stacked on to this carriage, which is outside the chamber, and the

carriage is then run along the rails into the chamber. The doors are to be closed, and the carbonic acid gas pumped, this pumping apparently to be continued without intermission until the whole of the lead has been carbonated or converted into white lead, *i.e.*, probably for some three months. Mr. Thompson's ingenuity, however, does not stop here, for in order to prevent any possibility of the carbonic acid gas being wasted by acting on the chamber itself, the cells are to be lined with glass. We need hardly say it will be many years before such a process as this is taken up.

---

Another ingenious inventor thinks that the principal cause of injury to health which occurs in white lead manufacture results from the dust rising from the pulverised white lead adhering to the skin, and being to some slight extent absorbed. No doubt this is partly true, but his remedy is certainly unique. The hands and face, in fact all parts of the body exposed to dust are directed to be washed three times a day in petroleum. We think that, like the last-mentioned invention, it will be a long time before this practice comes into general use.

But considering such statements as these, which are made on the authority of respectable journals, it really seems necessary to repeat, what every white lead maker ought to know, that the best remedy to prevent injurious effects among the workpeople is to insist upon thorough washing with plenty of soap and water, carefully avoiding anything in the shape of an alkali, adding, if anything, a few drops of sulphuric acid to the water in order to give it a slight acidity, and also adding a few drops of acid to the water which the workpeople drink, as sulphuric acid converts the lead, in whatever form it may be, into an absolutely insoluble substance, and therefore of course prevents its being injurious.

---

The subject of the payment of analysts by coroners is one which requires a most careful consideration at the hands of our legislators, when the whole question of Coroners' Courts comes up in Parliament. We are glad to see that the *Lancet* has taken the subject in hand, as we could tell some startling stories of analysts who have been obliged to waste days of valuable time in long and disgusting researches on semi-putrid matter, and then have been kept waiting for years for their fees, until, out of patience, they had to resort to the extreme measure of a summons. When a coroner believes an analysis necessary, he should be instructed to send the article, with a certificate to that effect, to the public analyst for the district in which the enquiry occurs, and on tendering that certificate at the offices of the county, the analyst should receive a fixed sum of so many guineas per day, according to the time he is employed in the analysis. We commend this to the notice of those at present considering the reformation of "CROWNERS' QUEST."

---

Space will not allow us to refer fully this month to a recent article in a scientific contemporary—an article evidently written with the object of supporting the proposed organisation scheme, but we give one quotation, which, coming from so favourable a quarter, will, we hope, be duly appreciated by those whom it concerns:—"The originators of this movement were *not* certainly and strictly speaking, professional chemists." Comment is needless, as this is one of the main grounds of objection to this proposed organisation scheme.

## RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
903*	J. Cammack and A. Walker ...	Manufacture of Sulphates of Soda and Potash ...	4d.
4420	G. W. Von Nawrocki ...	Manufacture of Sugar ... ..	6d.
4461	J. C. L. Loeffler and R. W. Higgs	Electric Telegraphs ... ..	6d.
4526	G. Symes ... ..	Apparatus for Manufacturing Gas, &c. ...	6d.
4659	J. and J. Kidd ... ..	Manufacturing and Carburetting Gas ...	2d.
4576	C. F. Mathieson... ..	Manufacture of Gas ... ..	6d.
4595	W. R. Lake ... ..	Electro-Magnetic Engines... ..	6d.
4613	W. Young ... ..	Manufacture of Illuminating Gas... ..	2d.
4636	P. Moritz ... ..	Electric Night Signal Apparatus ...	6d.
4655	J. S. Butler ... ..	Preparation of Aniline Dyes ... ..	2d.
4721	E. Rumbold ... ..	Purifying Sewer Gas ... ..	2d.
4751	F. T. Bond ... ..	Production of Sulphurous Acid Gas ...	2d.
4758	D. McKechnie ... ..	Treating Oxides of Iron ... ..	2d.
4779	W. P. and C. E. Cherry	Manufacture of Gas ... ..	2d.
4791	A. Graham ... ..	Obtaining Fatty Matters from Sewage, &c.	2d.
4805	R. Werdermann... ..	Electric-Light Apparatus ... ..	6d.
4806	J. W. Bantock ... ..	Manufacture of Nitro-Cellulose ... ..	d.
4848	G. Rydell ... ..	Treating Sewage, &c. ... ..	4d.
4900	J. J. Hicks ... ..	Thermometers ... ..	2d.
4964	E. Simmonds ... ..	Composition for Rendering Walls Impervious and Damp Proof ... ..	2d.
5007	W. Morgan-Brown ... ..	Preparing and Applying Oxygenated Air for Combustion	4d.
1877.			
91	E. Solway ... ..	Manufacture of Hydrochloric Acid ... ..	2d.
171	Ditto ... ..	Utilising Silicates and Aluminates of Lime and Magnesia	4d.
952	S. Hallsworth and R. Bailes	Treating and Clarifying Sewage ... ..	4d.
1423	W. R. Lake ... ..	Machinery for Manufacture of Sugar ... ..	6d.

*Sale of Food and Drugs' Act, 1875.*—Three members of the House of Commons have brought in a Bill to amend this Act. Its general purport is that in determining whether adulteration is committed by diluting spirits with water, regard shall be had to the price at which the spirits so diluted are sold. This is certainly a new phase of the adulteration movement, and we shall be rather glad to know what will be the next.

## BOOKS, &amp;c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The American Chemist; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Miller; The Anti-Adulteration Review

A correspondent writes, "Excuse the suggestion, but I think that analysts might each in their own district keep you properly informed of any information specially interesting to the members of the Society." We can only say that we wish they would do so, for such information would be of great value to the Society.

We have received a letter signed "B. Sc." with reference to Mr. Allen's paper on "Potable Waters." We shall be happy to publish the letter on receiving the writer's name and address.

# THE ANALYST.

## ORGANIZATION AMONGST CHEMISTS.

WE have previously referred in these columns to a scheme which has been some eighteen months under consideration, for promoting organization amongst chemists, and we have, upon several occasions, given space to correspondents to point out the defects which they thought existed in the scheme. Some of our remarks, or the remarks of our correspondents, appear to have given offence to one of our contemporaries, who has recently warmly defended the scheme at present proposed, and who, by implication, charges us with breach of confidence in publishing private information, or information surreptitiously obtained on the matter. We emphatically deny this charge. All the information we have published has been obtained in the same honourable way as any other journal could have obtained it, if it had thought fit to do so.

Our own views on the matter are the same as they have been from the commencement. We quite agree that organization among *professional* chemists is in a general sense desirable, although the necessity for it is not perhaps so paramount as some would seem to think. A remark made at a meeting which has taken place in connection with the subject appears to us very much to the point. One of the speakers, a chemist of eminence, and a member of the organization committee said that "most of his correspondents who were anxious for the promotion of the scheme had a grievance, but the grievance was chiefly that they had not work enough to do."

We differ distinctly from the promoters of the "Institute of Chemistry;" first as to the objects which it can immediately accomplish. The promoters think *they* can discriminate between competent and incompetent chemists, and at once sift the wheat from the chaff so effectually, as to obtain the full confidence of the public, and drive the unfortunate chemists (?) whom they have, (by refusing to admit them as members of the Institute,) dubbed incompetent, to seek "fresh fields and pastures new." We have asserted from the first that they are unable to do anything of the kind. Men of business, who are the principal clients of professional chemists, are quite able to judge for themselves, as to the competence or incompetence of those whom they employ, and it will be many years before the Institute, even if it be formed at all, will exercise any appreciable influence in this direction. The only real foundation upon which the Institute can be started is, that every analyst who has been in practice for say one year, and who cannot be proved to have been guilty of unprofessional conduct, whatever that may mean, should, if he so wish, be admitted as a member. The Institute will thus be formed in precisely the same way as the Medical and Pharmaceutical Professions were organized, and the Society of Public Analysts was formed, the condition however being, that all who desire to claim admission on these terms, *i.e.*, compulsory admission, must do so within some definite time, say within three months of the formation of the Institute. After that time every fresh applicant for admission, whether he bears an honoured chemical name or is a young and unknown aspirant for scientific honours, should be compelled to pass a certain examination, and that examination once passed, his title to the advantages of the Institute, whatever they may be, should be as clear and indisputable, as the title of a man who has passed the proper examinations at the London University is to his B.Sc. degree.

In the second place we differ from the promoters because we hold that if such an Institute as this is to be of any use at all, it should not be a miscellaneous body, composed of men of science and men of letters, but must be strictly confined to *professional* chemists. We shall, of course, be expected to give a definition of what we mean by professional chemists, and our definition shall be a plain one; we understand by the term, men who earn an income, even if it be a poor one, (we will not say a *living*, or we should exclude many of those who might otherwise be eligible,) purely by the practice of professional chemistry as distinguished from pharmacy. We need hardly say that this definition would exclude many of the promoters of the present scheme.

It is not at all surprising that having made these two fundamental mistakes, the promoters should in their attempts to launch this scheme have fallen into others only a trifle less serious. Having come to the conclusion that such a scheme was desirable, their first step was to call a meeting, and this meeting, which was to consider the whole subject, should of course have been a public one, open to every professional chemist in "Great Britain and Ireland," instead of which it was convened by a private circular, which appears to have been sent to few beyond the personal friends of the promoters; and although men of undoubted scientific attainments, but who were *not* professional chemists, were present, and even our continental *confreres* were represented, the meeting consisted of only about 40 persons; while some dozen or so well-known professional chemists whose names have appeared in the *London Directory* for years, and twice that number of provincial chemists were conspicuous by their absence. It might be urged that they were absent because they had no wish to be present, but in many cases we have found that it was not so. The meeting was in fact a gathering rather of theoretical chemists, than practical analysts.

A copy of the circular fell into our hands, and we sent our representative to report the proceedings, but—mistake again—he was told it was a *private* meeting, and although it was "not possible to prevent his reporting it, yet it would be looked upon as a great "breach of confidence," if he did. We did not report that meeting, but in front of us as we write is the transcript of the shorthand notes then taken, and after all that has occurred we can scarcely consider we are any longer bound to view them as private. At this meeting a small committee of 11 was nominated, but the names were not separately put to the vote. At the conclusion, it was stated that all present would receive a notice of an adjourned meeting to receive the report of this Committee, but—mistake again— notices were not issued, or at any rate were not received in accordance with this statement. The adjourned meeting also was a *private* one, and although we knew of it, we declined to send our representative.

So on with all the ordinary meetings of this body, and yet in the notice of one, now lying before us, we find the first words are, "The adjourned general meeting to consider "the subject of organization of the chemical profession will assemble." *General* and *private* are hardly synonymous terms, yet on the corner of this printed notice of a "general meeting" appears in writing the word "private." Comment is needless.

Nevertheless these "private" "general" meetings have been held, and the gentlemen attending them have appointed a committee of some 50 of their friends to carry the scheme through—mistake again—these 50 may be and perhaps are, the 50 most clever, most competent, and most successful chemists in the country; but if this is so, there can be no doubt that if a public meeting of their *confreres* had been duly summoned, these 50



gentlemen would have been elected, and they would then have held office by a public vote instead of a private vote, if any at all. Again, this committee having selected their officers, instead of at once calling a meeting and forming the society, and taking the opinion of the general body of professional chemists as to the future steps to be taken, trusting in time to secure a Royal Charter, if the Society should be found to merit it, arranged instead to register themselves as a Limited Liability Company, with a Board of Trade License, (if they could obtain it,) to omit the word "Limited," so that the title really should be "Institute of Chemistry, Limited." Fancy the Geological or Astronomical Society in such a position as this, and yet if this Institute is to go on at all, it should occupy a position, at least, as important as either of these two societies. But space will not allow us to continue; we have pointed out much, but we could say more. Our contemporary really argues strongly in favour of the views we have taken; his own words are "The originators of this movement were not certainly and strictly speaking professional chemists, or *at least some of them were not.*" The italics are our own.

One word of advice and we have done—mistakes, and grave mistakes have been committed, let them be at once rectified, it is not too late even now. Let a Public Meeting be duly convened by advertisement and circular to every professional chemist in the kingdom, and the matter be fully discussed; a really representative committee should then be elected by ballot, which committee would have the confidence of the profession. They can then go on, with strength instead of weakness, and, if fortune favours them, fairly achieve the object which we, as well as they, wish to see accomplished.

---

### THE SOCIETY OF PUBLIC ANALYSTS.

THE country meeting of this Society was held at Plymouth, on the 17th August, 1877, as usual, during the meeting of the British Association; the President, Dr. Duprè, F.R.S. in the chair.

The minutes of the previous meeting were read and confirmed.

The names of the following gentlemen were proposed for election as members, to be balloted for at the next meeting:

Louis Siebold, F.C.S., Manchester; Thomas Jamieson, F.C.S., Aberdeen; Thomas William Drinkwater, F.R.P.S., Edinburgh; James John Day, F.C.S., Derby.

The President delivered a short address, referring chiefly to the question of copper in preserved peas, and taking exception to the views of Dr. Paul and Mr. Kingzett, the authors of a paper on this subject, read at the Pharmaceutical Conference. Dr. Duprè cordially endorsed the opinion expressed in that discussion by Dr. Redwood and others, as to the danger of permitting the sale of peas, coloured with copper, unless specially labelled to that effect, when people who might be foolish enough to desire such an article would purchase it with their eyes open.

Dr. Muter, in moving a vote of thanks to the President for his address, took occasion to refer to a leading case in connexion with the subject in which he had been engaged, and where the magistrate, having convicted for the presence of copper, the defendant appealed to the sessions; but, when the appeal came on, withdrew it, on the ground that he could not get sufficient weighty evidence in his favour.

Mr. W. Thomson read a paper, "On the Incongruity of the mode generally adopted

of stating results of milk analyses," and a discussion ensued in which Dr. Muter, Mr. Allen, and Dr. Dupré joined.

Mr. Allen read a paper "On the Determination of Alcohol in Ether and chloroform," and Mr. Jarman, Mr. Fairley, and Dr. Dupré took part in the discussion.

Mr. Allen also read a paper "On the Detection of Strychnine," in reference to which a few remarks were made by Mr. Thomson and others.

The Secretary read a paper by Dr. Wynter Blyth, "On the Washing of Fats," the discussion on which was postponed, owing to the author's absence.

## ON THE INCONGRUITY OF THE MODE GENERALLY ADOPTED IN STATING THE RESULTS OF MILK ANALYSES.

BY WILLIAM THOMSON, F.R.S.E.

*Read before the Society of Public Analysts, at Plymouth, 17th August, 1877.*

FOR some time past it has occurred to me that the general mode of stating the results of milk analyses is illogical, and at all times places the analyst in a false position.

From the general mode adopted for making analyses of milk, analysts cannot, and have no right to say, that a sample is or is not adulterated with water, and they are equally unable to say whether cream has or has not been abstracted from the genuine milk.

It has been proved by many different analyses of genuine milk that the variation in its composition is so great, both as regards the fat and solids not fat, that no standard can be taken as representing the composition of genuine milk.

The total solids in genuine milk vary from  $10\frac{1}{2}$  to 15 or more, per cent. Up to the present time analysts have used standards, and have calculated from these standards the proportions of water added, and on this basis they say,—“This sample has been adulterated with so much water,” and “That sample is free from adulteration.”

The question I propose to bring before you is this. What is the law in these matters? Is it that it is illegal for any one to adulterate genuine milk with water; or is it that any one *may* adulterate his milk, provided he does not add too much water, *i.e.* that he does not dilute it below a certain standard?

Imagine the position of an analyst *versus* an inspector under two different and very possible circumstances.

In the first, suppose the latter sees a cow milked *dry* into a clean and dry vessel, and he takes a sample from it and sends it to the analyst, who finds it to be adulterated with water. In the second, suppose the inspector goes to a shop, and asks the vendor to sell him some milk; and presuming the latter, knowing that his milk is rich, says to the inspector, Sir! I adulterate my milk; and he forthwith takes three pints of his milk and one pint of water and mixes them together and sells part of the mixture to the inspector, who on sending it to the analyst receives a report to the effect that it is free from adulteration. What can be the inspector's opinion of the analyst? and yet, under the present state of affairs, such things may easily happen, but these only shew how the analyst may fall into public disrepute.

Here the effects of this objectionable mode of stating results do not end. If an honest man in a small town sell genuine milk, which is pronounced by the analyst to be

adulterated with water, the statement is published in the local newspapers, and the vendor suffers both pecuniarily and morally to a very marked degree. If adulteration of milk with water be an offence against the law, and the public be supposed to be injured by it, then the analyst, by his decided mode of expressing results, is constantly acting unjustly towards them, by passing adulterated samples; and if the "standard" method be recognized, then every milk seller ought clearly to understand that if he sell genuine milk, which should at any time happen to fall under the standard, he will be liable to be fined 5s. and costs, or possibly sent to prison for repeated offences against the Act.

If, again, the "standard" method be used, it would well pay a milk seller, who vends from 50 to 100 gallons of milk per day, to employ an analyst to analyse his milk two or three times a week, and from the results to add sufficient water to dilute the genuine milk to the standard, which necessarily must be low, and thus the public will have the satisfaction of learning that analysts, whom they have employed to protect them from adulteration, have secured to them an uniform supply of milk of low quality.\*

It seems to me, first, that adulteration of genuine milk with water, no matter to what extent, should be considered illegal, and secondly, that the seller should be prevented from vending abnormally poor genuine milk.†

In the first, it is easily within the power of the inspector and analyst to find whether or no water has been added to milk, independent of any standard, because if, after buying a sample of milk, the retailer be required to declare from what farm the milk was bought, the inspector of the district in which such farm is situated, may be communicated with and requested to see the cows milked and to take a sample of the mixture, which should be sent to the analyst side by side with the sample originally bought. The actual amount of added water could thus be calculated from the difference in the results, and magistrates could then have no hesitation in convicting, and there would, in such instances, be little chance of miscarriage of justice.

I was led to write this paper at the present time owing to the following circumstance:—A man waited on me and stated that the inspector had taken a sample of milk which he sold to him. It had been sent to Dr. J. Campbell Brown, who reported it to be adulterated with 8 per cent. of water. The man said he was certain no water had been added and that the analyst had made a mistake, and requested me to analyse a sample which had been left in his possession by the inspector. I did so. The milk was decomposed, and on analysis I found the total solids, and solids not fat to be exceptionally low, and wrote to him to that effect, stating that the analyst was justified in pronouncing it to be adulterated. I said, however, he had one mode of defence left to him, and that was, that I should see the cow or cows milked dry into a clean vessel and take a sample of the genuine milk for analysis, and if it coincided in poorness with the suspected sample, it could be stated in court that the milk was genuine.

I went to his house at 6·30 one morning, which was the general time of milking, he explained to me that one cow yielded four gallons of milk, which was sufficient for his custom, and only that cow's milk was sold. I went to the shippon with him and there saw a light roan colored cow, *apparently* in good condition. He assured me it was perfectly healthy. I saw it milked dry into a tin, and at once mixed the contents and filled two bottles from it, the one was sealed in presence of the owner of the cow, and immediately

\* This process has been carried on for a long time. (*Eds. Analyst.*)

† This is precisely what the law as at present administered does. (*Eds. Analyst.*)

afterwards I took both samples away, the sealed one I sent to Dr. Campbell Brown, who analysed and reported on the original sample, explaining the circumstances of the case; the other sample I submitted to analysis; both our analyses agreed in shewing that the genuine milk was of exceptionally low quality.

Dr. Campbell Brown very properly agreed to go further into the matter, and requested the inspector to see a sample taken from the cow and sent to him, this was done, and as it coincided with the sample originally analysed, the prosecution was withdrawn. The farmer a week afterwards forwarded to me the sample which had been left with him by the inspector, which I submitted to analysis, and the following are the results of these three samples obtained respectively by Dr. Campbell Brown and by myself, both our results coincide and serve to shew an exceptionally poor genuine milk.

	28th April, 1877. First Sample bought by Inspector.		May 14, 1877. Sample taken by Thomson.	Second Sam- ple taken by Inspector from the cow.
	Fresh.	May 9, 1877. Decomposed.	Fresh.	Fresh.
<i>Dr. Campbell Brown's results—</i>				
Fat ... ..	2·680	2·980	2·210	2·690
Solids not Fat... ..	8·297	7·321	8·190	8·503
Total Solids... ..	10·977	10·301	10·400	11·193
Ash ... ..	...	...	·682	·730
Specific Gravity ... ..	...	...	1·030	...
Cream ... ..	...	...	...	...
<i>My own results of the same samples—</i>				
Fat ... ..	...	Decomposed. May 15, 1877. 3·017	Fresh. 2·121	Decomposed. 2·953
Solids not Fat... ..	...	7·612	8·347	8·080
Total Solids... ..	...	10·629	10·468	11·033
Ash ... ..	...	0·614	·658	·712
Specific Gravity ... ..	...	...	1·026	...
Cream, percentage by volume ... ..	...	...	7·000	...

In the discussion which followed, Dr. Muter pointed out the necessity, which he had frequently urged in *The Analyst*, of considering the amount and constitution of the ash of any sample of milk which might be submitted for analysis, in addition to the usual examinations for solids not fat. He urged that an analyst should not take any single point in the constitution of a milk as an absolute standard, but should make a thoroughly full analysis and apply common sense in considering the whole of the results. He had himself, on five or six occasions, met with milks containing so low an amount of "solids not fat," that had he not taken pains to examine the amount and nature of the ash, he might have been led to condemn unjustly.

Mr. Allen considered that the addition of water to milk was not only objectionable, owing to the fraud practised, but also from the danger of spreading zymotic diseases by the employment of impure water.

The President, in summing up the discussion, remarked that what was wanted was the fixing by Parliament of definite qualities, below which, it would be illegal to sell both milk and spirituous liquors.

## NOTE ON THE DETERMINATION OF ALCOHOL IN ETHER AND CHLOROFORM.

By ALFRED H. ALLEN, F.C.S.

*Read before the Society of Public Analysts, at Plymouth, 17th August, 1877.*

SEVERAL chemists have pointed out that crystallized fuchsine (acetate of rosaniline,) was insoluble in pure anhydrous ether or chloroform, but that it imparted more or less colour to these liquids when alcohol was present.

On making the experiment I found that fuchsine readily coloured a sample of commercial ether. When the same sample was well agitated with dry chloride of calcium to remove alcohol and water, it lost the power of dissolving fuchsine, becoming tinged only very faintly, when shaken with the dye.

To employ the above facts for the determination of alcohol in a sample of ether, I operate in the following manner:—

A minute quantity of powdered fuchsine is placed at the bottom of a narrow test-tube, 10 c.c. of the sample of ether added, the tube corked and the whole agitated. If the ether be pure and anhydrous the coloration of the liquid will be almost *nil*. If the coloration be considerable, 10 c.c. of ether which has been treated with chloride of calcium, is placed in another tube of the same bore as the first, adding fuchsine as before.  $\frac{1}{10}$  c.c. of alcohol is then added to it from a finely divided burette, and the whole is shaken. If this quantity of alcohol is insufficient to produce a coloration of the liquid equal to that of the sample to be tested, a further addition of alcohol must be made until the liquids have the same depth of colour. The tint is best observed by holding the two tubes side by side in front of a window and looking through them transversely. The use of a piece of wet filter paper behind them facilitates the observation. It is well to permit the alcohol to drop right into the ether, and not allow it to run down the sides of the tube, as in the latter case it will dissolve any adherent particles of fuchsine, forming a solution which will be precipitated on admixture with the ether. For a similar reason it is not convenient to dilute the sample with pure ether so as to reduce the colour to that of a standard tint. In practice, each  $\frac{1}{10}$  c.c. of alcohol added from the burette may be considered as indicating 1 per cent. of impurity in the sample. Of course this assumption is not strictly correct, but the error introduced is insignificant when the percentage of alcohol is small. The method is very suitable for small proportions of alcohol, but becomes difficult to apply when the latter exceeds 5 per cent. of the sample, owing to the intensity of the colour. The results are within  $\frac{1}{4}$  per cent. of the truth. Occasionally the tints of the two liquids are not readily comparable, but on placing the tubes for a few minutes in cold water, this difficulty is overcome.

In attempting to apply the above method to the determination of alcohol in chloroform, I found that the latter liquid still dissolved fuchsine after treatment with chloride of calcium. By shaking with concentrated sulphuric acid it could be entirely purified from alcohol and water, but the product retained so much acid that it could not be directly tested with fuchsine. The acid could be got rid of by agitation with carbonate of potassium, but the chloroform so treated retained sufficient alkali to prevent the coloration by fuchsine. By employing dry precipitated carbonate of barium to eliminate the sulphuric acid, the chloroform was obtained so pure as to give only a very slight coloration with fuchsine, but the addition of a small proportion of alcohol readily caused

solution of the dye with production of the characteristic colour.\*

The method commonly described for determining the proportion of alcohol in ether is the agitation of the sample with water, with subsequent observation of the diminution in the bulk of the ether. This method appeared very unpromising in presence of much alcohol, but on investigating it, I was agreeably surprised to find that with certain precautions, it was possessed of considerable accuracy. The following are the details of the procedure I have found preferable.

A small quantity of fuchsine is placed in a Mohr's burette furnished with a glass tap, which is then filled with water and a small proportion of ether, a cork is next introduced, and the whole agitated. By this means a coloured etherized water is obtained, in which ether is quite insoluble, while alcohol readily dissolves. 10 c.c. of the etherized water are run into a glass tube holding about 25 c.c., and having divisions of  $\frac{1}{10}$  c.c., 10 c.c. of the sample of ether are next added, the tube corked, and the whole well shaken.

On the ether rising to the surface, its volume can be easily read off. Any reduction in its volume is due to admixture of alcohol. Thus each 0.1 c.c. lost, represents 1 per cent. of alcohol. If the proportion of alcohol in the sample did not exceed 20 per cent., the ether will be colorless, and the result of the experiment is correct; but if the proportion of alcohol is much above 20 per cent., the layer of ether is coloured, and the result is below the truth. The absence of colour therefore indicates the accuracy of the experiment. If the layer of ether be coloured, an accurate result can still be obtained by adding 5 c.c. of anhydrous ether, and again agitating. It is better, however, to dilute a fresh portion of the sample with an equal bulk of pure ether, and use the diluted sample instead of the original. By proceeding in this manner, the proportion of alcohol in mixtures of that liquid with ether can be ascertained within 1 or 2 per cent. with great facility. The process has been verified up to 60 per cent. of alcohol.

In all cases the proportion of alcohol must be deducted from the reduction in the volume of the ether, and not from the increase in that of the aqueous liquid. Care must be taken to prevent any volatilization of the ether.

---

## PRESENCE OF METALLIC COMPOUNDS IN ALIMENTARY SUBSTANCES.

By B. H. PAUL, Ph.D, F.C.S., AND C. T. KINGZETT, F.C.S.

*Abstract of Paper read before the Pharmaceutical Conference at Plymouth.*

1. INTRODUCTION.—Under the Sale of Food and Drugs' Act a number of prosecutions have been instituted during the last few years, having regard to the presence of metallic compounds in articles of food. Meanwhile, the knowledge possessed by either chemists or medical men as to the behaviour of such compounds upon the human system is extremely meagre. There can be no doubt that many mineral substances exercise a prejudicial influence upon health, but the measure and nature of this influence is in most cases an undetermined quantity, while it is probable that, owing to popular prejudices, a number of harmless substances are assumed to possess pernicious or poisonous properties.

---

\* In attempting to find a coloring agent more suitable than fuchsine for use with chloroform, methyl-aniline-violet was tried, with the curious discovery that this substance is exceedingly soluble in chloroform, with intense violet colour. So great is the affinity of methyl-aniline violet for chloroform, that this liquid readily removes it from its aqueous solution, when agitated with it.

Mr. G. Jarman informs me that he has observed the same fact, and has employed it for detecting the adulteration of indigo with methyl-aniline violet.

2. **PRESERVED PEAS AND COPPER.**—A popular food which has been most severely remarked upon is preserved peas. The quantity of sulphate of copper added varies between one and two grains of the ordinary blue sulphate to the tin of peas containing from  $9\frac{1}{2}$  to  $9\frac{3}{4}$  ounces of peas, and 150 c.c. of liquor. The question of what influence this copper has upon health is one which has been hotly discussed, and widely differing opinions have been expressed by medical men.

It appeared to us that in order to arrive at a proper knowledge of the physiological influence of the copper contained in preserved peas, it was desirable to determine the following points :—

- (1). Is the copper in mere admixture with the peas, or is it in actual combination?
- (2). Does it pass into solution under the influences of the digestive processes?
- (3). Is any part or all of the copper thus introduced in the stomach absorbed, or is it eliminated, and, if so, how?

3. **PRESENCE OF COPPER IN ORGANIC TISSUES AND PRODUCTS.**—Before proceeding to describe the experiments we have made relative to these questions, we may take note of the fact that from the time of Margraff, Gahn, and Vauquelin, chemists have been acquainted with the presence of copper in organic tissues and products.

In view of these facts we deemed it desirable to examine green peas for copper, and accordingly, two experiments were made with this object.

4. **METHOD FOR DETECTION OF COPPER.**—The method pursued throughout this investigation for the detection of copper may be at once stated; it consists in burning the suspected matters with a mixture of pure sodic carbonate and potassic nitrate, causing complete destruction of all organic matter; solution of the fused mass in dilute acid; and addition of excess of ammonia and filtration from alumina, phosphates, etc.

5. 80 grms. of green peas were examined and found to be absolutely free from copper.

6. The copper present in preserved peas is, therefore in actual combination.

7. The peas in stomachic digestion give up their copper to solution.

8. **IS THE COPPER INTRODUCED INTO THE STOMACH ABSORBED, OR WHAT BECOMES OF IT?** On the 13th July, the authors of this paper took each a dose of 0.3 grains of  $\text{CuSO}_4$ ,  $5\text{H}_2\text{O}$ , and examined the urine eliminated during the next 48 hours; it was found to be entirely free from copper.

The fæces secreted on the 30th by one of us, after taking 3 daily doses of .3 grain was examined, and was found to yield abundant evidence of copper, forming indeed a very considerable proportion of a dose.

Therefore, even if a part of the copper be absorbed into the system, another and *probably* the greater part passes out with the fæces.

9. **GENERAL CONSIDERATIONS AND CONCLUSIONS.**—Inasmuch as copper is normally present in certain organs of the body as stated above, it must get there in the first place through an introduction into the stomach. How then can we reconcile this fact with the partial secretion, at least, of copper with the fæces? Apparently this is very easy of explanation. After gastric digestion and while the contents of the stomach are still acid, a part of the chyme is absorbed into the blood system, and this would seem to constitute the stage at which the copper is absorbed. The greater part, however, of the digested mass passes on through the pylorus, and undergoes a further change in the duodenum, where alkaline biliary fluid takes part in the process. The probable result as regards the

copper would be its precipitation as phosphate, which would not be changed in the intestines, but would be passed as such with the fæces.

Now, if it be considered that ordinarily one person consumes only about two ounces of preserved peas at a meal, and that this quantity would contain only a fraction of a grain of cupric sulphate; and if it be further considered that only another fraction of this amount is ultimately absorbed into the blood system, it is impossible to defend the opinion of the prejudicial influence of such amount of copper upon health.

This represents our conclusion based upon the experiments we have described, and we think it probable that quite as much copper finds its way into the system through the handling of copper coins, the use of copper vessels in cooking operations, and in the consumption of pickles and such articles which are often prepared in copper vessels. At least we believe preserved peas are absolutely innocuous to health.

10. OTHER CONFIRMATORY EVIDENCE OF THE INNOCUOUS NATURE OF TRACES OF COPPER PRESENT IN FOODS.—In a prosecution case conducted before the Marlborough Street Police Court, on Monday, January 22, 1877. Dr. Pavy expressed the opinion that 0·31 of a grain of copper (sulphate?) would not be injurious to health; this opinion was unsupported by any evidence.

In what has gone before we have supplied the evidence required, and these results are confirmed by, and confirmative of, other results recently communicated by M. Galippe to the French Academy of Sciences.\* He has found that the administration of large doses causes vomiting, but that the same compounds may be taken in increasing amounts for prolonged periods of time without the attendance of any painful symptoms. Galippe cites the experiments of Burq and Ducom, who fed dogs with food that had been cooked and cooled in vessels made of copper, and previously exposed to the action of vinegar and salt; the dogs were not at all affected. Moreover, Galippe and his family have lived on food similarly prepared, without experiencing any poisonous effects.

Dr. Redwood said he had been engaged in the prosecution of some dealers in preserved peas, which were contaminated with copper, and should be inclined to say that the case which had just been brought forward was somewhat overproved. He referred to some cases where the poisonous effects noticed were without doubt due to copper. He was not prepared to say that a dealer was justified in supplying peas prepared with a substance which had an effect which was not necessary, and which was probably dangerous. If they were supplied, he thought they ought to be labelled "peas preserved with sulphate of copper." He had found two grains of copper in each tin.

Mr. Siebold protested against the notion that because the copper was eliminated therefore no poisonous effect would be produced. He instanced iodide of potassium and other medicines as also being rapidly eliminated, but which had undoubted medicinal effects.

Dr. Paul said the instances were not analogous. The copper passed through the system without being absorbed at all.

Dr. Rowe mentioned some instances from his own neighbourhood where streams, largely contaminated with copper, were indiscriminately drunk by the population. In one case there was sufficient copper in the water to pay for its extraction; in another instance there was no less than sixteen grains to the imperial gallon.

Mr. William Thomson had for a long period given to a dog one grain of sulphate of copper per day in his food with no unfavourable results.

Mr. Chipperfield said that in the neighbourhood of copper works, while vegetation was almost entirely destroyed, and copper could be distinctly tasted in the air, it was a fact that the residents were remarkable for longevity.

---

\* *Comptus Rendus*, April 9, 1877.



## MILK ANALYSIS.

The following correspondence has appeared in the *Western Morning News*.

## THE MILK DEALERS' GREIVANCES.

SIR,—If the writer of the letter headed "New Milk" in your paper a few days since had exercised a little patience, he would have been duly informed of the object of the promoters of the meeting of the cowkeepers held at the Plymouth Temperance Hotel, Treville Street, last evening. He anticipated the result of the meeting so far as the price of milk in future, which is to be 5d. per quart for raw and 2d. per quart for scald.

But the primary object of the promoters was to receive a certificate from Dr. Blyth to test how far his evidence may be taken as a Public Analyst. Last week a raid was made on the Stonehouse and Devonport dairymen, and on the evidence of the analyst that the milk was adulterated, they were convicted, and the magistrates imposed fines, together with costs, amounting to several pounds. Mr. Feeseey was also summoned, and, after hearing the evidence of Dr. Blyth against him, he put a few very pertinent questions to Dr. Blyth, who gave very doubtful answers. Mr. Feeseey then demanded a favourable verdict or that the milk be sent to Somerset House, for the purpose of substantiating Dr. Blyth's evidence or otherwise. This was not accepted, and verdict was given in favour of Mr. Feeseey. As before stated the object of the meeting last night was to receive a certificate from Dr. Blyth, Barnstaple, as also from Dr. Oxland, Plymouth, two supposed eminent analysts, of the result of analysing two bottles of milk. On Monday last I went to Mr. Superintendent Wreford, Plymouth police, and asked that a policeman be allowed to go to my field, see a cow milked, and himself fill three bottles with said milk, one each for the analysts, and the other to be retained by the police constable, and seal each with the Plymouth Constabulary seal. Sergeant Monkley was entrusted with this duty, and he is prepared to swear in any court of justice, that he performed that duty faithfully. Now, what does Dr. Blyth say as the result of his analysing. "To Mr. Superintendent Wreford.—I, the undersigned, Public Analyst for the county of Devon, do hereby certify that I received on the 17th day of July, 1877, from police sergeant a sample of milk for analysis (which then measured half-pint), and have analysed the same, and declare the result of my analysis to be as follows" :—I am of opinion that same is a sample of adulterated milk, if sold as milk." Then followed the constituent parts of fat, water, &c. He then further states that "the milk this certificate refers to has been almost entirely deprived of its cream—there is no other adulteration," and signs his name A. Wynter Blyth, and sealed with a wax seal bearing his name, for which analysing a guinea was charged and paid. Query—Is an Analyst's fee a guinea or half guinea?

Dr. Oxland, after stating that he had "received a sample of milk in a bottle, sealed with the Plymouth Constabulary seal, from Mr. Sayer," and stating constituent parts, says: "This sample has been skimmed; the greater portion of the cream has been taken away." In the face of this result of analysing pure milk from the cow by two well-known analysts, is it not possible that a cowkeeper may at any time be brought before a bench of magistrates (they depending on the evidence of the Analyst), be branded as a cheat, and fined several pounds, as was the case at Stonehouse and Devonport last week, at the same time being perfectly honest, and selling pure milk. Surely, as it has been shown that possibly Dr. Blyth was mistaken in the Stonehouse cases, in saying that the milk was adulterated—as most assuredly he is with regard to the milk supplied pure from my cow, to be sworn to by the police sergeant—it ought not to be too late for the dairymen above referred to to have the benefit of the doubt, and refunded the money; which to them, however, is not of so much importance as the "filching of a good name," which money cannot replace.

As a proof that the dairymen are desirous that the public shall have a pure article, the meeting resolved that the Mayors of Plymouth and Devonport be requested to convene a public meeting, for the purpose of considering the appointment of a Public Analyst for the towns of Plymouth and Devonport, conjointly. There was only one dissentient; and the reason he assigned for voting against, was that in the face of the result of analysing, as shown by the certificates read that evening, it would be useless to make such an appointment. The possible results of the meeting will be that an association will be formed of the cowkeepers and dairymen of the three towns. Over 100 cowkeepers were present. The remarks in the "Notes in the West" are, to say the least, unfair, such play upon words not always having the desired effect, and adding insult to injury. Two wrongs will not make a right, but I have no doubt that the average of honest men amongst cowkeepers will compare favourably with these to be found even amongst journalists.

Apologising for occupying so much of your valuable space.

W. SAYER, Cowkeeper,

(Chairman of Meeting.)

James Street, Plymouth, July 20th, 1877.

SIR,—A very curious circumstance appears to have occurred that, to say the least of it, is highly diverting and amusing. The harassed and injured dairymen of Stonehouse and Devonport select a cow, one of their number milks this cow (it is said in the presence of a police-constable), and two samples of milk are sent to two different analysts—Dr. Oxland and myself. In due time the certificates of the analysts come down, *each agreeing* that nearly the whole of the cream has been abstracted, and immediately a jubilant Plymouth cowkeeper rushes into print, raises the price of his creamless milk, and gives his own version of the transaction.

Unfortunately for the experiment the trick is at once too palpable, and has been carried too far. If a little less of the cream had been removed, the public, as well as the policeman, might have been imposed upon.

In this instance, as the mean of two very careful analyses, I returned the milk as containing .2 per cent. of fat, which equals 1 per cent. of cream.

Thousands of analyses have shown that if the milk from all the cows in England was mixed together, the Analyst would obtain from a fair sample about 3 per cent of fat. No cow in health, either abroad or at home, ever produced milk, when fairly milked, with so small a percentage of cream as was sent to me. I say when fairly milked, for I am perfectly aware of the dodges of cowkeepers, and I know very well that a milkman can if he chooses, by selecting certain portions, produce samples of milk with a somewhat low percentage of cream, such selected portions never being found in commerce, for I think the whole milking is mixed together.

I will buy any cow, certified to be in perfect health and properly fed, which when milked by me or in my presence, gives less than .2 per cent. of fat, and shew it as a curiosity.

It is almost difficult to treat the matter seriously; but if the dairymen of Stonehouse really desired experiments to be instituted upon the amount of cream their cows produced before they advanced the price of their milk, the experimental cow should certainly have been pronounced healthy by a competent veterinary surgeon, and, above all, should have been milked by some intelligent, uninterested person. As the matter stands, the whole affair wears the aspect of a conspiracy. I assert that (1) the milk was deliberately and intentionally skimmed, or (2) the milk sent was from certain selected portions of the whole milking, or (3) that the cow was diseased.

I am, yours truly,

A. WYNTER BLYTH.

Barnstaple, *July 23rd*, 1877.

SIR,—A letter in your paper of to-day is another specimen of "If you have no case bully the witnesses." I will not attempt to add anything to my former letter. Dr. Blyth insinuates that it may or may not be true that the cow was milked in the presence of a police sergeant. Had the man been a constable of a brief experience, as such he might even then have hesitated to question the performance of his duty faithfully, but he is an experienced member of the Plymouth Force, of twenty years' standing, and hence he may well feel insulted at the statement made, Sergeant Monkley would not risk his reputation for the sake of the cowkeepers or any body of men. He certifies as follows:—

"I hereby certify that I went by direction of Mr. Superintendent Wreford to Mr. Sayer's field, saw a cow milked, filled three bottles with said milk, and prior to the cow being milked saw the bucket and bottles wiped perfectly dry. I also sealed the bottles, and they did not go out of my sight during my filling and sealing them with the Plymouth constabulary seal.—(Signed) RICHARD MONKLEY."

Dr. Blyth says, "the trick is at once too palpable, and had been carried too far. If a little less of the cream had been removed, the public, as well as the policeman might have been imposed upon." I will not venture to comment on this, but leave the certificate of the police-sergeant to answer such an attempt to evade the matter, and make my former letter a lie. I here most emphatically deny that the milk from the cow was in any way tampered with. The public will be able to judge between the statements of the police-sergeant and Dr. Blyth.

I assert that there has been no attempt at "conspiracy," but on hearing that the Stonehouse dairyman had been fined, and knowing the questions put by a Stonehouse dairyman, I was desirous of ascertaining for myself, and getting the milk from my cow. I quite thought that to apply to Mr. Superintendent Wreford, of the Plymouth police, would be as good a course as possible to pursue, seeing that the superintendent of Stonehouse police was the prosecutor in the Stonehouse cases. Dr. Blyth says, "The cow should have been milked by an experienced and disinterested person." The man was both. He had no knowledge of the sergeant's coming, nor, until the bottles were filled, did he know for what purpose the milk was obtained. Mr. Endle, veterinary surgeon, has professionally seen the cow to-day, and certifies that the cow is perfectly healthy, and has been so for some time past.

Yours truly,

W. SAYER.

4, James Street, Plymouth, *July 26th*, 1877.

## TEA HAIR.

By THOMAS GREENISH, F.C.S., London.

*Read before the Pharmaceutical Conference at Plymouth.*

THE author said it appeared that tea hair found its way into this country as an article of legitimate commerce at tolerable regular intervals. Its commercial name was "Pekoe Flower," and sometimes "Bloom of the Pekoe Flower." It was a product of Indian teas, not of those of China. It was purchased somewhat as a curiosity, but some bought it regularly. It was never sold as tea simply, or for mixing with tea for sale; it was almost a necessary that it should be sold alone, for if it were mixed with ordinary tea it had such a tendency to separate and agglomerate into lumps, that any attempt of this kind would most probably result in the whole being returned as an adulterated tea.

In an essay on the cultivation and manufacture of Indian teas by Lieutenant-Colonel Money, published in Calcutta, the whole process of the manufacture of the Indian Teas was given, and it was not difficult to trace to its cause the condition in which this tea hair was found in commerce. One part of the process consisted in what was called "rolling" the leaves, when the juice was given out freely; and as to its results on the leaf and its hairs, Money says "If the leaves which give Pekoe tips are separated from the other leaves and rolled very little and very lightly, there will come out Pekoe tips of a whitish colour; if not separated from the other leaves, but manufactured with them, the sap from the other leaves expressed in the rolling, stains those said leaves which are covered with a fine silky down, and makes them look like the rest of the tea." This was evidently the part of the process in the manufacture of Indian teas which gave to the otherwise greyish white hair its brown colour, and also that extractive matter which was found adhering to it.

Wigner, in his analysis of the tea hair, gave theine 1.5 per cent., as compared with 3.5 per cent. for Pekoe tea, and Mr. Groves remarked in reference to this that "it was interesting to find theine present in the tea hair." The author doubted the correctness of this conclusion, and by several qualitative experiments satisfied himself that the theine found by Wigner was derived, not from the tea hairs, but from the extractive adhering to them.

---

**ANALYST'S REPORT.**

The report of Mr. W. L. Scott, analyst for North Staffordshire, was presented to the Board. It stated that 270 samples of food had been analysed by him, and most of the articles had been found to be more or less adulterated. He did not advise prosecutions, except in the worst cases, until the laws had become better known. He would have to recommend, subject to the approval of the clerk of the peace, several prosecutions, two of them being for the sale of adulterated spirits.

In a letter received subsequently, Mr. Scott said that it would be necessary that in future 250 samples should be submitted to him every quarter, and if the food inspectors did not receive instructions to make the purchases it was hopeless to attempt the improvement of the food products.

Mr. Gilbertson said that during the first three quarters of a year after his appointment Mr. Scott did nothing, and it was a question whether he was entitled to anything except for the last quarter, during which period he is said to have made analyses, but he had not furnished the usual certificates.

The Chairman said that the analyst himself appointed the food inspectors, and directed them to procure samples. The Act of Parliament directed that the medical officer of health, inspector of nuisances, or weights and measures, under the direction and at the cost of the local authority appointing him, should procure samples and submit them to the analyst. It also laid down that the analyst should receive payment and give a certificate. The analyst had induced the officer without the consent of Colonel Lindsay, to send him samples, and had now asked for payment, no doubt before the analysis had really taken place. He (the chairman) thought the samples were improperly obtained, as Mr. Scott had no business to direct the officers to do what they had. It seemed to be a case of over zeal on the part of a gentleman who was paid by fees. He (the chairman) would, therefore, propose that the clerk of the peace communicate with the analyst, desiring him to confine himself to samples sent by public officers, and not in future to give them any orders to procure samples for analysis. He would also move that in cases in which proceedings were directed Colonel Lindsay be requested to lay down the regulations for the conduct of the prosecutions. As Mr. Scott chose to play such a prank he thought he ought to be made to wait for his money until October.

After some discussion it was resolved to pay the public analyst his salary and £100 on account of his bill of fees.—*Western Mail*.

---

Mr. W. L. Scott has resigned his situation as analyst for the northern division of the county of Stafford.

---

#### LAW REPORTS.

**ADULTERATED SODA-WATER.**—The Cambridge magistrates have inflicted a fine of £5 upon Mr. John Yeomans, a chemist in that borough, for selling adulterated soda-water. The public analyst (Mr. Apjohn) certified that the samples he analysed contained no sodium bicarbonate, but 0·16 grains of copper in the gallon, and also a minute quantity of lead. In his opinion soda-water containing this quantity of copper and lead was injurious to health. Defendant said he was very careful in his manufactory; the vessels were tin-lined so as to avoid contamination, and he did not know how the copper got in. As to the absence of soda, the people did not require a soapy compound, and he made some of the water with and some without soda, to suit their requirements. It was pointed out that defendant should not have sold the article for soda-water.

**CURIOUS ADULTERATION.**—Charles Frampton was summoned under the Adulteration of Food Act for selling an article of food called oatmeal, which contained a mixture of 30 to 40 per cent. of *wheat* flour and barley meal. Defendant pleaded guilty, and stated that he sold it in the same state as he received it from the manufacturer. Fined £1 and costs.

**CASTOR OIL PILLS.**—At the Christchurch Petty Sessions on July 30, before the Hon. R. Douglas and six other magistrates, Alexander Duncan, chemist and druggist, of Commercial Road, and Lansdowne Crescent, Bournemouth, was summoned for having unlawfully sold a certain drug which was not of the nature, substance, and quality of the article asked for, to wit, castor oil pills, to the prejudice of the purchaser. The defendant pleaded not guilty.

Superintendent White, said that on June 22, he went to Duncan's branch shop at Lansdowne, and asked for a shilling's worth of castor oil pills, he was served with a box containing a number of pills, for which he paid a shilling. He then told the assistant that he was going to send them to the public analyst to be analysed, and offered to divide them. The assistant said it was not necessary. The same day he sent them to Mr. Arthur Angell, the county analyst, and on July 1, he received a certificate from him. The certificate stated that in the analyst's opinion the sample of pills contained rhubarb, aloes, peppermint oil, and soap, and that the application of the term castor oil to these pills was a dangerous practice, and might be attended with injurious results by leading the purchaser to understand that the active ingredient of the pills was castor oil.

Mr. Lacey addressed the Bench on behalf of the defendant. The very gist of the offence,

he observed, was that it should be "to the prejudice of the purchaser," and it could not be said that the purchaser had been prejudiced in this case. These pills had been known to the public and to the medical and chemical profession for several years as castor oil pills, and it had been universally the custom to call them so. The pills in question were very much more valuable than pills made of castor oil would be; but only one grain of castor oil could be contained in one pill, so that it would take from 200 to 400 pills for one dose. The custom originated at Bournemouth, through people who desired a mild aperient asking for castor oil pills, and being supplied with something very much better. This could not be to the prejudice of the purchaser.

The Chairman said it was argued in the gin case that the purchaser was not prejudiced by having 27 per cent. of water mixed with the gin, as the weaker the dilution the less harm it would do him, but the Bench ruled that the purchaser was entitled to have what he asked for. Mr. Lacey said this case was different. There was no castor oil at all in the pills. The Chairman: This is the case of a purchaser asking for one thing and getting another. Mr. Lacey: Which was better than the thing he asked for.

Mr. Lacey then called the defendant, who said—The pills in question are a compound of rhubarb, aloes, myrrh, soap, peppermint, and treacle, and are the mildest aperient mentioned in the Pharmacopoeia, and safe for the most delicate constitution. I have heard of these pills being sold as castor oil pills, and I believe that people know them as such. I myself have never sold them under that name, but I know that it is the custom to do so. Pills made of castor oil would be dangerous if relied upon for the ordinary action of castor oil, as an ordinary dose would have no effect. A serviceable dose would be two tablespoonfuls or 600 pills. He was in the habit of selling these pills as compound rhubarb pills. He believe it had been the custom for many years to sell them as castor oil pills. In reply to questions, the defendant said there was no nitre in sweet spirit of nitre, nor any hartshorn in spirits of hartshorn, nor any cream in cold cream. All these names are well understood to be misnomers.

Mr. Green, chemist, of Christchurch, said he had been in the habit for 25 or 30 years of selling a mild aperient—generally compound rhubarb pills—as castor oil pills, by which name people asked for them. He had done this in four or five counties in which he had lived. The action of compound rhubarb pills was similar to that of castor oil, but not quite so quick. I believe these pills were so named in consequence of some proprietor of patent medicines, bringing out pills under the name of castor oil pills. Gradually the public came to ask for them in small quantities, and it had been the custom in all parts of England to sell, under that name, such pills as those supplied in this case. The pills described in the certificate would be more expensive than pills made of castor oil would be. He also said that Vinegar-of-four-thieves does not really contain thieves. Epsom salts were not made at Epsom, but in the North of England, and there were no violets in violet powder, nor was Dragon's blood procured from the dragon.

Mr. Robert Chipperfield, chemist and druggist, of Southampton gave similar evidence, and said there were many instances of mis-leading names given to the articles by the public, but he did not know that they were bound to educate every one who came to their shops and tell him the composition of these articles.

In delivering the decision of the Bench, the Chairman said the evidence which had been given for the defence did not touch the fact that Mr. White had asked for one thing and been served with another, but only had shown the existence of a custom in the trade which they admitted as evidence in mitigation. It was a singular custom, however, and the sooner it was left off the better. It would be much better when the public asked for castor oil pills to tell them, "There are no such pills in the trade, but we can give you something which will answer the purpose as well." At all events the intention of the Act was perfectly clear—to give the public a right to have what they ask for, or be told that they could not get it. The penalty they should inflict was a very light one, because they thought it quite probable that the chemist in this case acted in good faith and was not aware of the law as it existed. They fined the defendant 1s. and 19s. 6d. costs.

---

#### NOTES OF THE MONTH.

THE opponents of the Sale of Food and Drugs' Act, 1875, who seem determined never to lack reasons for adulterating, or excuses for adulteration when it has been committed, induced Mr. Isaac, at the fall end of the session, to bring a short bill into the House of Commons for the purpose of making an alteration in the above Act, and if it had not been for careful watchfulness on the part of the hon. member for the University of Glasgow, Dr. Cameron, there would have been a fair chance of the bill passing through

the Commons and going up to the Lords. The Bill itself was short but none the less objectionable. It was to the following effect:—

A BILL TO AMEND "THE SALE OF FOOD AND DRUGS' ACT, 1875."

Whereas doubts have arisen with respect to the interpretation of 38 & 39 Vict. cap. 63, sec. 6 (Sale of Food and Drugs' Act, 1875):

Be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

1. In determining whether an offence has been committed under sec. 6 of 38 and 39 Vict., cap. 63 by selling to the prejudice of the purchaser, whether wholesale or retail, spirits reduced by the admixture of water, regard shall be had, not only to the extent of such admixture, but also to the price at which the spirits so reduced are sold.

It will be seen that if it had passed into law the difficulties of public analysts would have been increased to a great extent, as they would have had to judge as to the value of the spirits at the place where they were sold; in fact, putting it in plain language, they would have had to judge whether Martell's brandy and Hennessy's whisky were each worth the price at which they were sold, and would have been placed in the unenviable position of being judges of quality as well as of purity. There would probably have been but little chance of the Bill reaching even so advanced a stage as it did, but that the Government wanted to make a few slight amendments in the Sale of Food and Drugs' Act, in order to bring the latter more in accordance with one or two peculiar enactments which appear to prevail in Ireland, and consequently they added a clause to Mr. Isaac's Bill, and so made it to some extent a Government measure.

We should have thought the decision of the High Court of Justice in the case of *Webb v. Knight*\* was sufficient to settle the point as to diluted gin, but it appears the trade thought it was not so, and therefore the thanks of analysts are due to Dr. Cameron for having so promptly defeated this measure. It is probable it will be brought in again next year, and if so it will have to be fought more vigorously, as it will no doubt be introduced earlier in the session.

---

Castor Oil Pills have been in the Law Courts again, and we reprint on another page a report of the case. As might have been expected, the trade journals are annoyed at the matter, but we cannot see what they can possibly have to complain of. Compound rhubarb pills are good in their way, but why should they not be sold under that name instead of under a fictitious one. No doubt, as one of the trade journals puts it, the public do not require to be told, without chemical analysis, that a bucket full of castor oil cannot be contained in a box full of pills, but no one says the public do—what the chemists are prosecuted for, is for selling as castor oil pills, pills which not only do not contain a trace of castor oil, but are in fact a totally different article.

We dare assert that the majority of the public when purchasing these pills, believe, unless they are told to the contrary, that they *do* contain castor oil, and we see no reason why every chemist should not act as other tradesmen do when they are asked for something they do not sell, and at once say so, leaving the customer to please himself about

---

\* *Analyst*, Vol. 2, page 68.

taking something else, which the chemist may recommend as equally good or better. We should like to know what a chemist does when he is asked for compound rhubarb pills.

We agree with one of the witnesses that it is not a chemist's duty to educate the public, but that applies both ways, and if chemists have thought it their duty to educate the public to believe, as without doubt they have, that castor oil pills contain castor oil, we are strongly of opinion that it is their duty, and cannot see how they can object, to educate them back again.

---

A well known champion of druggists has come to the fore to defend the sale of castor oil pills, *i.e.*, these compound rhubarb pills. He estimates, that it would require 438 castor oil pills to make one dose if they really did contain any castor oil, but apprehends that scarcely anyone out of a lunatic asylum would imagine they did contain any. We may safely leave *him* to go on apprehending what lunatics may imagine, but we shall certainly have to enquire as to the sanity of one of our inspectors, for he thought the pills contained oil, and bought a box the other day. Our friend enquires whether druggists will be liable to penalties for selling "cold cream," and "violet powder," which are also misnomers. The simplest mode would be for him to purchase a sample and take it to the Public Analyst of the district, and if he receives a certificate of adulteration, prosecute on it, he will then obtain a legal decision.

---

We re-print on another page some correspondence from the *Western Morning News*, relating to a sample of milk which has recently been analysed by Mr. A. Wynter Blyth, the Public Analyst for Barnstaple. It will be seen that the sample was taken to Mr. Blyth as a catch, and that the statements on the part of the milk dealers avoid making any reference to the condition of the cow, or as to whether she was fully milked and yielded a fair quantity. Samples of the milk itself have been handed to us for independent examination, and we have certainly never met with a cow yet which yielded milk containing so little fat. In view of this Mr. Blyth's certificate appears to us to be quite correct. He does not assert that the milk "had been skimmed," but only that it had been "almost entirely deprived of its cream." Now it is obvious that there are three ways in which this may be done, namely, 1st, skimming, 2nd, stripping, 3rd, disease. In any one of these three cases the sale of such milk would constitute an offence against the sale of Food and Drugs' Act. Milk certainly means *whole* milk, *i.e.* the entire produce derived from the cow, clearly therefore either skimming, properly so called, or "stripping," *i.e.* partial milking of the cow, constitute offences against the Act, since they both separate the milk into two portions, one containing an excess of fatty matter and one a deficiency. Clearly also the milk of a diseased cow is not of the "nature, substance, and quality," proper, to be sold under the name of milk. There has been more than one conviction already for such an offence. If the milksellers really meant to act in a *bonâ fide* way, why did they not have the cow examined by and milked in the presence of a veterinary surgeon. If for the sake of extra profit a milkman half starves a cow till he produces disease, we hold that if he sells the milk of that cow as genuine milk, he is justly liable to conviction under the Act.

## CAPSAICIN—THE ACTIVE PRINCIPLE OF CAYENNE PEPPER.

By J. C. THRESH, F.C.S.

*Read before the Pharmaceutical Conference—abstracted by the Author.*

By acting upon 30lbs of pepper, the author hoped to obtain a sufficient quantity of capsaicin to admit of its thorough chemical investigation, but in this he was disappointed, as only from 3 to 4 drams of the slightly impure principle was isolated.

The pepper was first exhausted with spirits, and the spirits removed by distillation. The residue weighed 8½lbs. This was treated with benzine, and the fats left upon evaporation of the benzine solution, dissolved in a little warm petroleum. The solution after a few days deposited a very large quantity of a fatty acid, which when separated and purified, exhibited all the properties of palmitic acid. From the filtered petroleum the capsaicin was removed by repeated treatment with spirits of wine, and about 1 dram of perfectly pure crystalline principle, obtained by crystallization from ether.

Burnt with lead chromate ·356 grams, gave ·9105 CO<sub>2</sub>, and ·2995 H<sub>2</sub>O; ·38 grams gave ·9745 CO<sub>2</sub> and ·318 H<sub>2</sub>O.

These results agree closely with the formula C<sub>6</sub>H<sub>14</sub>O<sub>2</sub>, obtained by Dr. Buri, from a sample of capsaicin, prepared by the author from Natal pepper. By oxidation with nitric acid, oxalic and succinic acids are formed, together with a crystalline, and an oily substance, as yet unexamined.

Capsaicin appears to form more than one substitution product when treated with chlorine, and forms crystalline compounds with the metals, calcium, barium, and mercury.

## RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
4552	E. G. Brewer ... ..	Centrifugal Drying Machines or Extractors ... ..	6d.
4765	W. Morgan Brown ... ..	Electric Telephony ... ..	1/4
4905	S. A. Varley ... ..	Apparatus for Producing Electric Light ... ..	10d.
4999	J. B. Kunkel ... ..	Eliminating Phosphorus from Iron ... ..	2d.
5001	J. Hargreaves ... ..	Apparatus for Manufacture of Chlorine ... ..	6d.
5055	W. E. Gedge ... ..	Manufacture of Hydrocarburets of Coal Tar, &c, ... ..	4d.
5061	C. and A. Forrest ... ..	Drying and Powdering Blood, &c. ... ..	6d.
1877.			
27	W. R. Lake ... ..	Apparatus for Testing Milk ... ..	2d.
77	E. Solvay ... ..	Manufacture of Chlorine ... ..	4d.
97	T. A. Collinge & T. O. Paterson	Purifying Coal Gas ... ..	6d.
121	P. Dronier ... ..	Lighting Gas by Electricity ... ..	2d.
169	J. G. Tongue ... ..	Obtaining Colouring Matter from Coal ... ..	2d.
190	J. H. Johnson ... ..	Treating Saccharine Juices ... ..	4d.
263	J. Honzean E. Devedeix and J. Holden ... ..	Purifying Sewage ... ..	4d.
272	R. W. Wallace & C. F. Clans...	Purification of Gas and Utilization of Bye Products ... ..	4d.
457	W. Moody ... ..	Manufacture of Hyposulphite of Soda, &c. ... ..	4d.
1374	F. Lecourt & A. Guillemare ... ..	Manufacture and Application of Chlorophylle ... ..	4d.

## BOOKS, &amp;c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The American Chemist; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Telegraphic Review; The Medical Record; The Geological Society's Proceedings; The Miller; The Anti-Adulteration Review



# THE ANALYST.

## ORGANIZATION AMONGST CHEMISTS.

WE are not surprised that the article which we published last month under the above heading should have called forth remarks on the part of two of our contemporaries, namely the *Chemical News*, and the *Pharmaceutical Journal*. We took some pains to point out in that article certain defects, which appeared to us to be self-evident in the organization scheme as at present proposed, and our remarks naturally invited comment or assent.

The *Chemical News* of the 14th September, devotes a column to the consideration of the subject, and except that the article does not go far enough, we agree with nearly all that it says. The main point to which it draws attention is the fact that certain persons are—or a certain person is—offering by means of circular or letter to perform commercial analyses for ridiculously low sums; we know this is so, and the circular referred to is before us, and we quite agree that if analytical chemistry is to be practised upon such terms, “stone-breaking is of the two the more respectable profession.” But on two points we differ from the *Chemical News*. We do not think it is one or two men only who are guilty of this kind of unprofessional and *unbusiness-like* conduct. On the contrary, we fear that it is a much larger number of men, some of whom occupy a respectable position in chemical society, who in order to fill up their so-called spare time, or more likely to *utilize* according to their own views the services of some one or two of their pupils are working at these low rates; therefore we again differ from the *Chemical News*, in that we think that the Institute of Chemistry, as at present proposed, will do nothing whatever to remedy this grievance, if indeed a grievance it be: because among the Committee of the Institute of Chemistry itself are, if our correspondents inform us correctly, some of the most notoriously under-bidding men in the profession. Besides the *advertisements* from other members of the Committee to which we have already from time to time referred, we have as we write one lying before us, offering to *analyse starches or arrowroots, for the modest sum of half a crown*. The other charges are correspondingly moderate. It is hardly likely, that while the *heads* of the profession, as we suppose we must assume the members of the Committee consider themselves to be, do such things as these, the *men* whom they are going to organize will do much better.

The article in the *Pharmaceutical Journal* is a singular one. We wish we could stop at singular, but it mis-quotes us. The *Pharmaceutical Journal* says, “THE ANALYST grants that the Committee of fifty, which had the care of the child-institute, was “an able body, the most clever, the most competent, and most successful chemists in “the country.” THE ANALYST granted nothing of the kind; on the contrary, the words which we used were, “nevertheless these ‘private’ ‘general’ meetings have been held, and “the gentlemen attending them have appointed a Committee of some fifty of their “*friends* to carry the scheme through—mistake again. These fifty may be, and perhaps “are the fifty most clever, most competent, and most successful chemists in the country.” The sentence did not need to be looked at twice to be seen that our meaning has been perverted. However, to make it perfectly clear and un mistakeable, we *do not think* that these fifty are “the most clever, the most competent, and most successful chemists in the “country;” on the contrary, we think that the selection was in many cases an unwise one.

Now having referred to a mis-statement which we are sure our contemporary will regret, we will proceed to deal with the other points in the article, and also with some further points relating to the Institute itself.

The *Pharmaceutical Journal* calls the article which we wrote on the subject, a "funny article." It is hard to conceive of a worse description; we were writing seriously, and there was nothing which could possibly justify such a remark. It also objects to our definition of Professional Chemists, because it thinks that we are wrong in putting in the words, "purely by the practice of Professional Chemistry, as distinct from Pharmacy." We put them in advisedly, and we adhere to them. If this organization is to be, or is to do anything at all, it must appear at once in its proper light, and that light, call it what they may, is simply and solely that of a Trades Union. Now it would be absurd to talk of a Trades Union embracing both civil engineers and machine makers, and equally absurd of one embracing both professional chemists and pharmacists, and still worse to speak of one embracing professional chemists, pharmacists, and scientific amateurs; therefore we say that the members must be limited strictly to those who earn an income by Professional Chemistry, as distinct from Pharmacy, and if the *Pharmaceutical Journal* would wish us to add it, from every other branch of scientific or semi-scientific work. The remark that there is hardly a man in all England who earns an income purely by the practice of Professional Chemistry is feeble, and most probably there has been a printer's mistake here, and the writer meant to say that there are but few men on the Institute Committee who earn an income by Professional Chemistry, because we could point without difficulty to a dozen men who have not been invited to, or admitted to any of the conclaves of this body, who are not only earning an income, but a comfortable living, by Professional Chemistry only.

The "Public Analysts—well, only Public Analysts," of whom the *Pharmaceutical Journal* talks, are an almost extinct race. There is no doubt that at first when the Adulteration of Food Act came into operation, a large number of men possessing no higher qualifications for the position than the fact that they were medical officers, or chemists and druggists in the town where they lived, did happen to be elected as Public Analysts, but experience in the working of the Sale of Food and Drugs' Act has amended all this, and no further appointments of this kind can now be made, and even those few who had accepted the office and its responsibilities under the old Act are beginning to find out that the best thing they can do is to resign their appointments, and leave Professional Chemists to carry on the work which properly belongs to them. But those who remain are certainly entitled to claim admission to any organization.

Now leaving the question of the article in the *Pharmaceutical Journal* itself alone, we come to the views which it puts forward, evidently as the views of the promoters of the Institute of Chemistry. It says that we are apparently unacquainted with the just and proper means which will be adopted in order to cause a just appreciation of merits and qualifications. We certainly admit that we are so; but while admitting our ignorance on the point, we must say emphatically that there are no means which can infallibly be used to ensure this "just appreciation." We know, for instance, of one man in good and successful practice who only analyses one single commercial product, and on that product he is probably the best and most reliable authority in England; at any rate he has had the credit of carrying on a practice solely in connection with this staple article of manufacture for years, and supporting himself by his work; in fact,

earning a living by Professional Chemistry as distinct from Pharmacy. How would it be possible for any of the promoters of the Institute to judge as to his merits and qualifications, when his attention has been directed solely to an article in reference to which they are themselves profoundly ignorant! We know at least three other men, all of them with practices of the largest character, whose business is simply and solely Consulting Chemistry in its reference to chemical manufacture; men who in fact spend the entire of their time in visiting chemical works, and consulting with different manufacturers, and advising them as to the most desirable mode of working, so as to achieve the greatest economy in their factories. These men stand alone in the profession, and we believe that not one of them is included in the Institute. Who then is to judge as to their capacity? And again we may have one more class, and we think this class should certainly be included, the class of chemists and assistants in iron works, chemical factories, and manure factories, each of whom, in his own line, acquires an amount of knowledge and ability quite sufficient to justify the claim to admission to the Institute; but ability of such a kind, that no Committee could fairly or fully comprehend it, unless some of the class were included. The whole thing virtually sums itself up into this. There is only one way in which the Institute can be formed to become a success, and that is, as we and our correspondents have repeatedly urged, to call a public meeting of every professional chemist in England, and let them elect their own Committee, and without any hesitation, we say that the Committee who would be elected would be different from those who form the present body. Apparently at present, the object of the promoters has been to include the names of a host of their personal friends, the "nobodies" whom the *Pharmaceutical Journal* refers to, in order to gain all the power that they possibly could in the balloting for or election of "the gentlemen who pursue science as a profession," and earn a living by it, but who have not yet been invited to come among them. We somehow think it will be a long time before they will have to exercise their balloting powers.

In conclusion, we repeat what we have said all along, that an organization founded on the private meetings of a clique sitting with closed doors, will never be acceptable to the mass of Professional Chemists throughout England. Let therefore the present Committee fairly and openly call a public meeting of the analytical chemists of the country by public advertisement, and laying the proposed scheme before them, invite them all to join and assist in forming the Institute, and in electing a council, and all will go well. If the Committee really has the interests of the whole profession at heart, as distinct from private aggrandisement, and an endeavour to injure some of their present successful competitors, they will at once accede to our proposition. If not, then the latent spirit of the promoters of the present scheme will shine forth in all its true colours, as intended simply for the benefit and glorification of the few, at the expense of the many.

---

#### NOTE ON THE DETECTION OF STRYCHNINE.

BY ALFRED H. ALLEN, F.C.S.

*Read at the Meeting of the Society of Public Analysts, Plymouth, on the 17th August, 1877.*

In my practice I have had a great variety of animals submitted to me to be tested for poison. The number of cases in which strychnine has been found is probably greater than that all other cases put together, and as I find some chemists profess a difficulty in

applying the tests for strychnine, I believe I may do a service by publishing my method of procedure, though it has no claim to novelty, except, perhaps, in one or two details.

The matter to be tested is, first of all, digested on the water-bath with water and some acetic acid. Alcohol is next added in sufficient amount to facilitate the filtration of the liquid. The filtered liquid is evaporated nearly to dryness, water again added, and the solution filtered. The clear liquid is again evaporated to a syrup, strong alcohol added, and the liquid once more passed through a filter. The alcoholic solution is evaporated, the residue taken up with a small quantity of water, the solution filtered, if necessary, and treated with soda in moderate excess. The alkaline liquid is next shaken with ether, the ethereal layer removed with a pipette and allowed to fall—one drop at a time—into a porcelain basin, heated by hot water. In this manner the strychnine is concentrated in a comparatively small space, instead of being spread out over a large surface. When the ether has all evaporated and the basin become cool, the residue is treated with concentrated sulphuric acid.\*

There is considerable choice in the oxidising agent employed. Bichromate of potassium is decidedly the worst, in my opinion, of all those commonly used. Dioxide of lead is not very satisfactory. Powdered ferricyanide of potassium gives a very good result, but requires to be used carefully. Finely powdered dioxide of manganese gives the best results in my hands. It should be added to the sulphuric acid in moderate amount, so as not to obscure the violet coloration, and the mixture should be well stirred. The changes of color occur much less rapidly with the manganese dioxide than with ferricyanide. This is in some cases an advantage.

I have sometimes used dialysis for the original extraction of the strychnine, but as the aqueous liquid requires to be subsequently treated in much the same manner as already described, the loss of time involved is seldom accompanied by any compensating advantage.

Dr. Muter said he had found that the agitation of the acid solution of the strychnine with ether, to remove indifferent matters, greatly facilitated the subsequent purification of the strychnine.

Mr. Thomson had obtained good results by preparing chromate of strychnine, and subsequently treating that salt with sulphuric acid.

## AN EASY AND RAPID METHOD OF MANIPULATING "FATTY ACIDS."

By A. WYNTER BLYTH, F.C.S.

*Read before the Society of Public Analysts, at Plymouth, 17th August, 1877.*

I USE an apparatus, the principle of which has long been known to chemists, and indeed a small flask similar to the one I am about to describe is figured in "Mohr's Toxicologie," being there recommended as convenient for the separation of the alkaloids by solvents.

My flask is between 300 and 400 c.c. capacity, its neck is rather long and narrow, and is furnished with an accurately fitting stopper, through which two tubes pass, one provided with a stop cock to let out the liquid, and therefore, of course, terminating on a level with the inferior surface of the stopper, the other to let in the air, prolonged to nearly the bottom of the flask, and externally bent syphon-like.

\* If any serious discoloration ensues, the basin should be heated on the water-bath for an hour or two to destroy foreign matters. The solution is then treated with water, filtered, again rendered alkaline, shaken with ether, the ethereal layer evaporated to dryness and the residue re-treated with acid.

The fat is saponified in the flask, and the soap decomposed in the usual way, when this is effected, the stopper is inserted, and the flask is turned upside down and kept in that position during the entire washing process. Directly the whole of the fat has risen to the surface, the lower liquid is run off, whilst hot or cold water is introduced by opening the stopper under the water, and simultaneously sucking at the syphon. Thus all waiting for the fat to cool is discarded, any reasonable quantity of water can be rapidly used to thoroughly wash the fatty acids, and a filter is not required.

#### NOTES ON AN IMPURITY IN OXIDE OF ZINC.

BY W. W. STODDART, F.C.S., &c.

*Read before the British Pharmaceutical Conference at Plymouth.*

A FEW weeks ago I had a sample of oxide of zinc sent to me for analysis. It was bought for mixing with white lead as a paint, but on being ground was found to be nearly useless. It would not readily combine and form a homogeneous mass, as usual, nor would it give the "body" required. In fact it was so unsatisfactory an article that it was laid aside and another used in its stead. Some objection was raised to its being returned which caused the firm to have it examined, and the cause of failure ascertained.

I have brought the subject before your notice, not on account of the peculiar impurity, but because it has a pharmaceutical interest, for it answers well to all the pharmacopœial tests for pure oxide of zinc, and yet it is impure to the extent of nearly ten per cent. The sample was nearly white with a very slight buff tint. Like the pure oxide it became a strong yellow when heated, regaining its former whiteness when cold. It was perfectly and easily dissolved in an excess of carbonate of ammonia, and the alkaline hydrates. From the alkaline solution a white precipitate was produced by a sulphide of ammonium. It dissolved without effervescence in dilute nitric acid, and was so little affected by chloride of barium that after standing for several minutes, the milkiness was so slight as to require a close scrutiny for its recognition. If, however, the solution in nitric or hydrochloric acid be made in a flask, a strong odour and copious evolution of sulphurous acid gas becomes very evident. A few grains were placed in dilute hydrochloric acid with a small piece of pure zinc when sulphuretted hydrogen was evolved, and speedily became evident with the help of a bit of lead paper. The addition of chlorine water produced a distinct precipitate of sulphate with chloride of barium. The use of nitroprusside gave a red colour with a little of the solution to which a little soda and acetic acid had been added. An analysis showed that the sample was composed of oxide and sulphite of zinc in the following proportions:—

Oxide of zinc	...	...	...	...	...	90.87
Sulphite of zinc	...	...	...	...	...	9.13
Sulphate of zinc,	a very slight trace.					

100.00

The trace of sulphate was so small that it was probably due to oxidation of the sulphite. The cause of the presence of sulphite of zinc is not quite apparent, but the sample came from a continental house, and was very likely manufactured from a sulphide of zinc in some rapid and imperfect manner, which had partially oxidized some of the sulphide, and produced the impure product of which complaint had been made. The appearance of the sample suggested a process by heat rather than by precipitation.

## ABSTRACT OF A SUPPLEMENTARY NOTE ON THE ASSAY OF OPIUM.

By S. B. PROCTOR.

*Read before the Bristol Pharmaceutical Conference at Plymouth.*

SINCE the publication of my former note on this subject, I have recorded two or three small matters which I now offer for your consideration.

The process as described at our last meeting was devised with the object of being at once accurate and speedy. With the view of further expediting the extraction, I have modified the mode of operating thus:—

Rub the lump opium with its own weight of water, to as smooth a pulp as possible, if necessary with the aid of a gentle heat; add spirit equal to about three times its weight and transfer to a percolator tube which is furnished with a loosely fitting inner tube closed at both ends for increasing the hydrostatic pressure.

A phial filled with water and corked answers well for the inner tube, a string being tied round the neck, by which it may be let down gently till the bottom of the phial just touches the surface of the opium liquor.

Its position may then be fixed by pressing the string between the side of the tube and a cork wedge. When thus arranged, more spirit may be added, till a column of 6 or 8 inches is obtained without disturbing the marc or mixing to any appreciable degree with the opium liquor, and without using more spirit than is required for the exhaustion of the opium.

In one experiment with 200 grains of a soft sample of Turkey opium treated thus, a head of 8 inches pressure was obtained. In four hours, four ounces of percolate had passed through, which contained 98 per cent. of the morphia present; another ounce was considered to have effected practically a perfect exhaustion. Other trials gave similar results.

I have occasionally met with specimens, which deposited along with the morphia, a white amorphous substance which could be washed out only by long continued washing with spirit, strong or dilute.

These specimens I have assayed by the lime process, and by the acetate of lead process (in conjunction with the above mode of extracting), but without quite satisfactory results.

Upon the whole, I find it most advantageous to cut the washing short when I find such impurity present, dry the precipitate, wash out the narcotine with benzine as usual, and then re-dissolve with hydrochloric acid and spirit, and reprecipitate with ammonia, which treatment I have never found fail to give me well-crystallized, and nearly white morphia of almost absolute purity. If the quantity of spirit and water used for solution be limited to two drachms of each, (the quantity I find desirable for an operation upon 100 grains of opium), and the washing be not unnecessarily prolonged, one-quarter-grain may be allowed for the loss in purification. I find the solution by spirit and acid followed by reprecipitation is both more convenient and less wasteful than crystallization from boiling alcohol, which has been recommended by some analysts; and I find the loss of time is not necessarily great, for the morphia goes down with more promptness and certainty from this approximately pure solution than when deposited from a liquor containing the soluble extractive matters of the opium. Three to four hours are sufficient in the former case, while eighteen to twenty are desirable in the latter.

I have found in sundry cases that the precipitation of the morphia from solution in *strong* spirit and acid is advantageous, inasmuch as the crystals are whiter, larger, and sooner washed clean, but my experience is too limited yet, to say whether the strong spirit is generally preferable. When rectified spirit is used without water, for the solution from which the morphia is to be precipitated, a larger correction must be made for the quantity of morphia retained in the mother liquor.

Mr. Cleaver, regarded the washing water as a saturated solution of morphia, and quoted evidence in support of the supposition. I think it is safe after sundry experiments to assume that the loss of morphia in the mother liquor and washings when the process is performed as I have described, amounts to 0·2 to 0·25 grain.

Some analysts recommend the washing of the precipitated morphia with a small quantity of chloroform as well as with ether, benzine, or spirit. I have found the loss involved by its use to be very trifling, but I have limited its quantity to a fluid drachm or two, and in those cases where the washing with spirit and benzine did not readily remove the impurities, the chloroform also failed to do so unless used freely, and as its solvent action upon morphia is much greater than that of ether or benzine, the estimation of morphia washed away by its use becomes more important, at the same time that it is more troublesome. 11·2 is the highest percentage of morphia I have found in Turkey opium in its fresh moist condition.

The percentage of water in moist opium I have found to vary from 19 per cent. to 27 per cent. Mr. Dott's table agrees closely with my observations in this particular, if we omit one anomalous sample which he found to contain 31·2 per cent. of water and yield only 20·1 per cent. of aqueous extract.

---

## REVIEW.

### A TREATISE ON CHEMISTRY.

By H. E. ROSCOE, F.R.S., and C. SCHORLEMMER, F.R.S.,

*Vol. 1.—The Non-metallic Elements.*

A HANDSOME 8vo. volume of 771 pages, well-printed, and beautifully illustrated, a book more for the drawing room, than for the study and the laboratory. It is a work of some pretensions, and coming as it does from two chemists, long and favourably known both as workers and teachers at one of our highest science schools, will probably have no inconsiderable influence on the teaching of chemistry in England. This influence we fear will not be a favourable one; among much that is commendable, its completeness, its full description of many fundamental experiments, the frequent employment of equations to express re-actions, &c., there is much that has to be condemned. The book abounds in loose and illogical writing, conclusions are drawn, which, though frequently correct in themselves, have no logical connexion with the premises from which they are supposed to be drawn, and thus the chief value, as an educational instrument, which can be claimed for science teaching, the training of the mind to exact logical reasoning, is lost.

The book opens with a short historical sketch based chiefly on the writings of Kopp. Next follow some chapters on general principles, well illustrating our above remarks. On page 43 we are told that a science may be called experimental as opposed to observational, "when we are able so to control and modify the conditions under which the phenomena occur as to produce results which are different from those which are

otherwise met with." Surely experiments are not merely, or even chiefly, for the purpose of producing results, not otherwise met with, but rather for the purpose of showing that certain phenomena are produced under such and such conditions, proving the correctness, or otherwise, of our observations or conclusions. On page 70, after a table giving the combination by volume of various elements, when in the gaseous condition we are told: "It is thus clear that *the number of atoms which is contained in a given volume of any gaseous body, must stand in a simple relation to that contained in the same volume of any other gas,*" whereas all that is really clear, is that combination by volume usually takes place in very simple ratios, and this might well be, nay probably is, the case without the existence of atoms. Again, on page 71 we are told, "From this train of reasoning, it follows, that an atom is the smallest portion of matter which can enter into a chemical compound, whilst a molecule, on the other hand, is the smallest quantity of an element, or of a compound, which can exist in the free state." This is simply a definition of what chemists at present understand under the term atom and molecule, but does not by any means necessarily follow from "this train of reasoning." On the same page we find the following strange logic. After defining the use of symbols and explaining that by placing symbols of elements side by side, a combination of these elements is signified, we are informed, "hence it is clear that the atomic weight of a compound is the sum of the atomic weights of its component parts," this again is simply a statement of observed fact, although it would have been better to have put it, that the molecular weight of a compound, &c., &c., but no more follows from what precedes it than—well the ideas of the authors as to what is clear, clearly differ from ours. The whole of these chapters seem to be written by men who have not clearly grasped the subject, and are therefore unable to place it clearly and logically before the student.

The descriptive part begins on page 95, commencing with hydrogen. On the whole, this part is far better done than the first, but even here we find many instances of what we have called loose writing. To give a few examples merely. On page 177 the preparation of oxygen from barium peroxide is described, and we are then informed that "this simple method has not unfortunately come into general use, as the baryta looses its power of absorbing oxygen," &c., &c., the unfortunate thing being, not that the method has not come into the general use, but that the baryta looses its power of absorbing oxygen. On the same page it is stated that the mixture of caustic potash and lower oxides of manganese, produced by the action of steam on heated manganate, "when again heated absorbs oxygen," where from? On page 178, we find "certain metals also absorb oxygen when in a molten state, and give it off again on cooling," they give it off, like water, on *solidifying*. But we must hurry on, on page 713 we have, "This crystal," &c., &c., "must now be placed in such a position, that the edge whose angle of inclination has to be measured, is placed exactly in a line with the axis of the instrument." It should of course be, the intersection of the two planes, whose angle of inclination to each other is to be measured, must now be placed, &c., &c. It is also unnecessary to place the intersection or edge, exactly in a line with the axis of the instrument, which would be almost impossible to accomplish, but it is *necessary* to place it *parallel* with the axis, and nearly coincident with it, and this *can* readily be accomplished, although we are not told in this book how to do it.

The work is, as before observed, very complete, nevertheless some things are omitted which seem to us would have been worth mentioning. The preparation of



hydrogen by the action of sodium is described, but no hint is given that there is danger of explosion, and of course no directions are given for avoiding it. Among the properties of oxygen, no mention is made that it combines, at ordinary temperature, with binoxide of nitrogen, or that it is readily absorbed by alkaline pyrogallates, and various other substances. In some cases we come also across bad chemistry, as for example on page 410, where the action of nitric acid on metals is incorrectly given, it is the hydrogen and not the metal that reduces the acid. On page 650, very erroneous ideas respecting urea are put forward; urea is the predominating nitrogen compound in the urine of man, not in that of animals generally.

The printing is on the whole well done, though there are misprints in the book not mentioned in the table of errata. On page 128 the tension of hydrochloric and vapour at—10 is given incorrectly; page 146, line 9 from the bottom, hydroiodic is printed for hydrobromic; page 177, line 8 from bottom, we have manganese for manganate, &c.

In conclusion, we must express our sorrow that we have felt obliged thus to write of a work on which both authors and publisher have evidently expended much labour and capital, and we sincerely hope that future editions may be free from the blemishes we have thought it our duty to censure in this.

---

#### NOTE ON SEWAGE FARM MILK.

By JOHN SHEA, M.D., B.A.

SEWAGE farm fed cows appear to give milk of a high specific gravity. A sample of morning milk from seven or eight short-horned cows, fed chiefly on the rye grass from the farm, with a little "toppings," and maize, and permitted to graze for about an hour a day on ordinary grass land, gave the following result:—

Sp. G.	Cream per cent. by vol.	Total Solids.	Fat.	Solids not fat.	Ash.
1035	14	14·8	5·6	9·2	0·85

The milk is rich, but more remarkable for its weight than fat. All samples of milk from the cows fed on the farm have given results with high specific gravity, and large percentage of solids, but usually not over 4 to 4·5 per cent. of fat. The milk shows no undue tendency to early decomposition if kept. The sewage grass will occasionally "scour" the cows if they have too much of the rye grass.

---

#### TREATMENT OF ORES OF LEAD AND ZINC.

ALL metallurgists are familiar with the difficulties which have always been encountered in the attempt to treat these ores profitably, and immense masses of them have either been left altogether unworked or the waste portions have been thrown into heaps, encumbering the mines with useless deposits. The specific gravity of the different ores are too similar, and their union frequently too intimate, to admit of merely mechanical separation, and apparently up to the present time no efficient chemical means of separation seem to have been found, unless by processes involving so much expense as to make them unprofitable. In reference to the extraction of the zinc, there is not, of course much difficulty theoretically in separating it by distillation; but practically, the concentration of the lead remaining in the gangue has presented almost insuperable obstacles; while if it be attempted to separate the lead and reject the zinc, the zinc has a tendency

to form a hard scoria, not only retaining much lead, but also holding back much of the silver which ought to be taken up by the lead, so that the consequence is a greatly diminished yield of lead, and that which is obtained is less argentiferous.

Mr. Maxwell-Lyte, of Paris, has just published some processes which appear likely to remove a considerable amount of the difficulty which has been experienced with these ores. It is impossible in the space at our disposal to enter into a detailed account of the methods which he proposes, but we may say that in the main they consist of a combination of the wet and dry methods. Thus, in one of the cases to which he refers the mixed ore is treated in the first instance with dilute hydrochloric acid hot, by which means the zinc and lead are both chloridized, the lead being more or less dissolved, the zinc entirely so; while on cooling the solution the chloride of lead is deposited, because of its relatively slight solubility in the cold liquid. The clear solution is poured back on to the residuary gangue from which it was decanted, and again heated and redecanted, when it carries over a fresh portion of lead. Thus the gangue, deprived of its lead as well as its zinc, may be thrown away. The silver also all passes over with the lead. The deposit of chloride of lead and silver is now reduced to a spongy metallic state by placing in the solution bars or lumps of metallic zinc, while all the zinc remains in solution, whether that contained in the ore or that which had dissolved in the process of reduction of the lead and silver. This spongy lead may be easily fused in a reverberatory furnace, and subsequently desilverized. The zinc from the decanted liquors is precipitated by lime, washed and pressed into bricks, forming a kind of artificial calamine, containing from 60 to 70 per cent. of metallic zinc, and is ready for treatment by distillation. In this way Mr. Maxwell-Lyte considers that he can extract from ores all the lead and silver, while the zinc is also recovered in an available form free from lead. Several alternative processes are also described, but the one of which we have sketched an outline shows his ideas.

---

#### SULPHUR IN GAS.

THE vexed question of the amount of sulphur impurities to be allowed in gas, which for twelve months at least has been practically settled in London by the defeat of the two bills brought in by the Crystal Palace Gas Company and the Gas Light and Coke Company, has been raised at Maidstone, where the gas on two or three occasions appears to have contained from 35 to 45 grains of sulphur per 100 cubic feet; or, in other words, to have been in this respect as bad as absolutely unpurified gas. Complaints were naturally made on the subject, and the engineer of the Maidstone Gas Works presented a report to the directors of the company, containing some statements which, to those who are familiar with the evidence recently given before the select committees of the House of Commons, must appear to be of a most remarkable character. Thus, this gentleman says "the evidence given on that occasion by the chemists, who are alike the most eminent of the day and the most experienced in respect to coal gas, has gone to prove that a quantity of these compounds, up to about 35 or even 40 grains per 100 cubic feet, is not injurious to health; and that a partial removal is not worth the trouble and expense incurred." It is certainly somewhat singular that, if the evidence of these chemists did prove this fact, the select committee should nevertheless, as reported in our number for July, page 67, have thrown out both the bills, and there-

fore kept the companies still under restrictions in regard to sulphur compounds. There is no doubt that some evidence was given of the character alluded to in the engineer's report, but this evidence was so emphatically contradicted by chemical evidence on the other side that the committee had no other course before them but to reject the gas companies' proposals.

We propose in our next number, if space allows, making further reference to this subject, with a special view to pointing out the character of the products which are produced during the combustion of ordinary coal gas containing sulphur. It is quite evident that such a paper is needed, not perhaps so much for the enlightenment of analysts as for the information of those quasi chemists who put themselves forward to advise public bodies on such points. Thus we find in this case an argument extending over some half column of letterpress to prove that 40 or 50 grains per 100 cubic feet cannot be injurious, because it only forms about 0.18 per cent. by weight of the gas which is burned, ignoring entirely the fact that this gas in its combustion produces at least three separate ingredients in considerable quantity, namely—water, carbonic acid, and sulphuric acid. What can any percentage composition possibly have to do with a case of this kind, where the injury is done solely by the sulphuric acid which is formed? Impure gas has nearly as much influence on the death rate as impure water.

#### SUGAR IN PHARMACY.

Dr. SYMES read a paper before the recent *Pharmaceutical Conference* on this subject, and we extract from it the following useful table, showing the action which different acids exert upon solutions of cane sugar:—

##### INVERTING POWER OF ACIDS ON SUCROSE.

(Arno Behr.)

Acid.	211 hours 13°—17° C.	115 hours 19°—27° C.	78 hours 25°—27° C.
Acetic Acid ...	1.2	1.3	1.6
Butyric „ ...	—	1.9	2.5
Isobutyric „ ...	—	2.2	2.5
Succinic „ ...	—	3.5	4.0
Malic „ ...	—	8.1	8.8
Citric „ ...	8.2	9.2	10.2
Formic „ ...	—	9.2	9.6
Lactic „ ...	10.2	10.4	9.9
Tartaric „ ...	11.4	13.4	13.8
Phosphoric „ ...	24.2	25.8	26.9
Oxalic „ ...	49.6	53.1	54.5
Sulphuric „ ...	83.9	83.1	84.2
Hydrochloric „ ...	100.0	100.0	100.0
Nitric „ ...	100.1	100.4	100.1

The figures in the columns represent the inverting power of the acids upon cane sugar at various atmospheric temperatures and for various lengths of time. It will thus be seen that acetic acid has the lowest, and hydrochloric and nitric acids the greatest, inverting power, while phosphoric acid stands high in the scale. It is possible that this to some extent accounts for the difficulty which has been encountered in keeping all the compound phosphate syrups in a state fit for use.

ERRATA.—p. 98. In the last paragraph of Mr. Allen's paper on Alcohol in Ether and Chloroform, for "deducted" read "deduced."

## MILK ANALYSIS.

The following refers to the correspondence we reprinted last month on this subject:

## THE DAIRYMEN AND THE ANALYSTS.

TO THE EDITOR OF THE EXETER AND PLYMOUTH GAZETTE.

SIR,—Your leader of to day states; "We should very much like to know the name of the large town in the West of England" respecting the *Medical Examiner's* milk story, and I hasten to gratify such laudable curiosity, the more especially as on public grounds, it is highly desirable that there should be a complete exposure of the incident referred to.

After several milk prosecutions undertaken by the Stonehouse authorities, a private meeting of the Plymouth milkmen appears to have been held, and, whether as a result of the collective deliberative wisdom of the assembly, or of individual inspiration, the fact remains that the Chairman of the meeting, a Mr. Sayer, selected a cow and a constable, had the cow *partially* milked in the presence of the constable, and filled three bottles, one of which was sent to Dr. Robert Oxland, a second to me, and the third was at first retained by the police, but subsequently analysed by Mr. Wigner.

This milk, direct from the cow, was returned by the three analysts, and justly returned as adulterated. That is adulterated in the sense of the Sale of Food and Drugs Act. It was, indeed, almost destitute of cream, and the two first analysts *not knowing its history*, stated their belief that cream had been abstracted; the third analyst, Mr. Wigner, in full possession of the facts, certified—"It has unquestionably been deprived of part of its cream by skimming, or by *abnormal milking*."

It is well known, both to the milkman and the analyst, that the first portions of milk, technically called "fore milk," are, practically speaking, destitute of cream, and to sell this milk as new milk is evidently fraudulent, and has justly been held so by more than one magistrate. As an example, I will cite the Dublin case, reported in *The Analyst*, August, 1877, p. 82, where one Michael Hayden, a dairy proprietor, was charged before Mr. Woodlock, the divisional police magistrate, for selling milk deprived of its cream; the defendant stated that it was "fore milk," and that he had sold the "strippings" as cream, believing that he was allowed by law to do so. The magistrate expressed his opinion that milk should be sold whole, *i. e.*, with both fore milk and strippings, and fined the defendant £10.

The difference in the amount of cream in the first and last portions of milk is thus evidently known to the trade; and the uncharitable may suppose that the object of the Plymouth milkmen in undertaking an experiment costing them two guineas, the value of over thirty gallons of milk, was to enable fraudulent and lucrative practises to be carried out with impunity by casting discredit upon analysts in general and me in particular; the charitable, that the dairymen were animated with a sudden thirst for knowledge, and desired to place the composition of their milk beyond a doubt. I of course adopt the latter hypothesis, and remain,

Yours, &c.,

A. WYNTER BLYTH.

BARNSTAPLE, *September 3rd*, 1877.

## SYNCHRONIZED CLOCKS.

MESSRS. BARRAUD & LUND, the chronometer makers, have long been known in the City for the accuracy with which their own regulators were adjusted, but it is an entirely new feature in timekeeping that they have now attempted to regulate, or, as they, perhaps, more correctly term it, synchronize, any or all of the clocks in the City of London. We have recently had an opportunity of inspecting the electrical arrangement by which they are doing this, and we must say that, not only as electrical mechanism, but as a perfect piece of apparatus, it is unique and simple. The arrangement which is supplied to the clock is of the simplest kind, and does not interfere in any way whatever with the works of the time-piece itself, and it can be applied to any clock, no matter what its size may be. The arrangement virtually consists in two small pins, which project through a narrow slit in the dial of the clock, and at regular intervals of one hour adjust the clock. An electric current is automatically sent from the regulator in Messrs.

Barraud & Lund's establishment, which passes through an electric magnet, and causes these two pins to approach each other, and for a second nip the minute hand of the clock between them, so that, whether the clock has gained or lost time during the hour, it is certain at the hour to be set right. The mechanism can, if necessary, be removed at any time, without interfering with the clock itself. At present there are some five or six different circuits at work in the City, each one taking from eight to fifteen clocks. Nearly all the banks in Lombard Street and the neighbourhood have adopted it, and many firms at a greater distance. Perhaps among the greatest advantages of this system is its purely automatic character.

---

### CORRESPONDENCE.

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

TO THE EDITOR OF "THE ANALYST."

SIR,—A friend of mine has just handed to me a copy of the *Bath Argus*, September 8th, 1877, containing a report of certain proceedings, which were taken with regard to the adulteration of beer and milk; the cases had been referred to Somerset House, and in their certificate Messrs. Bell, Bannister and Helm state that they found the beer to contain 66.5 grains common salt per gallon. (Mr. Gatehouse for the prosecution found 68 grains.) At the same time they added "The strong Burton beers contain about 60 grains of common salt per gallon, solely derived from the water, malt and hops used."

In a book now before me "Burton-on-Trent, its History, its Waters, and its Breweries," by William Molyneux, F.G.S., 1870, page 207, there are three analyses of Burton water, in which the amount of chloride of sodium is given as 9.17, 10.01, and 6.636 grains respectively.

The total chlorides of sodium, potassium, and magnesium are—

No. 1.	10.136	grains per Gallon.
No. 2.	12.285	" "
No. 3.	27.433	" "

Further, in June, 1875, I went to the stores in this place, and obtained samples from the respective agents of the under-mentioned Breweries; against them I place the amount of salt per gallon which I found:—

Ind, Coope & Co.	8½	Grains.
Allsopp & Sons	16¼	"
Bass & Co.	20	"
Burton Brewery Co.	16	"

The above does not support the Somerset House Chemists in their statement. I can vouch for the samples I worked upon, as I took them direct from the stores of each of the above Firms.

It would be interesting to know what is the experience of other public analysts in this matter.

Yours respectfully,

WM. MORGAN, Ph.D.

SWANSEA, Sept. 21st, 1877.

---

### OBITUARY.

WE regret to have to announce the death of Mr. Richard Apjohn, M.A., of Cambridge, Lecturer on Chemistry at Gonville and Caius Colleges, Public Analyst for the County and Borough of Cambridge and for the County of Huntingdon, and Member of the Society of Public Analysts. He died in London on the 13th instant from injuries caused by a fall from a bicycle—one more unfortunate victim to the fancy for athletic exercises which occasionally seizes on the public mind.

## ANALYSTS' REPORTS.

Mr. C. H. Piesse, Public Analyst for the Strand District, reports that during 1875-6 he examined 525 samples, of which 33 or 6·3 per cent. were adulterated. Summonses were issued and convictions obtained in 17 of these cases of adulteration, and in the remaining 16 no proceedings were taken.

The two reports of Mr. Edward Sergeant, Public Analyst for Bolton, for the quarters ending March and July, 1877, have been submitted to the Town Council, and we find that in this town, which has a population of about 83,000, only 25 samples have been analysed during the half-year, which is scarcely in our opinion, sufficient to ensure that the character of the articles sold is well looked after. The results of the analyses quite confirm this opinion. Thus, taking them in order, we find—No. 1, milk, 25 per cent. of water; No. 2, milk, 20 per cent. of water; No. 3, milk, 30 per cent. of water; No. 4, milk, 26 per cent. of water; No. 5, milk, skimmed; No. 6, milk, genuine; No. 7, butter, foreign fats; No. 8, butter, 60 per cent. foreign fats; the other samples following in a somewhat similar style. We thus find that 58 per cent. of the samples purchased were, according to Mr. Sergeant's certificate, found to be adulterated. In one case he found a considerable proportion of lead in soda water.

## LAW REPORTS.

**COLLAPSE OF ANOTHER CASE.**—John Sargent, dairyman, of Millbrook Place, Swainswick, appeared in answer to an adjourned summons, charging him with selling adulterated milk on the 31st July. A sample of the fluid in this case had been forwarded to Somerset House, and subjoined is a copy of the certificate thence received:—"The sample of milk referred to in the annexed letter was received here on the 20th August, and the milk was then found to be in a very advanced stage of decomposition. The bottle when received was securely sealed. We hereby certify that we have analysed the milk, and declare the actual results of our analysis to be as follows: Solids not fat, 7·83 per cent.; fat, 2·18; water 89·99; ash, ·70. To these results an addition has to be made for natural loss, arising from decomposition through keeping, but after making such addition both 'solids not fat,' and fat, indicate a milk of low quality. The proportion of ash however is fully equal to the average found in genuine milk. We note that in your letter of the 21st August, you observe that "the cows which had produced it had been kept under cover, and fed upon grains, chaff and gurgeons," and from experience we are aware that feeding has a considerable influence on both the yield and quality of milk. From a consideration of the character of the feeding and its probable influence on the quality of the milk, together with the results of the analysis, we do not feel justified in pronouncing the sample adulterated with water. J. Bell, R. Bannister and C. H. Burge." Mr. Moger intimated that he should not ask for a conviction in this case, adding that the analysis of the London gentlemen *was identical with the results obtained by Mr. Gatehouse*. There was however a quantity of milk sold in Bath that *would require sophistication with 25 per cent. of water to bring it down to the level of this genuine milk*. The chairman remarked that as there was so much difficulty in detecting the adulteration of milk the public must take care of themselves. At the same time the bringing of the cases before the Bench was a very proper course to pursue.—*Bath Herald*.

**AT WORSHIP-STREET,** Edward Butler, baker, of 30, Pitfield Street, Hoxton, appeared before Mr. Bushby in answer to a summons charging him with having sold bread adulterated with alum. Mr. Enoch Walker appeared to prosecute on behalf of the Vestry of the parish of St. Leonard, Shoreditch. He produced the certificate of the public analyst of the parish, showing that the bread submitted to him and stated to have been purchased at the defendant's shop contained 15 grains of alum per 2lb. loaf. The solicitor for the defendant said that his client had trusted the bread-making to his foreman, and from what he had since learnt he would submit to the judgment of the court. Mr. Walker said the certificate stated that the proportion of alum found made the bread injurious to health. The solicitor for the defence said that there was a disagreement on that point between professional gentlemen, and Professor Wanklyn, who was in court, would state the contrary. Mr. Bushby said he should like to ask Mr. Wanklyn a question on that matter. Mr. Wanklyn, having been sworn, said that he was professor of chymistry at St. George's Hospital, and public analyst for Buckinghamshire. He had made analysis his particular study. There was no evidence to show that the quantity of alum in this case would be injurious to health. The danger of alum was in producing constipation. Here it was not in sufficient quantity. Before the bad effect was produced alum had to enter the system. Mr. Bushby asked the object with which alum was used in bread. The witness replied that it enabled sound bread to be made from unsound flour. Flour that had begun to "go" would not make good bread. Mr. Bushby supposed that "go" meant "ferment,"

and asked if the flour had begun to ferment what would be the effect of alum upon it. The witness replied that it would arrest the change. Mr. Bushby asked if when flour was "going" it was made into bread, whether, as bread, it would continue to ferment. The witness said it would not be good bread; it would be sour, and not white. Mr. Bushby repeated his question. The witness said that a little fermentation was required in bread to make it rise. Mr. Bushby understood that was obtained by the use of yeast, and asked whether fermentation of the flour did not destroy the quality of the bread. The witness said that alum was then used to arrest the nitrogenous substance, which the incipient fermentation going on would destroy. Mr. Bushby then understood that the use of alum would arrest the fermentation and preserve the nitrogenous substance. Mr. Wanklyn said that was so, adding that directly the fermentation was set up some of the nitrogenous substance would be destroyed. Mr. Bushby was obliged to witness for the light he had thrown upon the matter. This case was not particularly affected by the question whether 15 grains of alum per 2lb. of bread was injurious to health or not. It was clear that the bread was of inferior quality from the fact of alum being in it, and inferior from the loss of nitrogenous substance. He would deal with the case on that point, and as the defendant had pleaded guilty he would not impose upon him a heavy penalty, the *maximum* being £20, but fine him only 20s. and costs. Mr. Walker intimated that on a future occasion he would be prepared with scientific evidence to support his statement as to the injurious effect of alum.—*Times*.

**POISONED SALT.**—In the United States District Court of Admiralty an action has been tried, arising out of the mixture of arsenic with a large quantity of salt, *en route* from Liverpool by the ship *Niagara*, which arrived at New York in March, 1874. The cargo consisted in part of 4800 sacks of salt, and the ship also brought over ninety-nine kegs of powder arsenic. The salt and arsenic were stowed in close proximity, and several kegs of the arsenic were broken open and their contents became mixed with the salt. The consignee said that the salt was poisoned and entirely worthless, and sued the owners of the vessel for damages. The defenders set up that the kegs of arsenic were broken open by stress of weather, and that only a very small portion of the salt was impregnated by the poison. Careful analyses of the salt were made, and experts were called upon to testify. The salt and arsenic were alike white and undistinguishable by the eye. Two bags of the salt were tested. In one three grains and a half of arsenic was the average to a pound of salt. In the other bag arsenic was found in salt taken from the centre of the bag. Professor Doremus said that the salt ought to be used solely for purposes in which human life would not be endangered. Professor Chandler, on the other hand, expressed the opinion that no harm could come from the use of portions of the salt examined by him, because no person would consume enough of it to affect him. Judge Blatchford holds that the salt was so impregnated with the arsenic, as to be dangerous, and says:—"The neglect of the master was a gross wrong to the owners of the vessel, the owners of the salt, and the entire community, who might very well, some of them, have actually consumed some of the salt and some of the arsenic with it, but for the prompt action of those receiving the salt from the vessel." A decree is ordered in favour of the libellants with costs, and a reference to ascertain the amount of damages.—*Grocer*.

---

#### NOTES OF THE MONTH.

On another page we reprint a letter from Mr. Wynter Blyth in reference to the milk case which we referred to in our last. It is very much to be regretted that the *Medical Examiner* should have inserted a paragraph in reference to this case, which was based upon evidence quite as insufficient as that which first led to the cowkeeper's letter in the *Western Morning News*. Mr. Blyth's letter must be held to finally settle the question that the milk referred to was abnormal milk—whether it had been rendered abnormal by skimming or some peculiar mode of milking with which dairymen are specially familiar.

---

The publicans appear determined not to let the disputed question of Gin *versus* Gin-and-water rest yet. A lengthened correspondence has been going on in the columns of a variety of papers, and many persons, amongst them lawyers, have been called in to express their opinion that gin-and-water is still gin. No doubt, in a teetotal sense, the Good Templars would be glad to find it so. But there is another aspect to the case.

Mr. Poland's opinion is decidedly that the gin as sent from the distillery may not be reduced by dilution with water and sold as gin, unless the publican affix to it the proper label specifying that it is gin-and-water. This quite accords with the decisions which Justice Mellor and Justice Lush gave in the appeal case of Webb *versus* Knight, but is if anything a little more stringent. Lord Truro seems to have been greatly exercised lately in reference to the adulteration of beer and spirits. In writing to the *Times*, his lordship is so philanthropic as to think that it is the drugs introduced into the manufacture of these beverages which produce intoxication. The only unfortunate circumstance in connection with Lord Truro's statement is that the public analysts of the kingdom, whom we must consider to be on the whole the best judges, have not yet succeeded in finding any sensible quantity of drugs introduced into either beer or spirits; but, on the contrary, the complaints which they have had to make, and on which publicans have continually been summoned, have been that the latter had added water—not drugs; and water surely cannot conduce to intoxication any more when it is added to gin than when it is put in the form of Simpson to milk. The facts which we published in THE ANALYST in April of this year are very significant on this point. During the years 1875-1876 the returns show only 175 samples of adulterated beer and spirits; and they show 833 samples of adulterated groceries and 1,483 samples of adulterated milk.

---

We publish a letter from Dr. Morgan, of Swansea, which is worth the consideration of analysts generally, and we invite our *confreres* to give us a record of their actual experience in the matter. We have ourselves analysed the Burton waters repeatedly, and our results are accordant with those of Dr. Morgan on the ales.

---

“The public analyst for———presents his compliments to Mr. Simpson and requests to know with what he fed the cows which yielded the sample of milk obtained from him by the inspector on the——day of———187—.” This is a new form of enquiry which all analysts had better have printed at once, if they desire to keep in the paths of rectitude as laid down at Somerset House, and then they may possibly escape the fate of Mr. Gatehouse, as detailed in the paragraph which we reprint on another page from the *Bath Herald* of the 8th September.

The remarks of the prosecuting solicitor are very much to the point and more severe than any we could add, but we question whether, before assuming a particular amount of *natural loss*, it would not be quite as fair to ask for a copy of the results obtained on the fresh milk, and see really what loss had taken place, instead of taking an indefinite and as yet undetermined quantity as *natural loss*, and on that, aided by some peculiar and *unpublished* views on the effect of feeding on milk, condemn the analysis of a fellow chemist. If the ash obtained by the Somerset House chemists be the same as that obtained from the fresh milk, then the samples are clearly identical, and if the solids not fat agree with those previously found, it is unjust to assume a *necessary natural loss* in a sample when, as is sometimes the case, little or none takes place. It is this sort of systematic straining of opinions to give the benefit of an imaginary doubt, which goes far to encourage the traders to continue the addition of water. The sooner Mr. Bell publishes his table showing the relative effects of “grains,” “chaff,” “gurgeons,” and “keeping under cover,” on the *solids not fat* of milk, the better for both public analysts



and the public. Hitherto we have found feeding to affect the *fat*, but we have found nothing but *partial milking* or *positive disease* which lowers the solids not fat to 7.83 and until we do so we must decline to be "gurgeons" caught by "chaff." We shall, however, be pleased to give publicity to Mr. Bell's figures if he will send them.

---

We reprint a note on oxide of zinc contaminated with sulphite of zinc. We draw special attention to this because we have ourselves found practical difficulty to arise in commercial work from the presence of this form of adulteration; as far as we know, the details of the analyses of samples so adulterated have never before been published.

---

Castor Oil Pills are still to the fore. It seems a strange thing that there should have been such a discussion over a trivial thing like this. Druggists—of all men—ought to be most careful to sell exactly what they are asked for, and to sell it under its proper name, and certainly no one knows better than druggists do that castor oil pills, properly so called, do not exist. Why, then, is not the name at once given up?

---

One of our contemporaries, speaking of the water supply of one of the largest of the midland towns, says:—"The supply does not appear to have been so good as usual, an increase in organic matter being noted, and also the presence of infusoria, both no doubt due to inefficient filtration. *No harm, however, will be done by either.*"

Such a statement as the latter appears to us to fully justify another statement which the same journal made not long since, that the amount of sulphur present in gas as an impurity was not injurious, but it was only the carbon which did the harm. It really seems time that our engineers and sanitary officers had better information on scientific points than this.

---

There have been a large number of paragraphs lately in the London press, and some in the provincial press, in reference to the adulteration of treacle with arsenic. We have taken some pains to investigate the matter thoroughly, and are in a position to say that there is no foundation for the fright which has been caused by these rumours. The matter did not originate, as is stated, in the fact of a large quantity of treacle becoming accidentally mixed with arsenic in Lewisham, but simply from the fact of a small quantity of treacle with which some children were being fed having a small portion of arsenic accidentally mixed with it. The result of the examination which we have made of some dozens of samples from the same neighbourhood shows that they are all pure.

---

We should have thought the time had gone by for such statements as these in reference to the analysis of butter. It is extracted from the *Chemist and Druggist* and quoted by them from the *Pharm. Centralhalle*.

#### DETECTION OF LARD AND SUET IN BUTTER.

The butter, to which water has been added, having been first heated for two hours over the water bath, to remove saline and some other constituents, is thus treated:—five parts of concentrated sulphuric acid are agitated with three of the butter, and a nearly transparent yellow fluid is produced, soon becoming a clear yellowish red; if suet or tallow be present (but not otherwise) this will, in the course of half an hour acquire a dark reddish-brown tint.

An enquiry has taken place at Bath as to the death of a woman who is alleged to have been poisoned by her husband. The stomach and other viscera of the deceased were submitted to Mr. Gatehouse, the Public Analyst for Bath, who found copper present. Thus the liver contained 1.16 grains of copper, and the other viscera about 2½ grains. No other poison was detected, except a minute trace of antimony, which Mr. Gatehouse considers was present as an accidental impurity in the copper salts. This case appears to us to form a very practical commentary on the paper on copper in peas, by Dr. Paul and Mr. Kingzett, abstracted in our last number. As far as we remember there are only one or two previous cases on record of poisoning by copper salts. It certainly appears that this one case is worth far more than all the experiments made by the authors of the paper in question. It does not follow that because two men in good health can partake, without actual injury, of a daily dose of poison, a feeble woman can do the same. The public are, at any rate, entitled to the protection of the law against such practices. The makers of the so called preserved peas can have no ground of complaint, for if they simply label their canisters—"This is a mixture of preserved peas and sulphate of copper," the public can buy them if they please. Till they do so we hope every brand in the market will be carefully examined, until the sale of such an abominable mixture is entirely stopped.

#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
4826	F. Maxwell Lyte ... ..	Production of Ammonia Anhydride ... ..	6d.
4847	A. M. Clark ... ..	Crucibles, &c. ... ..	8d.
1877.			
92	P. Piccard ... ..	Evaporating Saline Solutions ... ..	6d.
135	J. Hooper ... ..	Lamps for Burning Hydrocarbon Oils... ..	6d.
351	C. W. Harrison ... ..	Impregnating Atmospheric Air, with inflammable vapours ... ..	2d.
357	D. McFarlane ... ..	Purifying or Treating Alcoholic Liquids ... ..	6d.
407	C. C. Creeke and H. Sharp ... ..	Sewer Ventilator ... ..	6d.
426	W. Cormack ... ..	Utilizing Refuse Acid Liquors... ..	2d.
488	J. H. Johnson ... ..	Treating Sewage, &c... ..	4d.
492	P. Jablokhoff ... ..	Apparatus for Generating Electricity ... ..	6d.
494	Ditto ... ..	Electric Lamps ... ..	6d.
493	J. E. Sears ... ..	Ventilating Rooms, &c... ..	2d.
609	W. Martindale ... ..	Apparatus for Inhaling Medicated Vapour ... ..	2d.
612	A. M. Clark ... ..	Obtaining and Fixing Nitrogen in Inert Substances for Fertilizing Purposes... ..	4d.
697	D. B. Hewitt ... ..	Utilizing the Sulphur contained in Vat or Soda Waste ... ..	2d.
683	J. Stuart ... ..	Manufacture of Sugar ... ..	4d.
684	J. Toussaint ... ..	Crucibles... ..	4d.
820	E. A. Parnell ... ..	Manufacture of Metallic Zinc and Sulphuric Acid ... ..	2d.
1814	T. N. Kirkham, D. Hulett, and } S. and J. Chandler ... .. }	Purifying Gas ... ..	4d.
2251	S. Pitt ... ..	Utilizing the Bisulphide of Carbon and Glycerine for the Production of Motive Power, &c. ... ..	4d.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Report on Various Methods of Dealing with Meat Seized as Unfit for Human Food, by Dr. Sedgwick Saunders; Journal of Applied Science; The Country Brewers' Gazette.

# THE ANALYST.

---

## THE SOMERSET HOUSE COURT OF APPEAL ?

It will be in the recollection of nearly all our readers, that when the Sale of Food and Drugs Act, 1874, was before the House of Commons, the Public Analysts of this country and many independent members of the House of Commons acting on behalf of their constituents, opposed very strongly the appointment of the Inland Revenue Chemists as referees in disputed cases under the Sale of Food and Drugs Act. This opposition was not made from personal grounds, but simply because the members and the analysts doubted the sufficiency of the experience which the Inland Revenue Chemists had had in such cases. From time to time since a few incidental matters have cropped up which have been sufficient to show that the doubt was not without foundation; but the mode of procedure which the chemists at Somerset House have adopted, has been so extremely cautious and tentative that it is only occasionally that a case has come to light to which it has been necessary to draw public attention through the failure of justice which has been occasioned by their conduct.

At the time when the question was before the House of Commons, the arguments on the point were very strong, and it was contended that tradesmen were suffering severely by the want of a competent! Court of Appeal; but the fact that the Inland Revenue Chemists only had to analyse five or six samples during the first year in which this duty was imposed upon them—and if our memory be right, they confirmed the analyses of the analysts in three cases of these five, and in one other case had opposed to them five chemists of wide reputation, and who all disagreed with their deductions—is sufficient, we think, to show that there was not much need for *such* a Court.

The letters which are published in our correspondence column this month, throw some further light on the matter. Our readers will also remember the letter from Dr. Morgan, of Swansea, which we published in our last number, wherein he stated that these Somerset House Chemists having found a certain sample of beer to contain 66.5 grains of common salt per gallon, added "Strong Burton Beers contain about 60 grains of common salt per gallon, solely derived from the water, malt, and hops used." This statement, however, although made above the three signatures of Messrs. Bell, Bannister, and Helm, is not only different from the results which the Chemists of the Inland Revenue Department at Somerset House themselves found only a few years since, but is, in fact, inaccurate.

The circumstances under which the previous investigation took place were, that salt having been inserted in the schedule of the Licensing Act as one of the prohibited ingredients, and complaints having been made by some of the brewers in reference to this, the Somerset House Chemists were directed to make an investigation into the amount of salt contained in ordinary ales, and the result of the investigation which they then made was that the rule was relaxed so far as to allow of the excessive amount of 50 grains of salt per gallon; and if our memory be right—we have not the figures before us now—the *maximum* amount in all the samples (several hundred in number), which were examined for the purposes of this enquiry was not more than about 55 grains per gallon, and we believe that this occurred in one case only.

It is hardly to be wondered at that the Burton brewers, resent such an outrageous statement. The Burton water certainly does not derive its excellence for brewing purposes from the amount of salt it contains, or it would be easy to imitate it; and it is scarcely possible for the Inland Revenue Chemists to make a more unjust or unfounded statement than to say that the strong Burton ales contain about 60 grains of common salt per gallon.

The paper which we publish from Mr. Gatehouse, shews pretty conclusively what is the maximum amount which can be derived from the malt and hops used. The amount present in the waters is capable of the most ready determination, and there can be no possible difficulty in allowing for the amount of concentration which takes place during the brewing process, and we affirm, unhesitatingly, that it is extremely rare to find a sample of genuine ale from any of the leading Burton breweries containing so much as 60 grains of salt per gallon. In this case, therefore, the want of knowledge on the part of the Inland Revenue Chemists has led to a failure of justice.

We must go further. Not content with failing to make themselves acquainted not only with what had been done by other analysts, but also with the reports which had been issued from their own laboratory, the Inland Revenue Chemists, who were, up to 1873 or 1874 unfamiliar with the subject of milk analysis—while other chemists had worked on the matter for many years previously—have since then examined samples of milk, many of which have, apparently, been taken from under-fed or imperfectly-milked cows, and a large proportion of which have, in all probability, been some days in the course of transmission to Somerset House, and on the basis of these experiments they have evidently come to the absurd conclusion that milk always decomposes at a certain definite rate, and that if they analyse a sample a certain time after it has been examined by the original analyst, they must make allowances on the results which they obtain before they form their conclusions as to its purity or otherwise. More than this, instead of taking the milk of average cows or an average dairy as a standard, or instead of taking the milk even from the poorest healthy cow which they could meet with, and which was not half-milked—they actually go out of their way, not only to take as a standard the milk of under-fed cows, but also to do, what the Sale of Food and Drugs Act certainly does not in any way authorise them to do, viz., receive and act upon *ex parte* statements of the "*poor prosecuted milkman*," as to the character of the food upon which the cows have been kept. It is incredible that any Court of Justice could, for one moment, admit evidence founded upon irregular statements of this kind.

Still one more point we must raise. By whom are the analyses at Somerset House executed? We cannot forget the fact that before a Committee of the House of Commons, not many years since, the heads of this very laboratory gave evidence "that neither by chemistry nor by any other means was the admixture of chicory with coffee to be detected." Even supposing that we admit that these men themselves do the work, are they honestly qualified to successfully contradict, by the examination of stale samples, the evidence of men who have been selected, by open competition, for the posts which they hold, and whose appointment has been in every case confirmed by the Local Government Board, and who have worked upon the fresh sample, while it was still in a state fit for analysis? Still more: is it just that a certificate from Somerset House, should be taken as a certificate representing the actual work of three men who in most cases are not cross-examined, in contradiction to the evidence of Public Analysts who are cross-examined,

when the fact is notorious that only one, if any, of the three signatories to the Somerset House certificate has been actually concerned in the analysis? Let the certificate of each man's work bear its own proper signature only, and then there will be a fair basis on which to act, as his position and salary will be then known, and the magistrates will be better able to judge into whose hands the reputation of the original analyst has been placed.

We do not say more now, because we know that as soon as Parliament meets, the matter is to be brought before the House of Commons, and we think this will be the most satisfactory mode of ventilating the whole subject; and, as amendments are certain to be made in the Act next session, it will probably be a convenient time for amending this point also, and relieving the Inland Revenue authorities from this source of anxiety. If prosecuting solicitors would only insist on the personal attendance of these gentlemen in the witness box, and give them full scope to air their little wisdom, the world would be the wiser, and the Somerset House Chemists more laughed at.

---

### THE CHEMICAL SOCIETY'S JOURNAL.

SOME months ago a general meeting of the Fellows of the Chemical Society was held at Burlington House. At this meeting, among other things, the condition of the Society's Journal was discussed, and various improvements were suggested and promised. So far, however, we are sorry to say, no beneficial results seem to have been produced. The Journal appears as late as ever, and the character of the abstracts becomes less and less satisfactory. Take the September number, for example. In this (page 271) we have an abstract of rather more than half a page, in which we are informed that, as it was difficult to form an abstract we had better consult the original. Why then attempt abstraction at all? On the same page an abstract of rather more than a page in length begins, written by some one, (whose initials, by-the-by, we do not find among the recognised abstractors given on the cover,) which few, we believe, will understand fully unless they have read the original; the attempted explanation of the fact that bubbles are sometimes attracted, sometimes repelled by heat being particularly unsatisfactory. On page 275 space is wasted on a perfectly childish experiment, called "Abortive experiment on Torpedoes," and the three abstracts, "Apparatus for Oxidation," "Laboratory Gasometer," and "A cheap Gas Blow-pipe," would have been more advantageously placed in the waste paper basket of the editor. The next sixty pages are chiefly devoted to abstracts on organic chemistry, which we pass over with the remark that a very undue proportion of space is devoted to abstracts of papers, the authors of which claim an intimate acquaintance with the exact position of every atom in even the most complicated compound. This may be very interesting to chemists who, like the authors of these papers, fancy themselves hail-fellows-well-met with every atom under the sun, but it is somewhat tedious to ordinary chemists not on the visiting list of either atoms or molecules. Passing on to other portions we come, on page 373, to what is probably the gem of the collection, entitled "Differences observed in unadulterated milk (we suppose unadulterated milk from healthy cows is meant) in which the specific gravity of cows' milk is said to vary between 1018 and 1045!!! This is really too much for our feelings, we must stop, and can only exclaim, whisper it not at Somerset House, or the increase in our dairies of the

well-known breed of cows favoured with iron tails, will be something truly alarming. In order to improve this lamentable condition of things, and to render the journal worthy of the Chemical Society of London, and an expenditure on it of over £1,500 a year, we venture to offer the following suggestions. Instead of hampering our able Editor with two dozen abstractors, occasioning the loss of much time and the frittering away of money, let there be but two, or at most three. These should be required to devote the greater part, if not the whole, of their time to the work of abstraction. A room in Burlington House should be set apart for their labour, and as an additional inducement to young but able chemists, the laboratory of the Society should be fitted up and placed at their disposal for certain kinds of work to be determined, or approved, by the Council. Under such an arrangement the Editor, and the Council of Publication, would have the whole work much better under control, which in consequence would be done with much greater regularity, and on the whole, much better than at present.

---

### ON THE AMOUNT OF SALT IN BEER.

By J. W. GATEHOUSE.

ON July 30th, a sample of beer, brought me for analysis by our Local Inspector, was found to contain 68.5 grains of common salt per gallon.

The case on being taken before the Bath Magistrate, was by them, at the request of the defendant, referred to the analysts at Somerset House. On September 7th, at the adjourned inquiry, a report was read, signed by Messrs. Bell, Baunister & Helm, which, whilst giving the amount of salt present as 66.5 grains per gallon, and thus substantially corroborating my own analysis, yet appended as a rider, that they considered the beer might not be adulterated as they had found certain samples of strong Burton beer to contain about 60 grains of salt per gallon, derived solely from the water, malt, and hops used in brewing. On the strength of this statement the magistrates dismissed the case.

Feeling assured that the Somerset House Chemists had made some mistake in the latter part of their statement, I have investigated the possibility of discovering from the composition of the beer itself, the maximum amount of salt that could be derived from the malt and hops, so that supposing the amount of chlorine in the water used to be known, the maximum amount which could naturally exist in the beer might be calculated.

In order to arrive at this conclusion, we must, in the first place, know the percentage of chlorine calculated as salt present in malt and hops; and secondly, be able to calculate from the analysis of the beer, the amount of each used in brewing a given quantity of the beverage.

Oudemans gives the amount of ash in barley at 3.1 per cent., and that of malt as 2.7 per cent. Fehling and Faist find the ash of barley to vary between 3.04 and 2.1. Polson gives it as 2.8, and Way and Ogston from 1.79 to 2.3 per cent., the mean of nine analyses being 2.09. Muspratt found for barley 3 per cent., and malt 2.52.

In experiments made by myself, a sample of barley gave 2.44 per cent. of ash, of which 2.04 was soluble in acid and .4 insoluble.

Malt from the same barley gave 2.47 per cent. of ash, of which 1.91 was soluble, and .56 insoluble in acid. The malt dust from the same sample yielded 8.4 per cent. of ash, of which 5.43 was soluble and 2.57 insoluble in acid. Another analysis of a

different sort of malt, and malt dust from the same sample gave respectively 2.44 and 5.69 per cent. of ash, so that it is plain that in the act of germination barley loses not only organic, but also a considerable amount of its inorganic constituents, and it will be seen that a goodly percentage of this inorganic matter is derived from the soluble chlorides contained originally in the seed. Way and Ogston state that the *ash* of barley contains from a trace of salt only an amount varying up to 2.47 per cent., their analyses of nine samples being respectively: a trace, 0.41, 0.56, 0.61, 0.725, 1.44, 1.59, 2.01 and 2.47 per cent., giving a mean of 1.09 per cent., and as malt certainly contains a less percentage than this, the amount of salt possible in a beer derived from the malt alone could not be greater than the highest of these percentages, and would with great probability, be lower than the mean. An analysis made by myself of the malt and malt dust mentioned above, gave for the malt only an unweighable trace of chlorine, but for the malt dust 0.04 per cent. of argentic chloride, which equals 0.0164 per cent. of salt. The barley, malt, and malt dust also mentioned before, gave respectively .00815, .0053, and .0256 per cent. of salt. In each case 1,000 grains were burnt, and the chlorine calculated in the whole amount.

We are therefore warranted in coming to the conclusion that the ash of malt is not higher than 2.5 per cent., and also that the percentage of salt this ash contains theoretically, as calculated from the total amount of chlorine present, is certainly less than 1 per cent., giving a percentage of .025 of salt in malt, as a possible maximum, this being probably many times higher than the average amount.

From the analysis of Way and Ogston, hops appear to contain from 5.95 to 8.07 per cent. of ash, and of this from 3.72 to 4.28 per cent. consists of salt. Taking the highest of these numbers, this would give us 0.345 per cent. of salt in hops. My own analysis of a sample gave an amount of chlorine corresponding to 0.062 per cent. of salt.

As the amount of hops used in brewing is seldom, if ever, more than 20-lbs. per quarter of malt for bitter beer, and generally less than half this in strong beer, and as this weight of malt would brew at least two barrels of beer or 72 gallons, the salt derived from the hops, could not in bitter beer exceed 6.7 grains, and in strong beer 3.35 grains per gallon.

In order to find the original amount of malt used in brewing any sample of beer, we require to know two things: first, the amount of alcohol; and secondly the amount of solid extract the beer contains, or the specific gravity of the boiled beer made up to its original bulk; from which, neglecting the small quantity of acid, we can find the original gravity of the wort, and the total amount of malt extract before fermentation. From these data the weight of malt used in the brewing, is easily deduced, as by Ure's experiments, a quarter of malt weighing on the average 320-lbs., will yield about 210-lbs. of extract, or in brewer's language, a barrel of 84-lbs. gravity.

That the calculations based on these facts may be more clear, we will now take an actual example of beer analysis, in order to compare the amount of salt it could contain, with that actually present. The beer was a sample of the strongest Burton I could procure, made by a well-known firm.

Specific gravity	...	...	...	...	1025.8 per cent.
Amount of alcohol	...	...	...	...	8.65 "
Specific gravity of boiled beer	...	...	...	...	1,039.6
Specific gravity of the alcohol 985.5, giving a "spirit indication" of 14.5, which by the tables, gives an additional gravity of					67.6
Original gravity of wort	...	...	...		<u>1107.2</u>

From this "original gravity," we next proceed to find the quantity of malt extract it contained, which may be done either from Ure's tables or by the following calculation.

Subtract 1,000 from the original gravity, divide by 100, and multiply by 2.5, will give the total amount of malt extract per gallon in pounds weight.

To show that the above rule agrees with the tables, a wort of specific gravity 1032 would, by the tables, contain 7.95 per cent. of extract, or .795 pounds per gallon, whereas by calculation  $1032 - 1000 = 32$ ; and  $0.32 \times 2.5 = .8$ .

Proceeding with our calculation above, an original gravity of  $1107.2 = 1.072 \times 2.5 = 2.68$  pounds of malt extract per gallon, and as 320 of malt = 210 of extract, the amount of malt used =  $\frac{2.68 \times 320}{210}$

But as the percentage of salt in malt is not greater than .025 per cent. the amount of salt in this =  $\frac{2.68 \times 320 \times .025}{210 \times 100}$  or expressed in grains  $\frac{2.68 \times 320 \times .025 \times 7000}{210 \times 100} = 7.15$ .

In this calculation we have taken no note of the amount of salt derived from the hop, but as it was not a bitter beer, if we add 3.35 grains, as before calculated, we shall obtain a total of 10.5 grains due to malt and hops alone.

The published analyses of the water used in the brewery where this beer was made, gives about 14 grains of salt per gallon, so that from malt, hops, and water, we get a possible amount of 24.5 grains of salt per gallon. The amount actually obtained by an analysis of the same beer was 18.24 grains, or about  $\frac{3}{4}$  of the possible amount.

As the whole of the numbers above used are constants, except the 2.68 obtained from the beer under examination, we may materially shorten the process by the annexed rule.

To find the possible amount of salt in a beer due to malt alone,—Deduct 1,000 from the original gravity of the wort, divide the result by 100, and multiply by 6.6, which gives the salt in grains per gallon.

To take a case:—

A Beer just analysed by me was found to contain Alcohol 5.2 per cent.	
Malt Extract 7.38	,,
The specific gravity of the Alcohol being .9911 the spirit indication	
was 8.9 which by the tables gives an original gravity of	... 38.6
Gravity of Boiled Beer	... 1030.6
Original gravity of Wort	... <u>1069.2</u>
Salt due to Malt alone	... .. = $.692 \times 6.6 = 4.567$
Salt due to Hops	... .. 3.35
Salt due to Water unknown	
Possible total due to Malt and Hops	... .. <u>7.917</u>

Amount of salt actually found by analysis 8.55. This process will thus, if the amount of salt in the water be known, always give a theoretical amount largely in excess of any that will actually be found, and yet sufficiently near to enable one to judge of the actual amount of adulteration, as the general character of the water in his district will always be known to the analyst.

A very slight consideration of the statement made by the Somerset House Chemists, that a certain Burton beer contained 60 grains of salt per gallon, due to the water, malt, and hops alone, will thus be seen to be based on some mistake, except the beer were purposely brewed from a water largely charged with salt, and much more so than is usually the case, even with Burton waters.



Even if a beer were brewed, so strong as to contain the extract from a quarter of malt in a barrel, the amount of salt per gallon could not possibly exceed—

$$\begin{array}{r} \text{From Malt } \frac{310 \times 7,000 \times \cdot 025}{100 \times 36} = 15\cdot5 \text{ grains.} \\ \text{Maximum due to hops} \quad \dots \quad 6\cdot7 \\ \hline \text{Maximum due to malt and hops} \quad 22\cdot2 \end{array}$$

leaving nearly 40 grains per gallon for the water alone.

This, however, is in every respect an extreme theoretical case, the amount of 18·24 grains as actually found in the strong Burton, examined by me, being much nearer what I believe will be actually found in practice.

This case shews, at least, how much Public Analysts lie at the mercy of statements made by Somerset House officials, without proof of their accuracy being offered.

## ON THE PRODUCTS OF COMBUSTION OF COAL GAS.

By C. HEISCH, F.C.S.

Now that the excitement of Parliamentary contest is (at least for the present) over, I think it may be well to lay calmly before your readers some, at least, of the reasons which have led me to the conclusion (shared, I am glad to find, by Silliman and other good authorities,) that the greater part, if not the whole, of the sulphur contained in coal gas, is converted during combustion into sulphuric acid. As there can be no question that sulphurous or sulphuric acid must be the result of the combustion, the investigation is really confined to establishing the presence of one or other, or both, of these compounds in the air of a gas-lighted room.

My experiments were first directed to establishing the presence or absence of sulphurous acid.

In a small room, containing only 292 cubic feet of air, an ordinary batwing burner, consuming 4 cubic feet per hour, was burned continuously for from 24 to 48 hours. The gas contained an average of 22 gr. of sulphur, per 100 C.F. The only ventilation was the want of absolute tightness in the door and window, and one or two chinks in a boarded partition. Pieces of paper moistened with a solution of iodic acid and starch paste were suspended in various parts of the room, but no coloration was to be found, though in this small space from 20 to 40 grs. of sulphur were burned during the different experiments. This was repeated many times, and on one occasion only, two of the slips of paper were discolored: one of these was suspended directly over the burner, the other over one of the chinks in the partition, before mentioned, so as to catch any outward draught there might be. An examination of the gas was conducted in the ordinary way, at the same time, and on this particular day the gas contained nearly three times as much ammonia as usual, which led to the belief that the discoloration of the paper was due to some nitrous compound formed by the combustion of the ammonia, and not to Sulphurous acid. This idea was confirmed by the fact that when the gas was passed through acid before being burned no discolouration occurred. This experiment was many times repeated, always with the same negative result. Much stress has been laid by some on the fact that if the gas be burned in a Referees' sulphur apparatus without ammonia, little sulphuric

acid is condensed, and, impressed with the idea of the high boiling point of that acid, the conclusion has been arrived at that if present it must be condensed. By connecting the end of the eduction tube of the Referees' apparatus with a good condenser, I found that much more sulphuric acid could be obtained, showing that it did pass out of the eduction tube, though there is no doubt a large amount of sulphurous acid is formed in the apparatus. Does the combustion, then, in this apparatus correspond with the ordinary combustion in a room where the products of combustion are at once mixed with an enormous excess of air? To test this several analyses were made of the air from the eduction tube, and it was found to contain only from 13 to 14 per cent. of oxygen, and 4 per cent. of carbonic acid; indeed it extinguished the flame of a taper when brought in contact with it. Having thus shown the difference between experiments, conducted in this apparatus and the ordinary combustion of gas, I made the following experiment to see how soon the sulphuric acid from the eduction tube would oxidize if brought into the air. A common lamp chimney, 7 inches long and 2 inches wide, was suspended over the end of the eduction tube, so as to receive the ascending current of hot air. Paper moistened with iodic acid and starch was suspended in this, and though such paper was rapidly blued at the mouth of the eduction tube, half way up the chimney it remained uncoloured.

I come now to the more positive proofs of the presence of sulphuric acid in the atmosphere of rooms in which gas is burned. I put on one side for the present all experiments with leather and metal goods, though in an economic point of view they are very important, and confine myself simply to the amount that can be condensed by merely lowering the temperature of the air, and its relation to the quantity of sulphur contained in the gas.

In the small room before mentioned gas was burned at 4 cubic feet per hour in a bat wing burner, after three hours a half-gallon flask full of powdered ice was taken into the room and left till the ice was all melted (about 3 hours). The flask was placed at 4-ft. 6-in. from the ground, or about breathing height. The outside of the flask was then washed with distilled water, and the washings precipitated with Ba. Cl. An average of several experiments thus made with gas containing just over 20 grs. of sulphur per 100 cubic feet gave  $H_2SO_4$  .3 grs. condensed.

A similar set of experiments made with gas containing an average of 10 grs. per 180 cubic feet gave only  $H_2SO_4$  .056.

Now as there can be no doubt that the mischief done by the acid formed must be, to a great extent, in proportion to the ease with which it is condensed, we have here a proof that the mischief increases much more rapidly than the actual increase of sulphur. These experiments are also interesting as showing that notwithstanding its very high boiling point, the condensing point of sulphuric acid, when mixed with air, is like all other vapours, altered very rapidly, according to the proportion of air with which it is mixed. This need not surprise us when we remember that water which boils at  $212^\circ$  has been found in the state of vapour in the atmosphere at a temperature of  $-100^\circ$  F, and there is good reason to believe exists at much lower temperatures. I am now engaged in a series of experiments to test those facts still more strongly and precisely, and these together with the experiments on the effect on metals and other bodies of the air of gas-lit rooms, I hope to lay before your readers on a future occasion.

## ON THE PRODUCTS OF COMBUSTION OF COAL GAS.

By W. C. YOUNG, F.C.S.

Does the presence of sulphur in gas produce sulphuric acid in sufficient quantity by its combustion to be injurious to health or property? This is a question which has exercised the minds of many for a long period, and was recently warmly debated before a committee of the House of Commons. Having stated to that committee my firm belief that the greater part, if not the whole, of the sulphur is converted into sulphuric acid, I propose to give in this paper, an account of the experiments upon the results of which I based my conviction.

The surfaces of varnished wood work, and the moisture condensed upon the cold surfaces of windows exposed in a room where nothing but gas had been used for lighting or heating purposes, gave very strong acid reactions to litmus paper, which acid proved to be sulphuric, and although I found considerably more on the upper part of the room, still the evidence was strong from the lowest portions. This led me to suspend various moistened surfaces in the room, so that by measuring the gas consumed during the time they were hanging, I could ascertain the amount of sulphuric acid deposited upon every square foot for each 100 cubic feet of gas burnt.

1st.—Two square feet of linen, moistened with water :

100 cubic feet of Gas burnt, gave  $\cdot 9$  Ba SO<sub>4</sub> =  $\cdot 377$  H<sub>2</sub> SO<sub>4</sub>  
 100 cubic feet of Gas =  $\cdot 189$  grains H<sub>2</sub> SO<sub>4</sub> on 1 square foot.

2nd.—One square foot of bibulous paper, moistened with water :

100 cubic feet of Gas burnt, gave  $\cdot 45$  Ba SO<sub>4</sub> =  $\cdot 19$  H<sub>2</sub> SO<sub>4</sub>  
 100 cubic feet of Gas =  $\cdot 19$  grains H<sub>2</sub> SO<sub>4</sub> on 1 square foot.

In the foregoing experiments no attempt was made to check the ventilation of the room, which was of the most perfect kind, there being an opening six inches square into the flue close to the ceiling, and another communicating with the outer air, close to the floor. The paper and linen dried in about two hours.

3rd.—Nine inches square of bibulous paper, moistened with weak solution of bicarbonate of soda, suspended a few inches in front of ventilator, in upper part of room :

150 cubic feet of Gas burnt, gave  $\cdot 70$  Ba SO<sub>4</sub> =  $\cdot 293$  H<sub>2</sub> SO<sub>4</sub>  
 100 cubic feet of Gas =  $\cdot 347$  grain H<sub>2</sub> SO<sub>4</sub> on 1 square foot.

4th.—Repetition of 3rd, using weak solution of potash instead of bicarbonate of soda, paper being  $4\frac{1}{2}$ -inches square :

72 cubic feet of Gas burnt, gave 1 Ba SO<sub>4</sub> =  $\cdot 42$  H<sub>2</sub> SO<sub>4</sub>  
 100 cubic feet of Gas =  $4\cdot 14$  grains H<sub>2</sub> SO<sub>4</sub> per square foot.

The two last experiments show clearly that a great part of the sulphuric acid produced was being removed by the very perfect means of ventilation in use, and the gas did not, at any time during the experiments, contain more than 12 grains of sulphur per 100 cubic feet. These results seem to me to show that whatever the sulphur was resolved into immediately after combustion, it was ultimately converted into sulphuric acid.

Having noticed that dust collected in rooms where gas had been much used was strongly acid, I collected some from the top of a wardrobe cupboard, which had been standing in a bedroom undisturbed for six months. The dust was boiled in water,

filtered, and the acidity of the liquid, ascertained in the usual way, I found to be equal to 1.005 grains,  $H_2SO_4$ .

The top of the cupboard was 3-ft. by 1-ft. in surface, so that each square foot would give .335 grain,  $H_2SO_4$ . This calculated for the whole surface of the four walls (the room being 12-ft. by 9-ft., and 9-ft. high), supposing the acid to be evenly distributed over them, the gas having been burnt for twelve hours a day on an average, at the rate of about one cubic foot per hour, making altogether about 2000 cubic feet, would indicate that two grains of sulphur per 100 cubic feet was deposited thereon as sulphuric acid.

As the wood upon which the dust had collected, had no doubt absorbed some of the acid into its pores, I cut three square feet out of the top of the canopy of the bed furniture in the same room, and treated it with boiling water, filtered, and took the acidity of the solution. This amounted to 1.42 grains  $H_2SO_4$ , which, calculated as above, would indicate that three grains of the sulphur in each 100 cubic feet of gas consumed was deposited as sulphuric acid. Certainly a very large proportion, considering that the room had been in ordinary use during the whole six months, the window opened for a considerable time daily.

I obtained from a tradesman two glazed show cards, which had been hanging in his shop for six months, in which no coal fire had been used. There had been five burners, burning about three cubic feet per hour each, in use for about three hours per day, so that in round numbers about 6,000 cubic feet had been burnt.

The cards were well washed with hot water and the acidity of the solution taken.

1 card, 3-ft. by 1-ft. = 1.78 grains  $H_2SO_4$

2 ditto, 1-ft. by 1-ft. = .588 " "

Calculated on the amount found upon the first card there would be .01 grain  $H_2SO_4$  on one square foot from 100 cubic feet of gas.

These cards had been suspended vertically, but the following experiment was made upon the top of a tin box, which had been laid upon a shelf, of course presenting a horizontal surface.

The box had remained undisturbed for fifteen months; during that time four burners had been in use for lengths of time per day varying with the season of the year. I have made an average which indicates that about 16,000 cubic feet of gas had been consumed during the whole period. The acidity found was equal to 1.96 grains of sulphuric acid upon the whole surface, which was one square foot.

This, then, would show that 100 cubic feet of gas burnt had deposited .012 grain  $H_2SO_4$  on one square foot of surface, or rather more than was found on the cards. The box was taken from another shop than the one from which I obtained the show cards, but the same Company's gas was used in each, and I should mention that upon examination I found that a perfectly new show card, similar to those I had previously tested after they had been exposed, contained no acid of any sort.

Both these shops were exceptionally well ventilated, and I am of opinion that the greater part of the acid was deposited with the moisture condensed by the cooling of the room, consequent upon turning out of the gas and closing the door at the end of the day.

I obtained from an old-established library, where but little gas was burnt, 8 octavo volumes which had been upon an upper shelf for a space of about 3 years. The books were well-dusted and carefully sponged with water, but I could not by these means wash

the whole of the acid off the face of the bindings, as I found after sponging six times that they were still strongly acid to test paper. The dust was added to the washings, boiled, filtered, and in the filtrate was estimated the free and combined sulphuric acid.

Result, Total  $\text{H}_2\text{SO}_4 = 4.76$  grains.

Free do. = 1.37 ,,

Some dust merely shaken off, eight other octavo volumes from the same shelf, gave

Total  $\text{H}_2\text{SO}_4 = 2.1$  grains.

Free do. = .441 ,,

so that the greater part of the acid is absorbed into the leather.

This dust was very hygroscopic, and when washed and dried, appeared exactly like powdered charcoal, in fact, presenting all the appearances of organic matter, subjected to the action of sulphuric acid.

I also examined dust from cellars where no gas or coal fires had been burnt, and found it quite neutral to test paper; containing only a trace of combined  $\text{H}_2\text{SO}_4$ .

I conclude from these results, that the atmosphere of a room becomes charged with the vapour of sulphuric acid in proportion to the amount of gas burnt, and the means of ventilation in use; that this acid is condensed with the moisture upon the cooling of the room, and the weak acid so deposited is deprived of its water when the room is again heated, so becoming concentrated, the process being repeated day after day, until the acid is in sufficient quantity to damage anything exposed to it, and even as instanced above to char it.

In favour of the theory that sulphuric acid *per se* is produced by burning gas containing sulphur, and not by the oxidation of sulphurous acid after admixture with the air, I may mention the following experiment, which, apart from the application, is curious in itself.

The glass chimney of the "Sugg's London Argand," is, when in use, more quickly covered with a deposit on its interior surface than other argands. This fact has been noticed by many, and I have heard several theories as to its origin, the more general being that it is due to the mineral matter or ashes of the suspended particles contained in the air supplied to the burner. If this were so, the same would be observed in other argands.

In order to ascertain the composition of this incrustation, I left a chimney on a burner consuming about one foot per hour for two months. I noticed that the deposit first appeared as an opaque coating extending up the chimney a distance of about one inch, the base being on a line with the upper edge of the cone. The deposit increased in thickness until it covered the same space with innumerable transparent globules, which, in time, decreased in number and increased in size. These globules were evidently in a molten condition, as on cooling they became opaque and hard, whereas when hot they were transparent and soft. They proved to be highly deliquescent, very strongly acid, and on analysis gave results showing them to be stannic sulphate.

The amount collected was nine grains; I need hardly say the tin was derived from the cone of the burner.

Here, then, is sulphuric acid found, where it would be least looked for, condensed on a very hot surface, and close to the base of a flame, that is to say, where combustion is admittedly not so complete as at any other part of the flame.

## ON THE PRODUCTS OF COMBUSTION OF COAL GAS.

By G. W. WIGNER, F.C.S.

For many years past this question has been thoroughly misunderstood. No doubt this may seem a very sweeping assertion, but when I find statements made by an eminent gas engineer, who is an ex-manager of gas works, that the question of the sulphur in gas is simply ridiculous, because sulphuric acid "could not be formed and is not formed," the matter becomes of some importance to meet and answer, and when further, this gentleman says in reference to the formation of sulphate of copper and sulphate of zinc caused by the burning of gas, "it is ridiculous," it is clear that there is reason to ventilate the subject.

Now what are the actual facts? Gas, as originally produced from the retorts, contains at least two different and distinct forms of sulphur impurities. One of these is unquestionably sulphuretted hydrogen, as is shown by its action on lead paper and other tests; the other is either bisulphide of carbon or a closely allied substance. Oxide of iron entirely removes the former, *i.e.* sulphuretted hydrogen, but for the removal of the bisulphide of carbon the use of lime in some form or other is essential, and it is also essential that this lime should be used in a judicious and careful way. The contention of the gas companies throughout has been that the products produced by gas containing sulphur in the second of these forms, did contain sulphurous, but not sulphuric acid, while the contention of those who have thoroughly investigated the matter has always been that the product was sulphuric acid.

I have recently carried out a series of experiments, and investigated the question, and will, as briefly as possible, describe them. I may state at once, that I do not at all doubt that just at the instant of ignition of the gas, and in the actual zone of the flame itself, a certain amount of sulphur has been burnt into the form of sulphurous acid only, so that if, for example, the products are drawn from a spot only half way up the chimney of an Argand burner, sulphurous acid will be found present, but this is hardly to be wondered at, when we consider that the combustion of the gas has reduced the oxygen present in the air by some five or six per cent., and replaced it by a corresponding quantity of carbonic acid. It is scarcely likely that oxidation could go on under such circumstances as these, but the moment these products of combustion *leave* the chimney of an Argand, or the globe of an ordinary batswing burner, oxidation again sets in, promoted largely, no doubt, by the amount of aqueous vapour present in the air, and the sulphur is oxidized into sulphuric acid, and becomes still more injurious in its effects.

Having referred to the matter in this general way, I will now consider it in the special light of the experiments I have carried on, to prove the correctness or otherwise of these deductions. The experiments were mostly tried in a room which was 10-ft. 6-in. high, and had nearly 2,000 cubic feet capacity. The room had been ventilated by means of an ordinary Arnot's ventilator, having an area of 36 square inches, but instead of continuing the ventilation through this, a series of plate glass tubes about 16-ft. long and of the same area, *viz.*, 36 square inches, were constructed, and the ventilation was allowed to take place through these tubes. This was effected by carrying the tubes round two sides of the room, so as to put the opening of the ventilator in a position nearly opposite to the old position of the Arnot's ventilator, over the fire place,

and in order to prevent any obstruction to the draft the ventilator was changed from a natural one into an artificial one, *i.e.*, instead of taking place from the lower specific gravity of the heated air, it was artificially forced by means of a small jet of steam in the chimney, and regulated to such an extent as to keep the room during the experiments at a temperature fairly accordant with the number of burners going. The fire place was stopped up during the experiments. These tubes to which I have referred, and which formed, in fact, the ventilator of the room, were then used as follows:—The first tube, which was about 5-ft. long, was surrounded with ice so as to cool the escaping air, and condense, as far as might be, any condensable vapour which existed in the products of combustion, and the cooling effect was sufficient to bring the air at the end of this first tube to an average temperature of about 80° F: the products of combustion thus having been drawn from a level, some three inches below the ceiling, at a temperature of nearly 100° F. The next tube, of about 4-ft. in length, was used to contain various articles, such as pieces of colored silk and other dress materials, which were exposed to the current of air in order to test the effect which was produced upon them, and this tube also contained a number of pieces of test papers of different kinds (which I shall refer to afterwards), in order to ascertain whether sulphuric or sulphurous acid was given off. The next four tubes were each of short length, and were filled with glass bubbles kept moistened with water, or with solutions of alkalies or baryta salts, so as to absorb any sulphuric or sulphurous acid which might have been given off; while the last tube of all contained an air meter, so fixed as to register the exact quantity of air which passed through the apparatus, or in other words the amount of ventilation of the room. There was practically no escape for the air from the room, except that which took place through this apparatus, and the only way in which the products of combustion could escape condensation was by their passing too rapidly through the tubes, and consequently still existing in a state of vapour instead of being absorbed.

I carried on the experiments under extremely varied circumstances, sometimes using three ordinary fish-tail burners, which would be a good average amount of light for a room of such a size; on one or two occasions using eight burners of various kinds, some Argand and some batswing; on one or two other occasions using only one burner, and not consuming more than 4-ft. of gas per hour. In every case the gas was tested during the whole time the experiment was going on, by the Referees sulphur test, to ascertain the amount of sulphur which it contained, and the gas was supplied to the burners through an independent meter, so that the quantity of gas burned was accurately known. The amount of gas consumed during each experiment varied from 34-ft. to 350-ft. The gas tested was of varying quality; sometimes the sulphur in it was as low as nine grns. per 100 cubic feet, while, in one case, it ran up to 18½ grns. per 100 cubic feet. The burners which I used were, as I have said, of all kinds, Argand, batswing, and fish-tail.

The experiments therefore resolve themselves into this:—That a room was ventilated, artificially it is true, but in the ordinary way, *viz.*, at the ceiling, and at the ordinary speed—and that the air escaping from the ventilator was cooled and tested.

I now come to the results of my experiments. First as to the sulphurous acid; during the whole of the experiments a piece of iodide of starch paper was exposed to the effects of the products of combustion, of something like 6,000 cubic feet of gas, and at no one time was there any discoloration of it, that is, it was exposed for about 180 hours to the products of combustion of ordinary coal gas, ranging from good to inferior

quality, passing through a small tube, and yet there was never sufficient sulphurous acid to tint it in any way, although part of it was continually kept moist. Another piece of the same paper, prepared in the same way, was in twenty seconds tinted to a heavy blue tint, by the combustion of only 5 grs. of bisulphide of carbon in a room of similar size. I am, therefore, quite justified in saying, that whatever the products of combustion may be, while they are within the chimney or globe of the gas burner, yet that the moment they are discharged into the room itself, the sulphurous acid which may have been produced, is entirely oxidised and sulphuric acid is the result.

Having obtained this result, I will now consider the question of the amount of sulphuric acid which can be recovered from these products of combustion, and looking at this it must not be forgotten that sulphuric acid, like all other liquids, is volatile even at ordinary temperatures, and consequently exists in the air in a state of vapour, which even at low temperatures it is extremely difficult to remove or absorb. In the worst of my experiments, while burning in the experimental room six large burners which consumed an average of nearly 40-ft. of gas per hour, I succeeded in recovering in the form of sulphuric acid 22 per cent. of the total sulphur present in the gas, a very considerable proportion of which was present as free and not combined sulphuric acid, while, in the best of my experiments, when I was burning only 15-ft. of gas per hour, *i.e.* lighting the room in the proportion in which an ordinary dining room would be lighted, I succeeded in recovering as sulphuric acid more than 62 per cent. of the total quantity of sulphur present. Therefore nearly two-thirds of the sulphur was formed into corrosive acid, and, in my opinion, it is not only justifiable, but right to assume that the air passing away through these tubes, carried off in the form of vapour the remaining one-third as sulphuric acid vapour.

It now becomes important to see to what extent these results are corroborated by other experiments which have been made in order to prove an opposite supposition. I would, first of all, say that the result of the exposure during the whole time of the iodide of starch paper proves that there was no sulphurous acid, and that, therefore, all we have to consider is, whether my experiments as to the production of sulphuric acid are capable of corroboration, and I think they are.

I find, for instance, from some evidence which Dr. Odling gave in an earlier part of this year, that, burning gas containing 33 grains of sulphur per 100 cubic feet, at the rate of 15 cubic feet per hour for 5 hours consecutively, in a room having a capacity of 3,800 cubic feet he found at a height of 1-ft. 6-in. from the ceiling,  $\cdot 160$  of a grain of sulphur per cubic foot of air; at a height of 5-ft. 6-in. from the ceiling,  $\cdot 056$  of a grain per cubic foot; at a height of 3-ft. 6-in. from the floor,  $\cdot 59$  of a grain per cubic foot. If we take the mean of these results, multiply them by 3,800 cubic feet, *i.e.* by the capacity of the room; this would amount to as much sulphur in the form of sulphuric acid as would be produced by gas burned for 40 consecutive minutes; in other words, if the ventilation of the rooms were so bad that the air was not changed more than once in 40 minutes, Dr. Odling would have succeeded in finding the whole of the sulphur which would have been given off by the combustion of the gas.

Dr. Stevenson and Dr. Russell also obtained very similar results; their experiments were of a different kind, and took the form of hanging plates upon the wall in order to ascertain how much acid condensed upon the surface of the plates. Some of the plates were clean glass ones, and some were moistened with an alkali, but when we calculated



these results, we found that in Dr. Stevenson's drawing room, the area of which is about 3000 cubic feet, the amount of sulphuric acid deposited on the walls of the room is about 9.4 grains per hour, or according to his figures 42 per cent. of the total quantity of sulphur present in the gas burnt. A more striking confirmation of the presence of sulphuric acid in the products of combustion can scarcely be wanted. It is quite clear, therefore, that whether the injurious effects of sulphur in gas have or have not been over-rated, sulphuric acid is the product which is formed during the combustion.

---

### ARSENIC IN TAPERS.

By PROFESSOR CHURCH.

THE tapers, which were the subject of the present inquiry, were in the form of slender spills for lighting, and consisted of a few threads coated with wax. They were 11½ inches long and weighed about 16 grains apiece. The strong garlic odour which they evolved on being burnt, the pronounced lavender colour of the mantle which enveloped their flame, and the smokiness of that flame, seemed to indicate that these tapers owed their vivid green colour to a very liberal dose of a well-known arsenical pigment. The following results of chemical analysis amply confirmed this prevision.

Two tapers together weighing 2.0914 grams were taken. They had been cut up into short lengths. The wax was removed by means of carbon disulphide, the residue was treated with strong ammonia and the solution filtered. Hydrosulphuric acid was now passed through the ammoniacal liquid until no more copper sulphide was precipitated. The curd having been filtered off, the filtrate was made acid with HCl and the  $As_2S_3$ , thus thrown down was collected, and then oxidized by nitric acid into arsenic acid. By addition of ammonia and 'magnesia mixture,' a precipitate of ammonia-magnesium arseniate was obtained. Assuming that this salt, dried at 100°C, has the composition ( $Mg NH_4 As O_4$ ), aq. the .0785 gram weighed would represent .031 gram of metallic arsenic. This amount equals 1.48 per cent. on the original tapers. Translated into white arsenic this corresponds to 1.905 per cent.; or, in other words, every taper of 16 grains contains nearly one-third of a grain of white arsenic. Surely the use of emerald green and similar arsenical pigments for colouring tapers should be abandoned. And the same compounds are constantly used for covering paper lamp and candle shades, and with the result, through scorching, of volatilizing or detaching the arsenical poison.

---

### POISONING OF FOURTEEN MEN BY SUGAR CONTAINING ARSENIC.

IN THE ANALYST for August, an account was given, copied from a Glasgow newspaper, of the alleged poisoning of fourteen of the crew of the ship "Crown Prince," on her voyage between Laneton and Callao. In the course of the voyage six of the men died, with all the symptoms of irritant poisoning, but the cause of their death was not ascertained at the time. On the arrival of the vessel in Glasgow, however, a Board of Trade Inquiry was held, the result of which was that a report was made to the Board of Trade Authorities in London, to the effect, that in the opinion of the officials who conducted the Inquiry, the illness and death of the men had resulted from the use of unsound pork, a barrel of which had been opened, and a portion used, shortly before

the first symptoms were noticed. Before the Inquiry opened, however, the owners of the vessel had requested Mr. Tatlock, one of the Public Analysts for Glasgow, to examine some sugar which the Captain (Cochrane) suspected was the cause of the illness and death of the men; the result was that  $13\frac{1}{2}$  grains of arsenious acid were found in one pound of the sugar, which was duly reported, and the report was furnished to the officials who held the enquiry, but the fact did not seem to influence them in their opinion. In consequence of their report, Mr. Tatlock communicated with Mr. Anderson, M.P. for Glasgow, who saw Mr. Stanhope, Secretary of the Board of Trade in London, and he at once telegraphed to Glasgow, and indicated that the Inquiry would probably be re-opened.

Shortly afterwards the Captain was apprehended on a charge of culpable homicide, or neglect of duty, by supplying unsound pork to the crew, and thereby causing their illness and death, and was tried at the Circuit Court, before the Lord-Justice-Clerk, at Glasgow, on the 13th September last. Several of the crew gave evidence to the effect that some rancid pork had been served out to them on a particular day, and that they were afterwards seized with sickness and vomiting of a violent and protracted character, and while some of them said that they considered the pork to have been the cause of their illness, the steward said that he never suspected the pork.

Professor Ferguson, (Chemistry), Glasgow University, and Professor Maclagan, (Medical Jurisprudence), Edinburgh University, were called for the Crown, and corroborated the presence of arsenic in the sugar; and Dr. Dunlop, (Surgery), Anderson's College, Dr. Moore and Dr. Johnstone gave it as their opinions, that the symptoms and the appearance of the men (some of whom were so paralysed in their lower limbs, that they were permitted to sit in the witness-box,) distinctly indicated blood poisoning by unsound meat. Dr. Maclagan, however, was so clearly and emphatically opposed to this view, and gave his evidence in favour of the probability of arsenical poisoning, with so much force and precision, that Lord Moncrieff after consulting with the Advocate-Depute, said it was impossible, after hearing Dr. Maclagan, to go on with the case, and instructed the Jury to return a verdict of "Not Guilty."

#### ABSTRACT OF A PAPER ON THE CONSTITUENTS OF THE IVY.—

##### "HEDERIC ACID."

By ROBT. H. DAVIES, F.C.S.

*Read before the British Pharmaceutical Conference at Plymouth.*

At last year's Conference in Glasgow, I had the honour, in conjunction with Mr. C. H. Hutchinson, of reading a paper in which some of the leading characters of so-called hederic acid were mentioned. Some little additional work having been done upon this substance during the past year, I proceed to report upon it. As already stated, so-called hederic acid consists solely of carbon, hydrogen, and oxygen. Three analyses have already been published of this body—two in 1849 by Professor Posselt, to whom we owe its discovery, and one in April, 1875, in Dr. Hartsen's paper on "A New Substance in Ivy Leaves." This new substance I last year showed to be identical with Posselt's hederic acid.

I have found it exceedingly difficult to burn "hederic acid" completely by the combustion process. When oxide of copper is employed I have never succeeded in

converting the whole of the carbon into  $\text{CO}_2$ . With chromate of lead better results have been obtained, but the method finally adapted was to mix the substance with a mixture of chromate of lead and bichromate of potassium in a tube, the fore part of which for 6 or 7 inches was filled with dry copper oxide. By this means I have obtained results which compare favorably with those obtained by burning the weighed substance mixed with granular oxide of copper in a stream of oxygen.

The following table indicates the percentages obtained in five experiments. The first three being combinations with granular oxide of copper, in a stream of oxygen, and the two last with a mixture of chromates.

	I.	II.	III.	IV.	V.	Average.	Theory for $\text{C}_{16}\text{H}_{26}\text{O}_4$
Carbon .....	67.88	67.37	68.03	67.41	67.63	67.66	68.08
Hydrogen ...	9.33	9.24	9.16	9.19	9.43	9.27	9.22
Oxygen .....	22.79	23.39	22.81	23.40	22.94	23.07	22.70
(by difference)							
	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The percentage of carbon is greater in every case than was obtained by either of the experimenters before alluded to,\* an error on their part which I think due to the difficulty of completely burning the substance.

Attempts to produce salts of barium, calcium, potassium, sodium, aluminum, copper, and silver, have been attended with uniformly negative results; and I have no reason to doubt that my former statement that this substance is not an acid is correct. An ammonium compound has been produced, but the amount of ammonia is so small as to preclude the probability of its being an ordinary salt. It is now under investigation.

## ABSTRACT OF A NOTE ON HEDERIC ACID FROM IVY LEAVES.

By CHARLES T. KINGZETT, F.C.S.

*Read before the British Pharmaceutical Conference, at Plymouth.*

HEDERIC ACID, when pure, is a snow-white powder, insoluble in ether, but soluble in hot alcohol. That specimen which formed the subject of the present paper, was kindly given to the author by Mr. R. H. Davies, and amounted to several grams only. When Mr. Davies read his paper, I suggested that hederic acid was a body constructed on the type of a saccharide, inasmuch as I had found many bodies of this constitution to give, with strong sulphuric acid, a purple colour, like to that given, as Posselt found, by hederic acid, and because this substance gives, on boiling with dilute sulphuric acid, a solution which reduces Fehling's copper test.

Since the time mentioned, I have, in conjunction with my friend Dr. H. W. Hake, published an account† of a number of new reactions in organic chemistry, similar to the one above-described, due to hederic acid, and in the continued prosecution of this study, I have subjected this last-named body to a closer examination.

When heated on platinum foil, hederic acid melts to a colourless oily-like substance, which emits a dense white aromatic and inflammable vapour, and on continuing the heat, the whole of the substance boils away in this manner, leaving no ash and no charcoal.

\* In Hartsen's paper the numbers are C 63.44 per cent., H 10.4 per cent. Posselt gave 66.49 and 66.43 per cent. carbon, 9.5 and 9.41 per cent. hydrogen.

† "On some new Reactions in Organic Chemistry and their Ultimate Bearings." *Pharm. Journ.*, May 12th, 1876.

As already stated, it strikes with strong sulphuric acid a purple colour, which does not form immediately; but this colour is not nearly so intense or so beautiful as that which is immediately formed when a trace of sugar is present, or more faintly when a drop of water is added; further addition of water causes the destruction of this colour.

An attempt was made by the writer to isolate sugar from the molecule of hederic acid by boiling it for a long time (twenty hours) in contact with a two per cent. solution of sulphuric acid. No visible change occurred, but the solution contained a substance much resembling sugar in its properties. The sulphuric acid was removed by baryta water, and the excess of this by carbonic anhydride, and on evaporation of the filtrate to dryness it left a sticky transparent barley-sugar-like mass, possessed of the following characters:—

It contained barium.

It gave with camphor and sulphuric acid the purple colour which Hake and I have shown sugar to produce.

Its aqueous solution reduced Fehling's test readily, and also nitrate of silver.

Strong sulphuric acid charred it in a manner resembling the action of the acid upon sugar.

After drying at 100° it admitted of pulverization.

I have no doubt that the body represents an intermediate state occurring in the spontaneous change of glucosate into glucinate of barium. Of its sugar-like character, however, there can be no doubt.

---

## THE ACID OF WILLOW BARK.

By D. B. DOTT.

*From the Pharmaceutical Journal.*

THE chemistry of the willow seems to have been little studied, and what attention it has received has been almost entirely devoted to its active principle, salicin. All the information I have been able to obtain regarding the constituents of the bark is very meagre, the majority of works on chemistry and materia medica merely mentioning that salicin is extracted therefrom; while, curiously enough, the 'Pharmacographia' of Flückiger and Hanbury omits all notice of the subject. Neligan states (authority not given) that the bark contains resinous matter, gum, chlorophyll, tannin, an organic salt of magnesia, and salicin; and that is as complete an account as I have found in any of the other books.

When an infusion of willow bark is made, the liquor is distinctly acid to litmus. In the preparation of salicin by Erdmann's process this acid is neutralised by the excess of lime, and the salt thereby formed passes into solution. On evaporating to dryness and exhausting the residue with spirit the salt is redissolved and remains in the spirituous solution after the salicin has crystallized out. The salt may be obtained by distilling off the spirit and allowing the residue to crystallize. These crystals are then purified by recrystallization from water. Thus prepared the lime-salt separates in the form of a cauliflower-like mass composed of radiate groups of prismatic crystals.

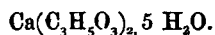
A portion of these crystals when heated fused, and inflamed, left a residue of calcic carbonate, indicating an organic salt of lime. It was found that the substance lost weight but slowly in the exsiccator, and likewise in the water-bath. A portion of the

air-dried salt was therefore dried in the air-bath at 130° C. 9.140 grs. lost 2.745 grs. = 30.03 per cent. In another determination with a different crop of crystals 7.85 grs. lost 2.275 grs. = 28.98 per cent. A quantity of the salt was then incinerated in a platinum crucible, the residue being treated with excess of sulphuric acid and the crucible again ignited. 6.41 grs. gave 4.00 grs.  $\text{CaSO}_4$  = 1.176 grs.  $\text{Ca}$  = 18.34 per cent. In the second determination 6.12 grs. gave 3.82 grs.  $\text{CaSO}_4$  = 1.12 grs.  $\text{Ca}$  = 18.35 per cent.

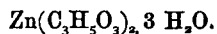
One or two methods for preparing the acid were tried, the following being the process finally adopted:—To a solution of the lime-salt in water solution of oxalic acid is added—not in excess. The precipitate is then separated by filtration, the filtrate concentrated and extracted with ether, which dissolves the acid. The ether being now driven off, a syrupy solution of the acid is left. A few ounces were prepared by this method and placed over sulphuric acid under a bell-glass for two days. The acid then remained in the form of a syrup, almost odourless, with an intensely sour taste. As in these respects it exactly resembled lactic acid, and seeing that the calcium salt in its crystalline form and in its percentages of  $\text{H}_2\text{O}$  and  $\text{Ca}$  corresponded with calcic di-lactate, there could be little doubt that the acid under examination was lactic acid. To make more certain, however, some further tests were applied. A little was heated in a test-tube, when water and carbonic anhydride were given off, and a residue left which shortly solidified. A portion was then boiled with sulphuric acid, which liberated an inflammable gas burning with a blue flame—no doubt carbon monoxide. When a small quantity was heated with sulphuric acid and manganese dioxide, a vapour smelling like aldehyde was evolved. A portion of the acid was distilled and the fraction coming over and above 130° C. was evaporated and treated with cold alcohol, which separated small white crystals, having the form of rhomboidal plates, and in other respects resembling lactide.

From the acid as above obtained the zinc-salt was prepared by warming with excess of zinc carbonate, filtering, and allowing to crystallize. The crystals were pressed between blotting paper and exposed for a short time to the air. In these air-dried crystals the  $\text{H}_2\text{O}$  was determined by drying in the water bath; 6.065 grs. lost 1.125 grs. = 18.46 per cent. In a second determination with another crop of crystals 9.275 grs. lost 1.695 grs. = 18.27 per cent. The zinc was determined in the dry salt by ignition in the blow-pipe flame; 6.33 grs. gave 2.12 grs.  $\text{ZnO}$  = 33.49 per cent. In another determination 7.58 grs. gave 2.55 grs.  $\text{ZnO}$  = 33.64 per cent.

The above numbers are here compared with those calculated for the normal calcium and zinc salts of lactic acid respectively—



	per cent	I.	II.	mean.
$\text{H}_2\text{O}$ . . .	29.22	30.03	28.98.	29.505
$\text{Ca}$ . . .	18.34	18.34	18.35	18.345



	per cent.	I.	II.	mean.
$\text{H}_2\text{O}$ . . .	18.33	18.46	18.27	18.36
$\text{ZnO}$ . . .	33.38	33.49	33.64	33.56

The  $\text{ZnO}$  is too high, owing either to an impurity in the salt, or to a fault in the analysis;

but I had not time to examine into the matter. The zinc-salt crystallized in four-sided truncated prisms, which were insoluble in alcohol.

I am unable to state from what species of *salix* the acid was prepared, but as all the samples of bark I have examined give acid infusions, it is not improbable that lactic acid exists in all the members of the Salicaceæ.

---

### CORRESPONDENCE.

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

TO THE EDITOR OF "THE ANALYST."

SIR,—With your kind permission, I should like to be allowed to make a few remarks on the following questions:—Firstly, as to the so-called castor oil pills. That the sale of a pill under the name of a substance of which it does not contain a trace is a fraud, and a very mischievous one, seems such an obvious truism, that one can scarcely understand how it can be disputed. Since the first prosecution regarding the sale of castor oil pills, without castor oil, has taken place, I have asked a number of persons, educated as well as uneducated, what they imagined the chief active principle of their castor oil pills to be, and was in every case informed that they bought them because they believed them to contain castor oil, or perhaps a concentrated extract of the oil, retaining all the active principle. The defenders of the practice of misnaming pharmaceutical preparations, who bring forward numerous cases to prove the generality of the practice, all ignore the gravest feature of the case, independently of the fact that two wrongs do not make a right, viz., that these pills are sold as a purgative, and are sold under the name of a well-known and highly appreciated article, unfortunately, however, somewhat unpleasant to take. Persons, therefore, who like the action of the oil, but not the taking of it, buy these pills, and are miserably taken in. The proposal of some pharmacists to add a trace of castor oil, and call the pill compound castor oil pill, is so utterly contemptible, that I can only express my astonishment at the length to which some trades-people seem willing to go.

Secondly, as to the question of peas coloured by copper. I must confess that I had hoped Messrs. Paul and Kingzett would of their own accord withdraw their hasty conclusions as soon as they saw the very poor show their experiments made in print. This, however, is obviously not their intention, and they actually seem to imagine that they have settled the question once for all in favour of the coloured peas. Could there be a more glaring instance of the unscientific use of the imagination. How could they venture to draw any serious conclusions from their few experiments, in which they have not even taken the trouble to estimate the total quantity of copper they took, nor the quantity of the metal passed by the bowel, and when they know absolutely nothing about the quantity of copper which, when absorbed into the system, proves injurious to various constitutions? But it is really waste of time to criticise such work as this, and I trust that no Public Analyst at least will be misled into the belief that peas coloured by copper have been in any way proved to be non-injurious.

Copper seems to be one of those substances which, like arsenic, mercury, lead, opium, &c., &c., act with very different intensity on different constitutions, or under different conditions. Some persons can withstand the injurious effects of quantities of these substances which to others would be absolutely fatal, while some are sensitive to the action of quantities which we can only call infinitesimal. How much lead, for example, will find its way into the system of a person exposed to the exhalations from freshly-painted surfaces for a few hours, or how much arsenic into the system of one staying for a few hours in a room, the paper of which is coloured by arsenical green? And yet we know that both these conditions sometimes produce characteristic symptoms of lead or arsenic poisoning. Now, although copper does not seem as active under any conditions as either lead or arsenic (although even this is doubtful), many of its compounds are undoubtedly poisonous, and it appears to me utterly unjustifiable to defend such a practice as the colouring of peas by means of copper on the strength of a few rough experiments such as those of Messrs. Paul and Kingzett.

In conclusion, a few words as to the question raised in Dr. Morgan's letter in your last issue. I can scarcely believe that the certificate of Messrs. Bell, Bannister, and Helm has been quoted correctly. As is well known, chloride of sodium had been put into the schedule of prohibited articles in the Licensing Act of 1872. This, as was natural, created some commotion among brewers; they petitioned Government, and, after a prolonged inquiry, the addition, or rather the presence in all, of 50 grs. of chloride of sodium per gallon was permitted. This is absolute proof that no English beer or ale of any consequence, at that time at least, contained naturally more than this proportion of common salt. It is extremely unlikely that the Burton supply has, since then, entirely changed its character. Yours, &c.,

October, 1877.

A. DUPRE.

TO THE EDITOR OF "THE ANALYST."

SIR,—Your letter of yesterday to our Directors has been handed to me. In answer, I assert and assure you that no ales leave this brewery containing 20 grains of salt per gallon. The waters used here contain from 5·10 grains to 5·35 grains chlorine per gall., and in no case is their a concentration to one-half. Salt is not used, or any matters to form it.

We are aware a little may be added from the malt and hops used. Consequently I cannot err much in my report of this day on a strong beer, having had more than usual amount of concentration, containing 15·60 grains per imperial gallon.

I am, Sir, faithfully yours,

WILLIAM KIRK.

*Chemist to the Burton Brewery Company.*

23rd October, 1877.

## LAW REPORTS.

### ADULTERATION OF GIN.

At Bow Street, William Birrell, landlord of the Two Brewers, 164, High Holborn, lately appeared to an adjourned summons, before Mr. Vaughan, charging him with having sold gin, which was not of the nature, substance, and quality of the article demanded. Mr. J. H. Jones, prosecuted, and Mr. Child, solicitor to the London Licensed Victuallers' Protection Society, defended. The facts were these:—On the 11th of July last John Hoyle went to the appellant's house, and, seeing him, asked for a bottle of gin for 2s., to which request the appellant answered that he had no bottles, that he had gin at three prices, upon which Hoyle said that he would take the cheapest, which cost 2s. 1d. He then received a bottle. He then said that he was an inspector under the Sale of Food and Drugs Act, and that he had purchased the gin for the purpose of having it analysed. Opening the bottle, he divided the contents into three parts, which he poured into three smaller bottles. Having sealed these, he left one with the appellant and the other two he took away with him. One portion, which was taken to Professor Redwood for analysis, was found to be 42 under proof, or, in other words it consisted of 53 proof spirits and 42 of water.

Mr. Thomas Arthur Smith, collecting clerk in the employ of Messrs. Tanqueray, gin distillers, of Vine Street, Bloomsbury, proved that the spirit when it was sent out by the firm was 17 under proof. Water and sugar were always added before the spirit was retailed. Mr. Child submitted that the question became what was the practice of the surrounding neighbourhood. If he went to Bond-street, he would expect to pay more than in Drury-lane. Mr. Vaughan said he did not see that at all—at least, not in a question of gin or gin and water. That was a contention *ad absurdum*. He asked witness at what price the gin (17 under proof) was sold to the defendant. Witness said the price of the gin was 12s. 11d. a gallon, and there were about six bottles to the gallon; about 2s. for a pint and a-half. Mr. Child said that of course the defendant could not sell it at the same price. He must consider his expenses, the cost of preparing it, and sweetening it for the public taste. Then there was also the style of the place. Mr. Vaughan said he did not take that into consideration. Mr. Child submitted that this was a place of entertainment, open to the public, and they ought to pay for the lights, the decorations, and the accommodation. If he went into a very smart shop, he would know that he had to pay for the extra smartness of the place. Mr. Vaughan said he could not take into consideration the beauty of the barmaids, the respectability of the barmen, or the cost of the lights and decorations; all those things were for the purpose of enticing a number of flies to the place. There the lights were, and the people swarmed round them. The question was, was a quantity of water put in to fraudulently increase the measure of the gin. There were two ways for a publican to act in. He could mix water to any extent that he liked, and the more water he put in, the better it would be for the public, but then he would have to say, "This is reduced 60 per cent.;" or he must say, "This is a wonderful gin, not watered at all, and I shall sell it you for 2s. 6d.," and so put his profit into his pocket that way. Then there was evidence that the gin sold at other places was not watered to the extent that the defendant's had been. In one instance, the gin was simply 32 under, and in another 31½, but the defendant's was 42. Mr. Child submitted that at the price the gin was sold at, this reduction was was not to the prejudice of the purchaser. Mr. Vaughan said not to the prejudice of his stomach, no doubt, but it was to his pocket. The purchaser might sweeten and dilute his own gin to his own taste. Mr. Child had, as usual, fought the case with great obstinacy, and said for his client everything that could be said; but having carefully considered the case and studied the Act of Parliament, no conclusion except one adverse to the defendant could be come to. Mr. Child submitted, in mitigation of damages, that this new application of the Act of Parliament had come upon licensed victuallers by surprise. The Act formerly specifying certain things that were not to be done had been repealed, and the licensed victuallers had been thrown in the general Act that affected all the public. He should also ask Mr. Vaughan to send the case by appeal to the Quarter Sessions, as it was a matter of great importance to publicans to have the matter decided. Mr.

Vaughan said he did not care whether the case went to the Quarter Sessions or to one of the Superior Courts. He should have thought one of the Superior Courts would have been better. He would grant a case for the law of the matter to be argued, or the defendant might appeal. Mr. Child decided to appeal, and said he now left the case in the hands of the magistrate.

Mr. Vaughan said he entertained no doubt but that the defendant had brought himself entirely within the provisions of the Act of Parliament—that is to say, had sold an article which had been adulterated with water to an excessive extent for the purpose of fraudulently increasing the measure of what was represented to be gin. The question really was, whether it was necessary to give the spirit a commercial character to reduce it or water it to this extent. He had no doubt but that it was not. The penalty the defendant had made himself liable to was £20; he mitigated that to £5 and costs. There was a second summons for the same offence against Mrs. Hitchin, of the "White Hart," 191, Drury Lane, but in this case the added water was to the extent of 48 under proof. Mr. Vaughan allowed the case to stand over till after the decision of the appeal, and said that all the publicans had to do was to label the bottle.

The appeal in connection with the above case was heard on October 20, before Mr. P. H. Edlin, Q.C., the Assistant-Judge; Mr. Hughes-Hughes, Mr. D. Hill, Mr. C. H. Campbell, Mr. Walshe, Mr. Bickerstaffe, Mr. Halswell, and Mr. Ritchie, M.P., Justices.

Mr. Besley and Mr. Child were counsel for the appellant; Mr. Poland and Mr. Croome were counsel for the respondent. Mr. Poland, having stated the facts, argued that Hoyle had asked for gin, and obtained not gin, but gin and water, as gin so weak as this was never supplied by the rectifier to the publican. In this case the water must have been added by the publican, who had no right whatever to dilute his gin with water and then sell the mixture under the name of gin. The distiller prepared the raw spirit, which afterwards, according to the provisions of the Act of Parliament, went into the hands of the rectifiers, who made it into the merchantable article called gin. The raw spirit was changed into the merchantable article by reducing it, mixing it with juniper berries and other ingredients, and by distilling it. The gin could be made of any strength the rectifier pleased, but it was generally 17 to 22 per cent. under proof. It would be contended that as there was no standard as to the quality of gin the publican had a right to sell weak gin, but he argued that directly the publican added water to the gin it ceased to be gin and became gin and water. When a purchaser went and asked for a certain article, he expected to get it in the same state as it was received from the manufacturer. If gin was made by the rectifiers as weak as that which had been sold in this case, it would be a different thing; but the publican was not at liberty to add water as he pleased to gin which he intended for sale.

At the close of Mr. Poland's opening address, John Hoyle was called to prove the purchase of the bottle of gin from the appellant, and Professor Redwood to prove the analysis. In cross-examination, the latter stated that he could not tell whether water had or had not been added after distillation, and that there was no fixed standard strength for gin, the rectifier being at liberty to reduce his spirit to any strength he pleased. Thomas Arthur Smith, in Messrs. Tanqueray's service, gave evidence, and stated that Messrs. Tanqueray supplied the Two Brewers with gin which was 17 under proof. The quality of gin generally supplied to customers was of varying strength, from 17 under proof to 35, and sometimes under that. Gin could be supplied by Messrs. Tanqueray of any strength down to 55 per cent. under proof, and it could be called gin, though 50 under proof.

Mr. Besley, for the appellant, alluded to the practice of publicans of selling fourpenny, fivepenny, and sixpenny gin over the counter, and said that no person who went in and asked for fourpenny gin believed that he was buying gin of the same strength as that which was sold for sixpence. Adulteration, as defined by "Richardson's Dictionary" was "to debase by a foreign nature, to bring into it something that is not a natural ingredient, to destroy its integrity by that which sullies its purity." Gin, therefore, could not be adulterated with water, which was not alien to it, and without which it could not be rendered fit for consumption. Mr. Hoyle, the purchaser, had not been prejudiced. He had not asked for gin 17 under proof or 22 under, but for the cheapest gin which was sold. He got it, and where was there any misrepresentation? By reference to the Spirits Act, 23 and 24 Vict., cap. 114, it was clear that while on the one hand a *maximum* strength could not be exceeded by distiller, rectifier, dealer, or retailer, the *minimum* strength was not prescribed, and quantities of not less than two gallons could be sold at any strength. The permit for larger quantities than two gallons, which on the face of it indicated the strength was a mere Excise regulation for the collection of duty, and did not carry with it any such consequence as that further dilution after leaving the hands of the compounder altered the character of the article. It was quite as much gin when 42 degrees under proof as when it was 17 under proof, and unless the purchaser specifically asked for gin of a certain strength no offence could be committed.

Evidence was then given that the particular bottle of gin sold had been bought by Mr. Birrell, from his predecessor; that he had not in any way tested it, and that he had sold it in the same state in which he received it, believing that it was an article of the same nature and quality as two-shilling gin which was demanded. This would have been a special defence under the statute if there had been an express written warranty, but the Court intimated an opinion that in the absence of such a warranty the defence failed.



Upon the conclusion of the case the Justices retired, and on their return the Assistant Judge gave judgment as follows:—

“ We think this conviction should be affirmed. With regard to the questions raised by Mr. Besley as to the construction of the sixth section of the Act, we have before us the accordant decisions of the Supreme Court upholding the convictions in two cases in which the facts were substantially the same as in the present case. It appears that it is the practice of rectifiers to add water to the rectified spirit or compound after its manufacture, so as to reduce its alcoholic strength to the degree below proof desired by the purchasers and thus there is no precise limit to the dilution it may undergo before it leaves the rectifier, although practically 35 per cent. below proof is the lowest strength for which there is any demand. But then, there is no room for fraud or deception in this mode of dealing, inasmuch as the manufacturer or rectifier is bound to specify in the permit which the Excise law requires him to give to the purchaser at the time of the sale the actual strength of the spirit or compound sold, and, of course, the price charged varies according to the strength. There is no such check, however, upon the seller of a less quantity than two gallons, and if, in order to increase the bulk and measure, water be added and the gin reduced below the strength at which the commercial article so called is ordinarily sold and which it may be reasonably expected to possess, he must be careful not to sell the diluted compound for such article to the prejudice of the buyer, as by so doing he may incur the penalty prescribed by this enactment. No doubt, in such a case the price charged has to be considered. The evidence has satisfied us that the appellant was rightly convicted of this offence. There will, therefore be judgment for the respondent with costs.”

Some of our Country Magistrates hold a different view on this subject, for:

At the County Petty Sessions at Stockton, Joseph Tynan, William Scott, Gilbert Irving, William Walton, and Mary Scott, innkeepers at Sedgfield, were recently charged with selling adulterated gin. Mr. W. R. Fawcett, solicitor to the Stockton and District Licensed Victuallers' Association, appeared for the defence. The case against Tynan was taken first. On the 16th ult., Superintendent Bell, inspector under the Food and Drugs' Act, purchased a pint of gin at the defendant's house, and had a portion of it analysed by the county analyst, Mr. Edger, who certified it to be 43 under proof. Mr. Fawcett submitted that no conviction should follow if he proved that the gin in question was of the strength at which it was usually sold in the district, and quoted an opinion of Mr. Justice Mellor's in support of the contention. He then called witness to prove that gin was bought at 22 under proof, and that 20 per cent. of water was customarily added, this being the innkeepers' only way of obtaining profit. The Bench dismissed the case and the others were withdrawn.

We are glad, however, to see that this view of such glaring cases of adulteration is not general in the provinces.

At the Bishop Auckland Police Court recently, Hugh Stoker, innkeeper, of Crook, was charged with selling gin which was 49 under proof, and George Knaggs of Spennymoor was charged with selling whisky which was 29 under proof. Mr. Superintendent Henderson was the prosecutor; and Mr. Maw, was for the defence in both cases. It appeared that the prosecutor went to Stoker's house, and, after inspecting the measures, asked for a pint of gin such as they supplied to customers. Stoker drew some out of a cask they had just got in, but the superintendent declined to have any. He pointed to a cask, and Stoker drew him a pint, and told him it was gin and water. In the charge against Knaggs, it appeared that the innkeepers of Spennymoor, with the exception of the defendant and another, had agreed to raise the price of their spirits, and to sell a better article, in order to keep them within the law. The case against Knaggs was dismissed; and Stoker was fined £5 and costs, and his license endorsed.

**HOW TO ADULTERATE MILK.**—At the Belfast Police Court lately, John Stevenson, milk dealer, residing at Ballymoney Towland, Falls Road, was summoned by William John Anderson, milk inspector, for selling adulterated butter milk. Mr. Coulter prosecuted, and Mr. Regan appeared for the defendant. It appeared that the complainant purchased a sample of the defendant's buttermilk, and forwarded it to Dr. Hodges, borough analyst, who certified that the sample contained 20 parts of water and 80 parts of milk. A witness who was produced for the defence said no water had been put in the milk; but, on being cross-examined, he said some water might have got in the cans before the milk was put into them. A fine of 40s. and 12s. costs was imposed on the defendant.

**DOCTORED BEER.**—At the Stafford Petty Sessions recently, a publican was charged by the Inland Revenue authorities with having in his possession, and adulterating beer with, grains of paradise, whereby he had rendered himself liable to a penalty of £200. The defendant pleaded guilty, and the Bench imposed a fine of £50. The popular notion that the seeds of the *Amonum melegueta* have a deleterious effect on the system is wholly unwarranted, the grains being a staple article of consumption on the West Coast of Africa, and much esteemed as a seasoner to food. If nothing worse than grains of paradise are infused into malt liquors, the consumers of such need be under no apprehension as to possible evil consequences. The pernicious adulteration of which the Excise and public should beware is the *cocculus indicus*. It is a

significant fact that while large quantities of this poisonous berry are annually imported into this country, the ostensible use for the same is almost *nil*. An ointment of *cocculus* was official in the British Pharmacopœia of 1864 (employed in certain skin affections), but is now quite discarded. It is not used in veterinary medicine in any way, and we are forced to the conclusion that the greater part received into this country is applied to illegal purposes—to “doctoring” beer and ale.—*Lancet*.

### ANALYSTS' REPORTS.

Mr. J. Pattinson reports that, as Public Analyst for Northumberland, he analysed during the quarter ending 30th September, 1877, 97 samples, of which 52 were found to be adulterated, and nearly all of these adulterated ones were spirits. Thus 21 out of 26 samples of whisky were from 23.5° to 40° under proof; 23 out of 25 samples of gin were from 23.5° to 61.4° under proof, and 4 out of 5 samples of rum, were from 24.5° to 44° under proof; the adulteration in every case being by the addition of water. It is evident from this that the spirit trade in this country needs serious attention on the part of the local authorities, and we hope that after the recent decisions in appeal cases arrived at both by judges and magistrates, the authorities will not be backward in prosecuting every publican who is detected selling adulterated spirits. Four samples of flour were also found adulterated, 3 with 3 per cent. of rice flour, and 1 with 5 per cent. of maize flour.

Mr. Pattinson also reports, that, as Public Analyst for Newcastle-upon-Tyne, he examined during the quarter ending 31st August, 1877, 66 samples, of which 17 were adulterated, viz.—6 samples of preserved peas which were coloured with copper, 2 samples of milk which were adulterated with water, and 9 samples of flour, the majority of which were adulterated with rice flour.

Mr. J. W. Gatehouse, Public Analyst for Bath, reports during the quarter ending Sept. 29th, 1877, I have analysed for the inspector appointed under the above Act 38 articles of food and drink, of which 36 were pure and 2 adulterated. The articles analysed were—Butter, 4 samples, all genuine, but one of a most inferior and objectionable character; beer, 2 samples, 1 genuine and 1 adulterated with salt; bread 3 samples, all genuine; coffee, 1 sample, genuine; confectionery, 3 samples, of different colours, all genuine; milk, 24 samples, 20 genuine, of good quality, 3 of inferior quality, and 1 adulterated with water; oatmeal, 1 sample, genuine. These results compare most favourably with the preceding quarter, when, out of 31 substances analysed, 10 were adulterated. The quality of the milk has generally much improved, many of the samples being of excellent quality.

Dr. J. F. Hodges, Public Analyst for Belfast, reports, that during the quarter ending Oct. 23rd, he analysed 114 articles of food, drugs, &c. Of these 16 samples of sweet milk and 26 of butter milk were found to be adulterated; 9 samples of aerated waters contained lead or copper; a sample of lime juice syrup contained sulphuric acid, and a sample of “castor oil pills,” as a matter of course contained no castor oil. In all the cases where the authorities prosecuted, convictions were obtained, and fines amounting altogether to £19 were imposed.

Mr. E. W. T. Jones, Public Analyst for Wolverhampton, in his quarterly report for Michaelmas last, states that during the quarter he examined 37 samples and found 10 to be adulterated; these were 1 sample of ginger adulterated with 25 per cent. of wheat flour; 6 samples of pill quiniæ; 2 samples of whisky were 29 and 39 under proof, and 1 sample of gin was 46 under proof.

### SOCIETY OF PUBLIC ANALYSTS.

The next meeting of the Society will be held at Burlington House, on Wednesday, evening, the 14th November, at eight o'clock, when the gentlemen proposed at the last meeting, will be ballotted for, and several other gentlemen will be proposed for election.

Mr. W. Morgan, Ph.D., Public Analyst for the Borough of Swansea, has been appointed Public Analyst for the county of Cardigan.

Mr. E. W. T. Jones, Public Analyst for South Staffordshire, the Boroughs of Wolverhampton and Kidderminster, and the City of Lichfield, has been appointed Public Analyst for the Northern Division of the County of Stafford, in the place of Mr. W. L. Scott, resigned.

## NOTES OF THE MONTH.

WE see one of our contemporaries announces that definite steps are about to be taken with regard to the professional organisation of chemists. We thought this was done some weeks since, when application was made to the Board of Trade for a few gentlemen to have permission to register themselves as a Limited Liability Company, with special leave to omit the word "Limited," though it is a pity they did not propose to adopt it for then the title would have been unique, like the body itself. "The Institute of Chemistry of Great Britain and Ireland, LIMITED," would have had an irresistible attraction for some aspiring gentlemen of limited practice. The Institute is to consist of only 500 members, but we do not know where they are to come from, as we should have imagined that "Great Britain and Ireland" could scarcely muster more than half that number of professional chemists, however, we suppose the number is considered unlimited. We note too, that the organizers, "generally recognised as among the heads of the profession" have thought it necessary—in case the future members should consider that, though they (the organisers) may be *among*, they are not *the* heads of the profession—to appoint themselves to office for two years instead of one; we hear the appointment was unanimous. We also note that the council is to consist of 34 members, but as it originally consisted of 51, we can only suppose that like the Kilkenny cats, they have disagreed among themselves—hence the reduction in their number.

---

Tea analytically is coming to the fore. We not only have compressed tea guaranteed but also tea in bottles and canisters. We certainly ought now to have the "cup that cheers" pure, whether the grocer uses it as a means to the end of inebriation or not.

---

Lord Truro's recent letter to the *Times*, in which he deplored the adulteration of spirits because of the insobriety to which it gave rise, is very aptly commented upon by Mr. Pattinson's report, which we print in this issue. It appears that Mr. Pattinson has given special attention to spirits, and like most other analysts he finds more than 80 per cent. adulterated, but unfortunately for Lord Truro's theory, the adulterant is, as usual, always water. No doubt the publicans have found out that gin-and-water is less intoxicating than gin alone, and so, in the interests of humanity, they sell the latter article after reducing it to the extent they think desirable—or profitable.

---

It is rather curious to note in connection with the above, that Mr. Poland, the counsel selected by the trade themselves, says, that a publican is not at liberty to dilute the gin at all: *i.e.*, if he buys at 11 u. p., he must sell at 11 u. p. Rather hard lines this for some of the St. Giles's men, whose cellar room is limited.

---

Why does not the Aylesbury Dairy Company, or some other body of men come forward and boldly announce that the milk they sell is up to the Society's standard. The supervision which is exercised in the large dairies is quite enough to prevent watering, and then it must be so. Such an honourable and business-like step would be followed immediately by the larger dairymen, and the Inland Revenue Standard of 25 per cent., water disproved. If the Dairyman's Association try it they will succeed.

Waxed rice seems a curious thing, yet strange to say, it is now in the market. It appears that one or two per cent. of wax adds a peculiar lustre to rice, and makes it look so pretty, that the Dutch are profiting much by preparing it for the English to use. Prussian Blue is said to be added, and certainly the appearance of some samples bears out this statement.

The *Pharmaceutical Journal* waxes wroth, because the dictum of Messrs. Paul and Kingzett, as to the non-injurious effects of copper in peas is disputed. Analysts when they view the matter from one point of view only are apt to fall into such errors as those we criticised in our last number. We wonder whether even these gentlemen themselves would accept as a suitable beverage a drinking water containing copper.

We are surprised to find the same journal, expressing regret that there is no good method of butter analysis. It certainly cannot be held, that because the chemists at Somerset House fail in the manipulation of a process somewhat too delicate for them, it is a total failure. On the contrary, in good hands the fatty acids process always succeeds.

#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Southampton Row, Chancery Lane, London.

1876. No.	Name of Patentee.	Title of Patent.	Price.
691	J. C. L. Loeffler and R. W. Higgs	Electric Telegraphs ... ..	1s.
700	A. Dudgeon ... ..	Applying Asbestos for Packing Boiler Lining, &c. ...	6d.
765	M. P. W. Boulton ... ..	Producing Heat by Combustion of inflammable Gases or Vapours ... ..	10d.
818	H. J. Hargreaves ... ..	Manufacture of Sulphates of Soda and Potassa ...	6d.
827	G. Du Vallon and J. Csete	Refrigerating Liquids ... ..	6d.
835	G. Alsing ... ..	Treating Sewage, &c. ... ..	2d.
846	V. Collyer ... ..	Preserving Raw Meat, Lard, &c. ... ..	2d.
850	C. Pieper ... ..	Filter Presses ... ..	8d.
853	H. Parkes ... ..	Obtaining Nickel from Ores ... ..	4d.
860	J. Hanson ... ..	Treating of Sewage, &c. ... ..	2d.
879	S. B. Bowen ... ..	Manufacture of Sulphate of Iron from "Pickle" ...	4d.
1022	G. Gould ... ..	Liquid Composition for Embalming, Disinfecting, &c.	4d.
1034	H. & J. Bell and J. J. Coleman	Refrigerative Processes for Preserving Food ...	6d.
1056	W. Jackson ... ..	Treating Fabrics Printed with Aniline Colors ...	2d.
1064	W. R. Lake ... ..	Treating Sewage ... ..	6d.
1116	W. B. Brain ... ..	Electric Batteries ... ..	4d.
1120	J. Waddington and B. Longbottom	Condensers ... ..	2d.

Mr. C. O'Sullivan, Chemist to Messrs. Bass & Co., writes to us to inquire whether Dr. Morgan would inform him what he (Dr. Morgan) means by the "salt" he finds in beer, and how he estimates it.

ERRATA.—Under Analysts' Reports in our last No., it is stated that Mr. C. H. Piesse examined 525 samples during 1875-6—it should be during 1873-6.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Principles of Theoretical Chemistry, by Ira Remson, M.D.; Supplement for 1875-77 to Bernard Quaritch's General Catalogue of Books; Journal of Applied Science; The Country Brewers' Gazette.

# THE ANALYST.

---

## PURE OR IMPURE GAS.

WE publish this month the reports of two cases in which gas companies supplying the metropolis have been proceeded against by the local authorities, and they differ so essentially in their features that they form a very practical commentary upon the present state of gas legislation in London. In the first case the Commercial Gas Company were summoned before Mr. Hannay, the stipendiary magistrate, at Worship Street Police Court, for having on eight different days supplied gas to the consumers containing more ammonia, and therefore being of less purity, than is allowed by the Company's Act. The case appears to have been fought out with a fair amount of energy, but in the end the magistrate considered the case proved, and ordered a warrant to issue for the full amount of penalties claimed, viz., £50 per day, or a total of £400.

In the other case, which was a far more important one, the West Ham Local Authority moved, before Mr. Justice Fry, for an injunction to prevent the Gas Light and Coke Company from carrying on business at their works in Canning Town in such a way as to cause a public nuisance. In the earlier part of the hearing the evidence was devoted to prove that a nuisance really did exist, and after one day of that kind of evidence the Company decided not to dispute this part of the question any further but to acknowledge the nuisance, and Mr. Justice Fry, in reply, said that the West Ham Board had not only proved a nuisance, but an *intolerable* one. The next step was for the Company to proceed to justify the nuisance on the ground that it was impossible to comply with the restrictions of the gas referees and supply gas containing less than 20 grains of sulphur per 100 cubic feet, unless they did create a nuisance. Mr. Vernon Harcourt, one of the gas referees, having been called, succeeded in entirely dissipating this myth, and satisfied the judge that it was quite possible for such manufacture to be carried on without any nuisance whatever to anyone outside the works. Unfortunately, too, for the success of the Gas Company's case their own witnesses proved facts which had not previously been brought out in evidence, for they showed that a considerable part of the nuisance complained of had been caused by foul lime, *i.e.* sulphide of calcium saturated with bisulphide of carbon, which had been brought from other works and deposited on the ground at Canning Town in order to raise its level and make foundations for new buildings. The result was that on this point alone the judge held that the Company had no right to moderate a nuisance in one district by transferring it into another, and that therefore they were liable to an injunction even if they had taken reasonable precautions to prevent a nuisance, which, however, he considered they had not done.

The reports of the two cases, when viewed in connection with the decision of the Parliamentary Committee, which we reported in our July number\*, have a much more important bearing than might at first sight appear. The Company have now fought the matter in every way. They have gone to Parliament for permission to increase the amount of impurity which they may send out to the public, in other words to form sulphuric acid in our own rooms instead of eliminating the sulphur at their works. In one of these cases they have exceeded their Parliamentary maximum of impurity and have fought the matter to the utmost before the magistrate, with the result that they have been

fined in the maximum penalty, and in the other case they have created a nuisance at their works by the process of elimination of sulphur, and after being driven, so to speak, into a corner they have acknowledged the nuisance and pleaded that they could not help it, and this plea has been disallowed by the judge.

The whole thing therefore comes to this, the London gas companies, and we regret to say some of the provincial companies as well, must now work up to the standard of purity which some of their competitors in other places have without any compulsion already succeeded in attaining. We confess we cannot see why if it is possible to purify gas without nuisance at a score of places we could name, what difficulty there can be in carrying out the same process in London or other provincial towns. The size of the works is not in any degree an element in the matter, but the fault must lie in imperfect management or carelessness in the necessary precautions.

These decisions are of immense importance. Parliament has said the public shall not be poisoned in their own rooms, and Mr. Justice Fry has decided that the public shall not be poisoned by the emanations from gas works.

---

#### SOCIETY OF PUBLIC ANALYSTS.

A MEETING of this Society was held on the 14th November, at Burlington House, Piccadilly, the President, Dr. Dupré, F.R.S., in the Chair.

The following gentlemen were balloted for and declared unanimously elected as members:—Louis Siebold, F.C.S., Manchester; Thomas Jameson, F.C.S., Aberdeen; Thomas Wm. Drinkwater, F.R.P.S., Edinburgh; and James John Day, F.C.S., Derby.

The following gentlemen were proposed for election as members:—J. R. Martin, F.R.M.S., London; J. W. Gatehouse, Bath; J. Whittle, Monaghan; and they will be balloted for at the next Ordinary Meeting.

The President said their first business that evening was rather important; the German government were thinking of introducing an Adulteration Act, but before doing so they wished to enquire in various countries how food and drugs were dealt with, and they sent a commissioner (Dr. Rottenburgh) here, among other countries, to inquire into the matter. He seemed to be greatly impressed with the good work which the Society had been doing here, and that was certainly very gratifying, because unfortunately they usually got more abuse than praise. He (Dr. Dupré) had had several interviews with the Commissioner, who had also been to one of the Secretaries (Mr. Wigner), and they had given him a good deal of information, with which the Commissioner was so well pleased that he had expressed his wish to be allowed to submit a number of questions to the Society at large. These questions and answers thereto had been considered at one or two council meetings, and would now be laid before this meeting. There were a good number, and they would require careful attention, but he (Dr. Dupré) thought it was well worth their while to devote that attention to them. In the first place as replying to the inquiries made, and secondly because it would be a good opportunity for them to express their opinion as a Society upon the working of the Sale of Food and Drugs' Act. On the whole he thought it had worked satisfactorily, but difficulties had cropped up here and there, and some hardships had been felt by analysts which it would be advisable to correct in the future. No doubt in a short time there would be some amendments proposed in the Act, and when that time came they would be prepared to say what they wanted done.

The questions submitted by Dr. Rottenburgh, and the answers suggested by the Council, were then considered, and after a lengthy discussion, the matter was referred back to the Council for further consideration, to take what course they thought best with regard to it, and it was understood that a Special Meeting should be called in the course of two or three weeks to dispose of the matter.

Mr. O. Hehner read a paper "On the Analysis of Five Mineral Waters," and another paper, "Notes on Water Analysis."

Messrs. Piesse, Allen, Jarmain, Heisch, Dr. Dupré, and other gentlemen, took part in the discussion which ensued, and Mr. Hehner replied.

The Secretary read a paper by Mr. Carter Bell, "On Milk Analysis."

The Secretary also read a paper by Mr. Young, "On a New Method for the Estimation of Sulphuric Acid in Vinegar, &c.," and a discussion followed, in which Messrs. Hehner, Allen, Heisch and Dr. Dupré joined.

A paper, by Mr. Wynter Blyth, "On Methods of Separating Salicylic Acid," was also read by the Secretary.

---

An Extraordinary General Meeting of the Society of Public Analysts will be held at Burlington House, Piccadilly, on Friday, December 7th, at five o'clock, to receive the report of the Council, with reference to the resolution of May 3rd, 1876, as to the question of changing the name of the Society, and to pass any resolution thereon. It will be proposed to alter the name of the Society, by omitting the word "Public."

A Special General Meeting will be held at the same time and place, to consider the amended report of the Council, in reference to the replies to be made by the Society to the questions submitted by Dr. Rottenburgh, on behalf of the German Government.

Mr. A. Anthony Nesbitt will be proposed for election as a member.

The Council has recommended the following gentlemen for nomination as Associates, Mr. F. W. Gear, and Mr. W. J. Williams, Assistants to Mr. Wigner.

---

### ON MILK ANALYSIS.

By J. CARTER BELL.

*Read before the Society of Public Analysts, on 14th November, 1877.*

MILK analysis may seem to many a trite subject, but the haziness which exists in the minds and ideas of those to whom we have looked up to as our best authorities, shows that the milk subject is by no means yet exhausted: a painful experience of the manner in which an analysis of milk was interpreted by one who was considered an autocrat in this special branch of Analytical Chemistry led me to undertake a series of investigations.

To make sure that the samples should be genuine I visited all the 17 farms myself, the 183 cows were milked in my presence, and the milk was analysed the same day that the samples were obtained: the samples were gathered under very various conditions, some of the cows had only calved half an hour, while others had not calved for 12, 15, or even 18 months.

The total solids in no case have fallen below 12 per cent. per 100 c.c. of milk, the minimum was 12 and the maximum 33.4, the latter was taken under very exceptional

circumstances, the cow having only calved half an hour before I arrived, it had already been milked once since calving, and my sample was taken from the second milking when there was but very little milk in the udder.

The specific gravity of milk is generally stated to be 1029, but out of the samples which I examined only two or three were found to be so low.

The ash of milk I consider a very important item in its analysis, as far as my experience goes no genuine milk gives a very low ash. Should a milk give an ash lower than .68 I should look upon it with great suspicion. In the course of these analyses I only found two milks which gave so low an ash as .68. I thought there might have been some mistake, therefore on the next day I procured a second sample from one of these two cows, and found the ash to be about the same: with regard to the second milk which gave .68 of ash, the cow had only calved four days, and I believe it had travelled for many miles, which must have had some influence upon the milk, this is the only sample in which the solids not fat fall below nine per cent. When chemists find a milk which yields a very low ash, they should at once examine their platinum dish and they will often find that the lowness of ash is due to the loss of weight which the platinum dish has sustained, it is surprising that so few works upon quantitative analysis notice this loss of weight which platinum dishes are liable to when heated by gas: to show how serious this loss is, and how it may affect an analysis, I will give the weight of my six dishes at different dates.

Feb. 29th, 1876.	May 25th.	October 25th.	Jan. 3rd, 1877.	May 1st.	July 19th.
7.284	7.271	7.263	7.264	7.260	7.255
6.144	6.141	6.132	6.131	6.130	6.126
7.065	7.062	7.054	7.050	7.049	7.036
8.627	8.626	8.626	8.618	8.615	8.600
9.583	9.580	9.580	9.573	9.569	9.560
7.600	7.600	7.599	7.585	7.584	7.578

In the course of these milk analyses the dishes have been frequently weighed and the loss of weight noted, to show how seriously this loss would affect the ash of the milks. I will take the ashes of the milks upon the 2nd July and deduct the weight of the platinum dishes as obtained on May 1st, the six ashes would then stand

	.64	.66	.45	.43	.54	.64
they should be	.74	.74	.70	.74	.73	.76

The loss of platinum I attribute mainly to the impurities of the gas. I may mention that a large platinum dish used for bread analysis weighed 141.351 grammes, but after about 20 experiments its weight was reduced to 140.663, giving a loss of .688.

In taking the ash of the milk, care must be exercised not to let the temperature rise too high, for some of the constituents might be volatilized, my plan is to burn at a very low temperature with a piece of platinum foil over the dish until the ash is white, sometimes if the temperature is raised to bright redness, the ash will fuse and enclose particles of carbon which are then very difficult to burn away.

It has been stated that the ash of decomposed milk is lower than the ash of fresh milk; that is not my experience. I have kept milk for weeks and found the ash practically the same as at first.

I analysed a sample of milk twice with the following results:—

	May 11th.		June 18th.	
Total Solids	...	9.00 per cent.	8.19 per cent.	
Solids not fat	...	6.92	6.42	„
Fat	...	2.08	1.77	„
Ash	...	.55	.55	„



Another sample gave following results:—

	May 17th.	June 18th.
Total Solids ... ..	10.35 per cent.	9.05 per cent.
Solids not fat ... ..	7.90 "	6.96 "
Fat ... ..	2.45 "	2.08 "
Ash ... ..	.63 "	.64 "

From these and other experiments I do not think that the ash of milk ought lightly to be passed over.

In examining this large number of milks it will be seen that I have been careful in obtaining the particulars of the food with which the cows were fed, and though the food does exercise a considerable influence upon the milk, yet I may safely say that no milkdealer could reduce his dairy milk down to the Society's standard without half starving his cows. Ordinary poor feeding does not reduce the quality of the milk so much as some chemists would make us believe, for I have examined the milk of cows which were said to be half starved, and though the milk was decidedly lower in quality than the milk from other cows, yet it did not come nearly so low as the standard given by the Society of Public Analysts.

It seems absurd to think that large cowkeepers should be so blind to their own interests, that they wilfully injure their cows by not giving them food enough to eat, and it will be seen that out of the 17 dairies which I have examined, not one is so low as 9 per cent. of solids not fat, and 2.5 of fat. It is true that a man who only keeps one cow may sell milk, and it is just possible that this cow, through bad food or bad health, may give inferior milk, but I do not think that an exceptional case like this should be taken into account in fixing the standard of milk.

In the following tables I have given the name of the farm whence the samples were obtained, the breed, colour and age of the cow, when last calved, the quantity of milk, amount of cream, as shown by the creamometer, specific gravity, total solids, solids not fat, fat, and the ash.

In the following 17 tables, the percentages are given by weight upon 100 cubic centimetre of milk.

No. 1 Dairy—Mr. Green, Kersal Old Hall, 20 cows. The milk was obtained on May 1st to May 4th, 1877. During the time cold east winds prevailed. The cows were all stall-fed; the food consisted of hay, brewer's grains, bean meal, and ground corn. Provender at time of milking.

	Breed.	Colour.	Calved.	Qts. of			Total	Solids	Fat.	Ash.
			Age.	Milk.	Cream.	S.G.	Solids.	not Fat.		
1	Short Horn	Roan	3 days	6	4	15	1036	14.80	11.00	3.80 .92
2	Half Ayrshire	Red & White	4 months	4	3	1	1033	14.00	10.66	3.34 .80
3	Ayrshire	Red	7 ...	8	3	9	1032	14.04	10.14	3.90 .92
4	Short Horn	Roan	4 ...	7	3	9	1029	13.00	9.36	3.64 .88
5	...	White	5 weeks	6	4	10	1030	13.00	9.40	3.60 .81
6	...	Red	2 months	6	4	11	1033	13.32	10.00	3.32 .80
7	...	Light Roan	6 ...	5	4	11	1031	14.82	10.44	4.38 .80
8	...	Dark Roan	8 ...	7	3	16	1032	15.60	11.32	4.28 .77
9	Half Ayrshire	Roan	6 ...	7	3	11	1032	14.06	10.61	3.45 .86
10	Ayrshire	Red	12 ...	3	2	5	1034	14.20	11.00	3.20 .82
11	Short Horn	Roan	3 ...	4	3	3	1031	13.40	10.38	3.02 .77
12	Half Ayrshire	Red & White	8 ...	6	3	7	1033	14.50	10.98	3.52 .80
13	Short Horn	...	6 months	6	4	10	1031	13.70	10.04	3.66 .77
14	...	...	3 days	3	4	13	1035	14.60	10.76	3.84 .84
15	...	...	1 month	4	6	16	1031	14.14	10.16	3.98 .80
16	...	Red	6 months	6	4	13	1032	14.10	10.61	3.49 .81
17	...	Light Roan	7 weeks	6	4	12	1031	14.12	9.87	4.25 .80
18	...	...	12 days	4	4	12	1034	14.32	10.73	3.59 .77
19	...	...	1 month	12	6	9	1032	12.90	9.60	3.40 .86
20	...	...	2 weeks	4	4	2	1033	15.10	10.18	4.92 .84

No. 2 Dairy—Mr. Partington, Kersal Old Hall Farm, 25 cows. May 4th to 9th, 1877. Cold east winds prevailed. Cows stall-fed. Food consisted of hay, brewers' grains, Indian meal and potatoes. Provender after milking.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
21	Short Horn	Light Roan	1 month	2½	3	5	1032	13·62	9·69	3·93	·80
22	Irish	...	4 ...	4	3	5	1035	15·00	11·42	3·58	·74
23	Short Horn	Red	5 ...	4	3	7	1031	12·90	9·28	3·62	·74
24	...	Red & White	8 ...	5	2	8	1032	14·04	10·26	3·78	·76
25	...	Roan	3 ...	6	4	6	1031	12·50	9·47	3·03	·72
26	...	...	2 ...	7	4	5	1030	12·70	9·70	3·00	·74
27	...	...	2 ...	6	6	8	1030	14·32	9·73	4·59	·76
28	Half Ayrshire	Red & White	12 ...	7	2	...	1030	12·50	9·60	2·90	·82
29	Irish	Dark Roan	6 ...	5	3	...	1030	14·40	9·90	4·50	·76
30	Short Horn	Roan	4 ...	6	3	...	1030	12·04	9·57	2·47	·82
31	...	...	8 ...	8	3	...	1028	12·61	9·21	3·40	·80
32	...	Red & White	6 ...	7	3	...	1032	12·50	9·80	2·70	·84
33	...	Roan	2 ...	4	5	...	1033	14·52	10·47	4·05	·88
34	...	...	3 weeks	4	5	9	1031	12·86	9·50	3·36	·84
35	...	Red & White	3 ...	4	3	6	1031	12·92	9·74	3·18	·80
36	Half Ayrshire	Roan	4 days	4	4	12	1031	14·00	10·46	3·54	·86
37	Short Horn	...	5 months	4	2	9	1032	12·02	9·58	2·44	·88
38	...	Red & White	5 ...	6	4	14	1031	13·62	9·81	3·81	·78
39	...	Light Roan	8 ...	8	2	12	1031	13·32	10·02	3·30	·74
40	...	Dark Red & White	5 days	2½	6	8	1036	13·40	10·10	3·30	·80
41	...	Red & White	4 months	2½	6	6	1033	12·40	9·79	2·61	·80
42	...	...	3 weeks	2½	5	4	1032	12·14	9·58	2·56	·80
43	...	Red	4 months	5	8	9	1032	12·00	9·34	2·66	·72
44	...	...	3 months	5	6	8	1033	12·52	9·45	3·07	·78
45	...	...	14 ...	3	2	7	1033	13·92	10·21	3·71	·76

No. 3 Dairy—Mrs. Marsden, Kersal Farm, 11 cows. May 10th, 11th, 31st, 1877. Stall-fed. Hay, brewers' grains, and bean meal. Cold east winds prevailed. Provender at time of milking.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
46	Short Horn	Red	5 weeks	2	2	3	1033	13·80	10·50	3·30	·73
47	Friesland	Black & White	4 months	4	6	3	1033	12·42	9·99	2·43	·78
48	Short Horn	Roan	4 ...	7	6	6	1032	13·68	10·20	3·48	·76
49	...	...	3 ...	5	6	10	1033	14·30	10·20	4·10	·78
50	Half Irish	Red and white	17 days	5	6	5	1032	13·84	10·54	3·30	·76
51	Short Horn	Roan	9 weeks	6	6	6	1031	13·16	9·85	3·31	·74
52	Half Ayrshire	Red	8 days	4	4	10	1034	16·60	11·64	4·96	·86
53	Half Scotch	...	5 months	4	5	8	1030	14·28	10·22	4·06	·75
54	Short Horn	Roan	2 ...	5	6	12	1030	14·40	10·80	3·60	·74
55	...	...	17 days	3	4	9	1035	13·04	10·30	2·74	·90
56	Irish	...	17 ...	20 mths	4	8	1033	13·50	10·30	3·20	·78

No. 4 Dairy—Mr. Webster, Sedgley Hall Farm, Prestwich. 20 cows, May 14th, to 17th, 1877. Stall-fed. Hay, grass, brewers' grains, and Indian meal. Out in the fields for 6 hours a day. Provender before milking.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
57	Short Horn	Roan	7 months	6	3	17	1030	13·80	9·67	4·13	·77
58	...	...	7 ...	5	4	9	1032	12·03	9·43	2·60	·82
59	...	...	4 ...	5	7	11	1031	14·50	10·25	4·25	·76
60	...	Red & White	4 ...	6	3	12	1032	14·36	10·20	4·16	·78
61	...	Roan	6 ...	7	7	6	1033	13·50	10·40	3·20	·83
62	...	...	7 ...	7	3	10	1031	13·40	10·20	3·20	·74

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
63	...	Blue Roan	6 ...	8	7	13	1031	14.22	10.30	3.92	.75
64	...	Roan	4 ...	5	7	7	1032	13.14	10.00	3.14	.75
65	...	...	6 ...	9	4	10	1032	14.00	10.40	3.60	.75
66	...	...	13 ...	7	3	12	1032	12.85	10.13	2.72	.77
67	...	...	5 ...	6	7	7	1033	13.10	10.20	2.90	.75
68	...	...	13 ...	8	4	21	1030	17.04	10.21	6.83	.85
69	...	...	4 ...	6	7	9	1031	13.22	10.10	3.12	.79
70	...	...	7 ...	8	5	8	1034	15.12	11.20	3.92	.83
71	...	...	10 ...	7	4	9	1033	14.00	10.38	3.62	.86
72	...	...	5 ...	6	4	10	1031	12.82	9.60	3.19	.86
73	...	...	13 ...	8	2	...	1030	14.70	10.00	4.70	.73
74	...	...	18 ...	12	3	13	1032	14.10	10.30	3.80	.73
75	...	...	7 ...	2	2	13	1030	13.62	9.62	4.00	.83
76	...	...	5 ...	6	4	17	1032	15.18	10.43	4.75	.80

No. 5 Dairy—Two cows which came from Westmoreland and Yorkshire, May 18th, 1877. Food of No. 1 cow. Hay, oatmeal and bran. No. 2. Hay, corn and grass. Provender at milking.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
77	Short Horn	Roan	10 days	4	6	7	1032	13.20	9.25	3.95	.75
78	...	Red & White	16 ...	6	7	11	1030	12.80	9.70	3.10	.72

No. 6 Dairy—Mr. Partington, Broughton Farm, Kersal, 19 cows. May 28th to 30th. Cows out in the fields. Provender after milking. Beans meal, Indian meal and grains.

	Breed.	Colour.	Calved.	Qts. or			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
79	Short Horn	Roan	12 months.	6	2	...	1036	18.00	12.48	6.52	.86
80	...	Red	2 ...	3	3	9	1033	13.62	10.12	3.50	.68
81	...	Roan	7 ...	4	3	9	1032	14.32	10.35	3.97	.72
82	...	...	7 ...	4	3	9	1030	14.20	9.72	4.48	.74
83	...	Red & White	5 ...	6	3	9	1033	14.12	10.35	3.77	.76
84	...	Roan	4 ...	6	3	13	1032	14.78	10.14	4.64	.78
85	...	Red & White	7 ...	6	2	12	1034	14.54	10.71	3.83	.82
86	...	Roan	2 ...	3	3	5	1032	13.22	9.74	3.48	.71
87	...	...	6 ...	8	4	11	1030	13.32	9.18	4.14	.70
88	...	...	4 ...	3	3	6	1032	13.60	9.85	3.75	.72
89	...	...	3 ...	7	5	9	1033	13.40	10.21	3.19	.74
90	...	Red & White	3 ...	6	3	10	1033	14.00	10.30	3.70	.74
91	Irish	Red	3 ...	7	3	18	1030	13.74	10.14	3.60	.81
92	...	...	12 ...	7	2	13	1031	13.50	10.30	3.20	.72
93	...	Roan	4 ...	7	5	10	1032	13.70	9.84	3.86	.76
94	...	...	4 ...	7	4	11	1034	13.90	10.30	3.60	.78
95	...	...	4 ...	5	5	9	1031	12.50	9.30	3.20	.70
96	Yorkshire	Red & White	7 ...	6	3	12	1032	13.58	10.03	3.55	.74
97	Irish	...	3 ...	6	4	3	1034	13.32	10.05	3.27	.73

No. 7 Dairy—Three cows from Westmoreland, Yorkshire and Lancashire, bought by Mr. Green, and fed by the same food given to his own cows.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
98	Short Horn.	Roan	4 days	5	6	13	1033	14.58	10.06	4.52	.83
99	...	...	5 ...	9	10	16	1033	16.86	11.00	5.86	.80
100	Half Irish	...	6 ...	7	5	14	1036	15.70	11.56	4.14	.88

No. 8 Dairy, Mr. Finall, Kersal Moor Farm. Five cows, June 8th, 1877. Cows out to grass, provender at milking. Indian meal and brewers' grains.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
101	Short Horn	Red	4 months	6	5	10	1031	13.70	10.10	3.60	.78
102	...	Roan	4 ...	6	6	6	1032	14.60	10.17	4.33	.73
103	...	...	2 ...	4	6	5	1033	13.00	9.92	3.08	.73
104	...	...	2 ...	4	7	7	1032	13.26	9.61	3.65	.73
105	...	...	1 ...	6	7	7	1032	12.50	9.50	3.00	.78

No. 9 Dairy—Cows from Long Preston, in Yorkshire, June 12th, 1877. Out in the fields. Provender at milking. Bean meal, and brewer's grains. The first two cows had travelled 50 miles by rail and road.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
106	Short Horn	Roan	1 day	5	5	10	1033	12.33	9.73	2.60	.82
107	..	..	1 day	6	5	14	1638	15.07	11.83	3.24	.90
108	..	..	9 days	6	6	12	1033	13.87	10.16	3.71	.78
109	..	Red & White	4 ...	5	9	12	1029	12.55	8.91	3.64	.68
110	..	White	2 ...	5	6	10	1034	13.70	10.48	3.22	.90

No. 10 Dairy—Mr. Edge, Gordon Street, Lower Broughton, June 19th, 1877. Weather was very hot. Temperature of the Shippon about 80° F. These cows are stall-fed all the year round, and never go out to grass. Food consists of pea meal, mangel wurzel, hay, brewers' grains, and Grimshaw's condiment.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
111	Short Horn	Roan	3 months	6	9	7	1032	12.44	9.37	3.07	.80
112	..	..	15 ...	6	5	9	1033	13.44	10.00	3.44	.74
113	..	..	6 ...	5	6	4	1034	14.18	10.62	3.56	.76
114	..	..	5 ...	7	9	5	1031	12.46	9.15	3.31	.80
115	..	..	3 ...	4	8	5	1032	12.90	9.45	3.45	.74
116	..	White	6 ...	6	8	...	1033	13.38	9.80	3.58	.74

No. 11 Dairy—Two cows from Yorkshire, two from West Houghton, June 22nd, 1877. Food out in the fields. Provender at milking. Meal and brewers' grains.

	Breed.	Colour.	Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
117	Short Horn	Roan	3 days	6	6	10	1032	14.40	10.00	4.40	.82
118	..	..	not known, been in calf 1 month	6	2	6	1031	13.50	9.20	4.30	.78
119	..	..	1 week	6	5	12	1032	14.60	9.52	5.08	.78
120	..	..	10 months	6	3 pints	...	1032	14.00	9.81	4.19	.76

No. 12 Dairy—Yorkshire cows, July 2nd, 1877. Cows out in the fields. Provender at time of milking, bean meal, and brewers' grains.

	Breed.	Colour.	Last Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
121	Short Horn	Roan	5 weeks	6	5	11	1031	13.10	9.52	3.58	.74
122	..	..	7 days	6	5	11	1031	15.28	10.06	5.22	.74
123	..	White	10 days	6	6	7	1031	13.64	9.78	3.86	.70
124	..	Red & white	5 days	5	8	...	1032	15.50	10.17	5.33	.74
125	..	Roan	not known	4	4	6	1032	13.60	10.20	3.40	.73
126	..	..	2 weeks	6	7	10	1033	14.44	10.30	4.14	.76

No. 13 Dairy—Eight cows bought by Mr. Green, of Kersal Old Farm. The cows had travelled 50 miles, from North of Lancashire. Out in the fields at grass. Provender at time of milking, bran meal, brewers' grains, July 19th, 1877.

	Breed.	Colour.	Last Calved.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Age.	Milk.	Cream.					
127	Short Horn	Roan	1 day	5	9	21	1034	16.50	12.27	4.23	.78
128	..	Light Roan	4 days	5	6	9	1035	13.68	10.80	2.88	.90
129	..	Roan	Half-an-hour	6	only 1 pint of milk in under	48	1054	29.48	20.54	8.94	.94
130	..	..	1 hour	5	1 pint milk...	...	1075	33.40	31.47	1.93	1.112
131	..	Red	1 day	5	6	7	1042	14.44	13.20	1.24	.78
132	..	Roan	1 ...	4	6	13	1039	15.24	12.80	2.44	.79
133	..	..	4 days	6	5	17	1033	16.14	10.80	5.34	.88
134	..	..	5 ...	6	10	5	1033	15.68	10.54	5.15	.88

No. 14 Dairy—Sixteen cows from a Stockport farm. Out in the fields all day, but taken in at night. Provender at time of milking, bean meal, Indian corn, brewers' grains. The milk from the 16 cows was put into one can, I had it thoroughly stirred up, and then I took my sample.

Total Solids by weight ...	...	...	...	...	...	13.22
Solids not fat ...	...	...	...	...	...	9.43
Fat ...	...	...	...	...	...	3.79
Ash ...	...	...	...	...	...	.70
Specific Gravity...	...	...	...	...	...	1032
Cream by volume ...	...	...	...	...	...	10

No. 15 Dairy—Two cows. Out in the fields in the day-time. Provender at milking. Brewers' grains, oil cake, bean flour. October 20th, 1877.

Breed.	Colour.	Calved.	Age.	Qts. of			S.G.	Total Solids.	Solids not Fat.	Fat.	Ash.
				Milk.	Cream.	S.G.					
151 Short Horn	Roan	2 months.	6	4	10	1035	14.00	10.48	3.52	.82	
152 ...	...	15 ...	5	3	8	1033	13.92	10.37	3.55	.81	

No. 16 Dairy—Twenty-five cows. These cows were bought in Yorkshire by Mr. Green of Kersal Old Farm. I saw the cows milked, and I thoroughly mixed the milk in the large can before taking my sample, October 20th, 1877. Out in the fields in the day time. Provender at milking, brewers' grains, bean flour and hay.

Total Solids ...	...	...	14.120
Solids not Fat ...	...	...	10.460
Fat ...	...	...	3.660
Ash ...	...	...	.810
Specific Gravity ...	...	...	1033
Cream by Volume ...	...	...	10

No. 17 Dairy.—John Graham, Rigby Street, Higher Broughton. November 5th, 1877. Eight cows. Short horn out to grass for two hours in the day. Food consists of hay, brewers' grains, bean meal, and bran. Provender while milking. The cows have calved from 5 weeks to 7 months; one cow, the former assured me, had not calved for two years, and was still giving good milk.

Total Solids.	Solids not Fat.	By weight.		Ash.
		Fat.	Specific gravity	
13.7	9.9	3.8	.77	
Cream ...	11.5			10.33

The following table gives the number of cows to each dairy, with the composition of the milk by weight. In the previous tables the percentage has been given upon 100 c.c. of milk.

Cows.	Total Solid Matter.	Solids not Fat.	Fat.	Ash.
1	20	13.6	10.0	3.6
2	25	12.7	9.6	3.1
3	11	13.5	10.1	3.4
4	20	13.5	9.8	3.7
5	2	12.6	9.2	3.4
6	19	13.5	9.8	3.7
7	3	15.2	10.5	4.7
8	5	13.0	9.6	3.4
9	5	13.1	9.9	3.2
10	6	12.7	9.4	3.3
11	4	13.7	9.3	4.4
12	6	14.2	10.0	4.2
13	6	14.8	11.3	3.4
14	16	13.2	9.4	3.8
15	2	13.5	10.1	3.4
16	25	13.7	10.1	3.5
17	8	13.7	9.9	3.8

On examining these tables it will be seen how variable the quantity of cream is as given by the creamometer, in some cases of very rich milks no cream or only a very small quantity was shown by this instrument. This is a very strong proof how utterly untrustworthy is this test. If we take milks numbers 2, 20, 46, 73, 115 and others from the list it is seen that these have not shown much cream by the creamometer, but actual analysis proved that they were first class milks. Therefore to take the volume of the cream, as an indicator whether the milk is good or bad, is so fallacious that this test ought not for one moment to be entertained, because if a milk exhibits a small volume of cream, watering the sample to the extent of 50 per cent. will increase the volume.

There have been some who have acted in the defence of the milkman, and have urged as an excuse for the poorness of the milk sold, that it was due to the milk being sold late in the day, and that the milk on standing had thrown up its cream and the customers who came at the sixth and ninth hours of the day had carried off the cream in the milk supplied to them, whereas the unfortunate ones who came at the eleventh hour could only obtain the impoverished article, because the milkman had omitted to stir up each time he served out a portion. I have put this statement to the test, and the following experiments will show that the customers at the sixth, ninth, and eleventh hours are all practically treated equally. One day in July I bought two gallons of milk. I analysed it and found 100 c.c. to have the composition of

Total Solids	...	...	...	...	...	...	...	...	12·30
Fat ...	...	...	...	...	...	...	...	...	2·70
Solids, not Fat	...	...	...	...	...	...	...	...	9·60

The milk was put in the cellar, and at every hour from nine o'clock in the morning till twelve o'clock at night, one pint of milk was taken out at the commencement of each hour, and a portion of each pint was analysed. In taking out the pint, great care was taken not to stir the milk; the measure was simply dipped into the milk and taken out. The whole experiment was conducted throughout in the favour of the milkman, and according to these experiments it is more advantageous for customers to be late than early.

	Total Solids.	Fat.
8 o'clock in the morning	...	12·30
9	...	12·68
10	...	12·68
11	...	12·70
12	...	12·70
1 p.m.	...	12·24
2	...	12·30
3	...	12·28
4	...	12·88
5	...	12·80
6	...	12·40
7	...	12·54
8	...	12·30
9	...	12·48
10	...	12·88
11	...	12·60
12	...	12·90

The Society of Public Analysts has suggested that skim milk shall contain at least nine per cent. of total solids. From my experience this per centage is far too low, and I believe that it is not possible to find skim milk which has been obtained from ordinary genuine

## THE ANALYST.

milk that will give so low an amount of total solids as nine per cent. My samples were obtained from the following milks after they had stood from twelve to twenty hours:—

Fresh Milk. Total Solids.	Skim Milk. Total Solids.	Fresh Milk. Total Solids.	Skim Milk. Total Solids.
13·10 .. ..	9·70	29·48 ... ..	21·28
15·28 ... ..	10·48	33·40 ... ..	31·20
13·64 ... ..	10·04	14·44 ... ..	13·84
15·50 ... ..	10·80	15·24 ... ..	12·84
13·60 ... ..	11·00	16·14 ... ..	11·30
14·44 ... ..	10·64	15·68 ... ..	12·08
16·50 ... ..	12·90	12·90 ... ..	10·80
13·68 ... ..	11·68	12·50 ... ..	9·54
14·12 ... ..	10·68	14·00 ... ..	10·81
		13·90 ... ..	10·80

The analyses of the milk of 183 cows (excluding the two cows numbers 129 and 130, whose milk was in the abnormal state) gives an average of—

Total Solids	...	...	...	...	...	...	...	...	13·60
Solids not Fat	..	...	...	...	...	...	...	...	9·90
Fat ...	...	...	...	...	...	...	...	...	3·70
Ash ...	...	...	...	...	...	...	...	...	·76

The foregoing tables, which have been compiled with the most scrupulous care, appear to prove that all pure dairy milk should show at least a specific gravity of 1030 total solids, 12 per cent., and ash ·70; therefore the standard at present fixed by the Society of Public Analysts does not inflict any hardship upon the milk dealers, but on the contrary allows them to water milk to the extent of ten or even twenty per cent.

### ON A NEW METHOD FOR THE ESTIMATION OF SULPHURIC ACID IN VINEGAR, &c.

By W. C. Young, F.C.S.

*Read before the Society of Public Analysts on 14th November, 1877.*

THE methods most commonly used for the determination of sulphuric acid in vinegar consist in either estimating the total sulphuric acid as sulphate of barium and deducting from it the amount found as sulphates in the ash, or in taking the acidity of the vinegar after evaporating the acetic acid on a water bath.

The first of these methods is open to the objection that all chlorides present are converted into sulphates, thus taking up part of the sulphuric acid originally present in the free state. In the second method I have found great difficulty in driving off the acetic acid without charring some of the organic matter and consequently forming sulphurous acid; in addition, the objection to the former method applies equally to this, as any hydrochloride acid formed by the action of the sulphuric acid upon the chlorides present would be volatilised.

It occurred to me to take advantage of the decomposition of chlorides by sulphuric acid to estimate the quantity present by determining the amount of hydrochloric acid liberated. This I do in the following manner:—To 30 c.c. of the vinegar under examination is added an excess of chloride of barium and the liquid made up to any convenient bulk; in one-third of the liquid (which is equal to 10 c.c. of the vinegar) is estimated the total chlorine by standard solution of nitrate of silver after carefully

neutralising with weak caustic soda solution; the remaining two-thirds is evaporated to dryness, carefully iminerated, and the chlorine in the ash estimated as before. The difference between the two results calculated for the same ash quantity of vinegar is due to hydrochloric acid volatilised, from which the sulphuric acid may be deduced by calculation.

I have made many trials of this method and have obtained uniformly exact results, it takes but a short time and indicates only the free sulphuric acid added. It is of course applicable to lime juice or lemon juice.

---

### METHODS OF SEPARATING SALICYLIC ACID.

BY A. WYNTER BLYTH, M.R.C.S.

*Read before the Society of Public Analysts on 14th November, 1877.*

SALICYLIC ACID can be separated by (1) dialysis, (2) sublimation, (3) ether acting on an acid solution.

(1) *Dialysis.* Dr. Muter has already described this method, and has also given a process for the colorimetric estimation\* of salicylic acid.

(2) *Sublimation.* On placing a little of the pure acid between two watch glasses, and heating for even a few minutes on the water bath at 100°C, the upper glass is clouded by silky crystals, which shows that solutions containing the acid must not be evaporated to dryness at that temperature.

Placed in the subliming cell I have already described† salicylic acid begins to give a scanty sublimate as low as 60.5 C, whilst at 100°C sublimation is rapid.

Sublimation at these low temperatures does not, however, take place in flasks, closed tubes, or the like vessels. I have not succeeded in getting a decided sublimate at 100°C in a closed tube.

Struck, however, with its low subliming temperature I have attempted to distil it over from beer.

A milligramme was dissolved in 100 c.c. of beer, and the beer distilled to dryness, no salicylic acid came over until the residue was apparently dry; then the drops from the delivery tube gave a distinct colouration with ferric chloride, but the whole of it was not obtained.

On using, nowever, a globular flask without a neck, furnished with a very short wide delivery tube, and the whole immersed almost entirely in a spermaceti bath, and towards the end of the operation passing a stream of purified coal gas through the flask, most of the salicylic acid distilled over at a temperature approaching 149°C.

(3) *Extraction by Ether.* Salicylic acid is very soluble in ether, it does not take the acid up from an aqueous, alkaline solution, but if the solution be strongly acidified by ClH, the removal is complete. A simple experiment will show this; if to a solution of salicylic acid in a test tube ClH is added, then shaken up with ether, and lastly tested with ferric chloride; the lower stratum of liquid will not show a trace of the well-known purplish colour. Advantage of this fact can be taken in the testing of various fluids, such as beer, &c. The beer is first concentrated to a small bulk acidified with ClH and shaken up with ether, the latter removed and evaporated in the usual way.

---

\* Analyst p. 193. 1877.

† Analyst, p. 38. 1877.



Milk cannot be manipulated so simply, and merely shaking up with ether, after adding ClH, will scarcely succeed. I find it best to concentrate the milk first at 100°C, and then at 60°C, until it is in a pasty condition. Repeated treatment with ether will now dissolve out both fat and salicylic acid, and after evaporation of the ether the salicylic acid is separated from the fat by obvious methods.

---

### CORRESPONDENCE.

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

#### COPPER IN PEAS.

TO THE EDITOR OF "THE ANALYST."

SIR,—I have to apologise to Messrs. Paul & Kingzett for having, inadvertently, given them credit for a virtue which they neither seem to possess, nor have apparently, any desire to possess, viz.: that of retracting a statement when it has been shown to be based on insufficient data.

I need scarcely say, however, that the passage in my letter, in the last number of *THE ANALYST*, relating to the above subject was not written with a view to converting Messrs. Paul & Kingzett to correct views on this subject, for their personal opinion on such questions is a matter of perfect indifference. The passage was written in order to save Public Analysts—who might think that where there is so much cry, there must be at least a little wool—from being misled by statements and conclusions which are utterly worthless, being based on a few crude, very crude experiments conducted by men destitute of the knowledge necessary for such inquiries.

I remain, yours, &c.,

WESTMINSTER HOSPITAL,  
Nov. 24th, 1877.

A. DUPRÉ.

---

### LAW REPORTS.

(BEFORE MR. JUSTICE FRY.)

THE ATTORNEY-GENERAL *v.* THE GAS LIGHT AND COKE COMPANY.

This was an information at the relation of the West Ham Local Board to restrain the Gas Light and Coke Company from carrying on business at their works at Canning Town so as to cause a public nuisance. The nuisance complained of arose from the discharge of sulphuretted hydrogen from gas lime during the process of moving it. The defendants did not deny the nuisance, but they raised a defence which amounted to a claim to a statutory power to commit the nuisance. They alleged that under their own Acts and the various Metropolitan Gas Acts, and the requisitions of the referees appointed under those Acts, they are bound to produce gas of a certain degree of purity with reference to sulphur compounds; that they are bound to eliminate from the gas they supply to the metropolis sulphur compounds to such an extent as to render it practically impossible for them to carry on their works without discharging the noxious gas complained of. The hearing of the action has occupied nearly three days; many witnesses (chiefly scientific) have been examined; and the tiny, dark court has been crammed; consequently, notwithstanding the utmost endeavours to procure proper ventilation, the sanitary conditions of the court have been most unfavourable. Fortunately it was a case in which it was not necessary to exclude the witnesses (not actually under examination) and turn them out in the rain.

Mr. Kay, Q.C., Mr. Aston, Q.C., Mr. Bardswell, and Mr. R. E. Webster appeared for the plaintiffs; Mr. Benjamin, Q.C., Mr. Davey, Q.C., Mr. A. L. Smith, and Mr. Hornell for the defendants.

Mr. Justice Fry said that the evidence established that for a great part of the period during which the nuisance was complained of a large part of the noxious vapour was due to the shovelling and disturbance of gas-lime which the defendants had taken to their Bromley works from their two other gasworks. Dr. Odling, one of the defendant's own witnesses, estimated the proportion at one-half; the defendants would have no statutory justification for this proceeding, and the plaintiff would be entitled to an injunction on this ground. His Lordship, in construing the various Acts of Parliament which had been referred to gave his opinion that the liability of the company in respect of nuisance was expressly kept on foot. But, apart from that consideration, he thought the defendants had not shown that they had adopted all the means in their power to prevent the nuisance. The referees, officers appointed under the Gas Acts, had in the discharge of their duties fixed a standard of purity, such that, in their opinion, the gas companies, in the present state of gas engineering, could practically attain without the necessity of injuring any one; and therefore there rested on the defendants the burden of showing that they had adopted the best means of preventing the nuisance. In his opinion they had failed to discharge that burden, and an injunction

must be granted, not merely limited to the foreign lime from other works. A period of three months' grace was allowed to enable the Gas Company to devise better means of taking their used-up lime from the purifiers and to remove it.—*Times*.

**HEAVY PENALTY FOR IMPURITY IN GAS.**—At Worship Street, the Commercial Gas Company, of Stepney, appeared to an adjourned summons requiring them to show cause why a warrant of distress should not be issued to recover the sum of £400, being eight penalties of £50 each, for having on eight days supplied gas of a less purity than allowed by the Act of the Company. Mr. Besley, instructed by Mr. Spencer, appeared on behalf of the Board of Works to support the summonses; Mr. Reed appeared for the Company. Mr. Besley said that he appeared to ask the magistrate to issue a warrant of distress against the Company for the recovery of eight penalties of £50 each, for which they were liable under the Act of Parliament 38 and 39 Vic., cap. 200 (the private Act of the Company). In this case the defendant Company had on the 15th, 17th, 18th, 19th, 20th, 21st, 22nd, and 24th days of September last, supplied gas of less purity than allowed by the Act of Parliament. The quality of the gas supplied was determined by officers called gas referees, who from time to time fixed the *maximum* of impurity at which gas was to be supplied. In this case the impurity complained of was an excess of ammonia over that which the referees had fixed as the *maximum*. The fact was known to the defendant Company from the report of the examiner. They had not appealed to the chief gas examiner, and the penalties were, therefore, recoverable against them by distress warrant. Mr. Besley also pointed out that the Act gave the magistrate no power to mitigate the penalties, and added that the question had arisen whether the issuing the warrant of distress was not really an *ex parte* proceeding in which the Company were not entitled to be heard. A clerk from the office of the Metropolitan Board of Works then proved that Mr. Edwin Adenbrook was the appointed gas examiner at the Parnell road testing-house of the Commercial Gas Company. Mr. Adenbrook proved testing the gas supplied through the testing-house from the works of the defendant Company, and produced his certificates of such testing. Mr. Charles Fry, principal assistant in the Solicitor's Department of the Metropolitan Board of Works, produced the certificate of the gas referees appointing the quality of the gas to be supplied. From this it appeared that the *maximum* of ammonia allowed was 20·5 grains per 100 cubic feet. Mr. Hannay examined the certificates of the gas examiner, and said there were some four, some five, and some three in excess. Mr. Reed cross-examined the witness Adenbrook, who said that the testing extended over 20 hours, as required by the Act. He had supplied a copy of the certificates to the Secretary of the Company, and by courtesy, one to the Engineer. In the latter he had marked the excess of ammonia by underlining the figures, and he considered that sufficient notice. For the defence, Mr. Reed said he should have to make an objection to the jurisdiction of the court, the Company's Works being out of the jurisdiction. Mr. Hannay overruled the objection, Mr. Besley pointing out that the testing station where the offences were shown was within the district of the court. Mr. Reed took a further objection, that the notice given to the Company was insufficient under the Act, but this was also overruled. Mr. Hannay said that upon the facts proved, he could only order the warrant to issue for the penalties claimed, £400.—*Times*.

**ATTEMPTING TO BRIBE AN ANALYST.**—Benjamin Kirkham, dairyman, 26, Charlotte Street, Blackfriars Road, was summoned before Mr. Partridge by the sanitary inspector of St. Saviour's Board of Works, for selling milk adulterated to the extent of 12 per cent. of water. Mr. Simpson, Vestry Clerk, prosecuted. Mr. Errington proved the purchase of the milk on Monday the 5th, and taking a sample to Dr. Bernays, of St. Thomas' Hospital, for analysis. Dr. Bernays said that soon after the sample was left with him in a sealed bottle by last witness, defendant came into the laboratory and said it was not a fair sample of his milk, and, thrusting a half-sovereign into his hand, asked him to make a favourable analysis. Witness threw the coin away and told him he should analyse it in the usual way. Witness afterwards analysed it and found it to be adulterated with 12 per cent of water. The defendant said he was ill at the time and left the charge of the milk to his man. As for the half-sovereign he tendered it to Dr. Bernays for the trouble he had put him to on previous occasions. Mr. Errington was recalled, and, in answer to Mr. Simpson, said that the defendant was fined £5 in 1875. Mr. Partridge fined the defendant £10 and costs. Charles Hill, 9, Little Charlotte Street, and Thomas Bevan, Nelson Square, dairymen, were each fined 40s. and costs for a similar offence.—*Times*.

**ADULTERATED HONEY.**—At the Central Police Court before Mr. Gemmel, Stipendiary. Malcolm Campbell, grocer, 39, George Street, was charged under the Adulteration Act 1875, section 6, with having, on the 22nd August, sold to Alexander Johnston Walker, Food Inspector of the Sanitary Department, three jars of honey, which were not of the nature, substance, and quality demanded. Campbell pleaded not guilty, and evidence was led, Mr. Walker stating that on the day in question he saw in the window of defendant's shop a ticket setting forth that pure comb honey was sold in jars. He entered the shop and bought three of the jars paying 9½d. each for them. Campbell was then told that they would be analysed, and Walker offered to leave a portion of it with him. Campbell declined to receive it, and Walker sealed up the sample, which was sent to Dr. Clarke for analysis. Dr. Clarke stated that he had analysed the sample, and found it contained 57 per cent. of glucose, a preparation from starch. Campbell said in

defence that the honey was sent to him warranted to be genuine American honey, and he believed it to be so. The Stipendiary, however, found the charge proven, and imposed a penalty of £2 with the alternative of 7 days' imprisonment.—*Glasgow Evening Citizen.*

**HEAVY PENALTY FOR MILK ADULTERATION.**—John Adams, farmer and milk contractor, Southall, who supplied milk to the St. Marylebone parochial schools, was summoned before the Brentford magistrates, for selling adulterated milk. Of two samples of milk obtained from the defendant's cart, one was certified by Dr. Redwood to contain 19 per cent. of added water, and the other 16 per cent. Mr. John Paton, superintendent of the schools, stated that the defendant had held the contract for the milk supply for four or five years. The consumption amounted to about 160 gallons per week, and the defendant's account reached the large sum of £900, or £1,000 per year. By the terms of his contract he was bound to supply "good, genuine, unadulterated, new milk from the cow," and the witness had written to him two or three times calling his attention to the quality. The chairman (Mr. Glossop) said the case was a bad one, because the milk was intended for children, many of whom were weakly and scrofulous, and to whom a good milk diet was essential. Therefore this adulteration was very wicked, and the magistrates had decided to impose a fine of £20, and £2, costs.

**ADULTERATION OF GIN.**—At Lanchester Petty Sessions, Joseph Towns, innkeeper, was summoned for selling adulterated gin. The magistrates were Mr. Fawcett (chairman), Mr. E. T. Smith, Mr. Clavering, and the Rev. J. P. De Pledge. Superintendent Oliver, the inspector, said, on the 18th August, he called at Mr. Towns's house and obtained a pint of gin, which he divided into three parts, one he sent to Mr. Edgar, the county analyst, whose certificate he now produced, showing that the gin was 30 per cent. under proof. Mr. Granger of Durham, who appeared for the defence, said he did not dispute that the gin was 30 per cent. under proof. The question for the magistrates to decide was whether this was an adulteration within the meaning of the Act. Mr. Towns, the defendant was called, and said the gin which he sold was not reduced in strength. He got it from Mr. Greenwell, and received an excise permit with it. Mr. Greenwell, on being called, said he had been in the wine trade 36 years, and during the whole of that time he had been in the habit of selling gin at 30 per cent. under proof, which he considered a very good strength. Mr. De Pledge: What is gin generally made at? Mr. Greenwell: From 17 to 22 under proof. We never buy any stronger than 22. He considered that gin 22 under proof was better than 17 under proof. Mr. Hearn, Supervisor of Excise, Durham, said he had been connected with the trade upwards of 20 years, having been in it at Liverpool, Dublin and London. He considered 30 per cent. under proof was a fair saleable article. The Chairman: Suppose you asked for a glass of gin what strength would you expect to get it?—Mr. Hearn said he should not expect to get it any lower than 30. The Chairman: You consider 30 per cent. under proof is a good commercial article? Mr. Wilson: Yes. The magistrates then retired. On their return, Mr. Clavering said they had decided to convict. Defendant was fined 10s. and costs. The Chairman said: Because the decision has not come from the chair, it will naturally be supposed that I disagree with the other magistrates. I am sorry to disagree with my brother magistrates at any time, but I do not agree with them in the present judgment.

Mr. Plimsoll, M.P., was present at a temperance meeting at Derby last month, and in the course of his remarks said,—“I have long held the opinion that a great deal of the crime which is attributed to intoxication in this country is not so much owing to the quantity of drink which the criminal has consumed as to the abominable adulteration by which the drink has been treated before it was sold to him. There are certain classes of people in London, I am informed—certain classes of tradesmen who are called publicans' chemists, who sell articles by which the spirits which they receive from the distilleries are adulterated, to the great injury of the people who consume them, and it is impossible to see the almost total absence of intoxication which you may see on the Continent, where every one drinks the light wines of the country, without being convinced that the people are intoxicated—which means poisoned, as distinct from inebriated which means drunk—that they are here intoxicated or poisoned by the drink they get at some of the public houses in the country. As to spirits I know very little, but I do happen to know that salt is used very strongly by common brewers in the country with the distinct purpose—I speak deliberately because I speak of things I know—with the distinct object of making the people who drink the beer thirsty. I have known a case in which a large load of salt, some 70 or 80 tons, was taken to a large brewery in one town in the Midland Counties, and if that is the case it is a frightful fraud and a wicked sin; and if a person drinks a pint or half a pint of ale in a reasonable manner, to satisfy thirst, and he or she finds him or herself a short time afterwards as thirsty as before, if they are unwilling to take water, as we know they are, they must drink again or bear the thirst. I think it is a wicked thing which it is impossible should be allowed. I felt this so strongly that when the Act of 1872 was before the House of Commons I obtained a schedule of the things prohibited to be used in the manufacture of liquor, and it may be instructive to this meeting to know what Parliament did prohibit in that schedule. In Committee, I strove, and strove hard, to have the use of salt in breweries prohibited along with the use of other things, but I was resisted very stoutly indeed by some members of Parliament who were interested in brewing, not by my colleague, and they

declared over and over again that it was not used, and the divisions that were taken were carried against me. But in the course of the debate they had contended that it was not used, and when the Bill came up for third reading I put it that if they did not use it, the prohibition of its use could do them no harm, and I moved for the recommittal of the Bill, and had this matter put in as a prohibited article. A very short time after that, however, a deputation of brewers waited on the Home Secretary, who had power to vary the schedule, and though it was stated in the House of Commons over and over again that salt was not used, their appeal to the Home Secretary was, that beer would not keep without salt was used, and they succeeded in obtaining sanction for its use in limited quantities. I always like to speak from the book, and so I went to the House of Commons' library to see if I could find the Order of Council authorizing this, but the library was cold and I was warm, and I could not stay long enough to find out whether it was authorized or not, so I cannot say; but in the 37th and 38th Victoria, cap. 49, sec. 33, passed two years afterwards, the whole of the four clauses on the Bill of 1872 making adulteration criminal, and providing for the punishment of those who had adulterated, and the schedule of things prohibited were all repealed by the Government which is now in power. It will give you an idea of some of the things that are used if I read to you the schedule of the things prohibited, and which we may, therefore, assume were used, for I don't suppose Parliament, or the Government, would prohibit these things unless they had good reason for knowing they were used. In the 35th and 36th Victoria the following things are mentioned:—'Cocculus indicus, darnel seed, chloride of sodium' which is, of course, common salt—'copperas, opium, strychnine, tobacco, extract of logwood, sulphate of zinc or lead, and alum, or any extract or compound of the above ingredients,' these were the things prohibited. If any one is fond of his glass and thinks it does him good, I would have him bear that list in mind. I think the temperance societies might possibly—I submit the suggestion with much deference—do some good if they were to try to obtain an authoritative exposition of some of those things, and if they cannot secure the punishment of those who use them they may at least secure their exposure."—*Times*.

---

#### NOTES OF THE MONTH.

MILKMEN appear to think that analysts belong to the same category as detectives, and that for a consideration they may be induced to depart from the strict line which their duty lays out for them. We do not suppose that Dr. Bernays went quite so far as the paragraph in the *Times*, states as to throw away the coin with which Mr. Kirkham presented him, but it is clear that notwithstanding the tender of half a sovereign, which of course he indignantly refused, Dr. Bernays found that Mr. Kirkham's milk was adulterated, and in consequence Mr. Partridge fined the latter person £10 and costs. It is perhaps rather significant, and may serve as a warning to other peccant milkmen, if we point out that two more of the fraternity were summoned at the same time for a similar offence, but not having attempted to bribe the analyst, were only fined 40s. each. On the whole it must have been rather an expensive morning's work for Mr. Kirkham, and we can only hope that he was satisfied with it.

---

The analysts at Somerset House seem to have an irresistible tendency to over-estimate everything. They have already succeeded in finding .78 per cent. of ash in milk where several other analysts could only find .72; they have also in several cases found more milk in a mixture of milk and water than any experienced analyst pitted against them could find, and now they have capped their work by finding 13 grains of alum per 4-lb. loaf where three public analysts, who presumably had had ten-fold their experience, had only succeeded in finding 10 grains. Really it looks as if they lived in such a cloud of smoke at Somerset House that the ashes must drop into their crucibles and make the results heavier.

---

Gin cases are going on all over the country, and convictions are most frequently obtained; and the publicans, we are glad to see, are adopting the common sense mode of labelling their bottles as a mixture of dilute spirit, but this, although a step in the

right direction is not sufficient; they must not only say it is diluted but what the degree of dilution is. There can be no possible reason why a publican should get off free whilst a milkman is fined for a similar offence.

---

Mr. Plimsoll, M.P., appears to have taken a fancy to teetotal meetings, and has been reviving the fallacies which Lord Truro published in the *Times* a few weeks since, that the injurious effect of stimulants is caused mainly by the adulterants which are added to them. It is a great pity that a man who has done a really good work in a special line which he has laid out for himself should trespass upon matters about which he knows nothing, and should therefore make such mistakes as are contained in his recent speech at Derby. As to salt in beer our readers will remember what we said last month about it, and some will probably be prepared for the sequel. The beer from a number of public-houses in one of the London districts, which for the last three years has averaged less than 15 grains of salt per gallon, has since the recent certificate of Messrs. Bell, Bannister & Co., suddenly increased to from 65 to 75 grains per gallon. We are quite sure our readers will view with satisfaction the statement that one of these adulterators was summoned and fined, but did not think it worth while to appeal to Somerset House, because when his wife was put into the witness-box she acknowledged having thrown a handful of salt into the barrel of beer. This case is an illustration of the necessity for the amendment of the Act of Parliament to the extent of making the publication of the convictions compulsory. At present the payment of a fee is sometimes, as in this case, sufficient to prevent such a misdemeanour from becoming known to the public unless we publish it. It is clear that some change in the law is necessary.

---

It is pleasant to note that the German Government are following in the wake of our own, and are about to introduce into their Parliament a Bill for preventing the adulteration of food and drugs, and also that they recognise the services which our Society has already rendered in the matter by sending their Commissioner to us first for information. The facts elicited in the discussions which have already taken place will help greatly towards the adoption of the amendments suggested by our Society in the present Act and which will be introduced in the Bill to be brought forward next session, and not the least important of these is the confiscation and destruction in certain cases of adulterated articles.

---

We have received several letters with reference to the question of salt in beer, but have not space to refer to the matter fully this month. We were not aware that the schedule of the Licensing Act was still in force, but from the following quotation it *appears* it is.

The chemical waters are again troubled by analytical disturbances, and several journals have rather gone out of their way to describe the matter in question as "analytical discrepancies." This is scarcely a fair designation, as will be seen from the facts, which may be thus briefly set forth. Mr. Gatehouse found in a sample of Burton beer 68 grains of common salt to the gallon, while the report from the laboratory at Somerset House shows the presence of 66.5 grains to the gallon, but goes on to say that "the strong Burton beers contain about 60 grains of common salt per gallon, solely derived from the water, malt, and hops used." Now, as regards the analysis the discrepancy is not very dreadful, but objection may and has been taken against the additional statement which is quoted above. It is not probable that the water, malt, and hops would furnish so much salt, and this has been placed beyond doubt by subsequent work conducted by Mr. Gatehouse. The Licensing Act allows the presence of 50 grains of common salt to the gallon of beer, to cover the quantities introduced into beer from the sources stated; hence anything above that amount is fairly viewed as evidence of adulteration. The squabble to which allusion has been made would have been avoided had the Somerset House analysts restricted themselves to the bare analysis. It was an act of supererogation to make the additional statement which caused the grievance. If analytical and

consulting chemists generally in giving certificates confined themselves more particularly to the facts of their investigations, and abstained from going into hypothetical reasons and expressing opinions of qualities and things, and instituting comparisons, such certificates would be less offensive to a healthy professional mind, and admit less of malconstruction or abuse.—*Pharmaceutical Journal*.

**THE DILUTION OF GIN.**—At a meeting of licensed victuallers and wine and spirit merchants, held yesterday at York, to consider the recent decisions in reference to the adulteration of gin with water, a letter was read from the Chancellor of the Exchequer, stating that it was impossible for him to say just what could be done with regard to the subject. The question of the reduction of the strength of gin by water was not a revenue matter. The Local Government Board were now, he believed, consulting the Inland Revenue Department, and the whole subject would be fully discussed, with a view to determine whether any legislation was practicable or desirable.—*Evening Standard*.

The prize offered by the Leipzig Pharmaceutical Association for a trustworthy method of butter analysis, has been awarded to Otto Hehner, F.C.S., Public Analyst for the Isle of Wight, and Arthur Angell, F.R.M.S., Public Analyst for the county of Hants. As one of the stipulations, namely, that the successful essay should become the exclusive property of the Association could not be fulfilled by Messrs. Hehner & Angell, their method having been published some years ago, and as the examiners, Professors Heintz, Knop & Kohlmann, yet wished to show their appreciation of the method, they presented the Authors with the sum of 150 marks.

Mr. Wm. Fredk. Donkin, F.C.S., has been appointed Public Analyst for the Borough of Abingdon.

Mr. J. A. Woodhams, has been appointed Public Analyst for Rye, Sussex, in the place of Mr. W. A. Smith resigned.

### RECENT CHEMICAL PATENTS.

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

1876. No.	Name of Patentee.	Title of Patent.	Price.
1171	J. Coquillion ... ..	Carburemeter for Analyzing Carburets, &c. ... ..	6d.
1185	F. A. Bonnefin ... ..	Extracting and Treating Juice from Sugar Canes, &c. ... ..	6d.
1219	J. H. Bald ... ..	Utilizing Residual and other Oxides of Iron ... ..	2d.
1300	J. C. Martin ... ..	Manufacture of White Lead ... ..	6d.
1309	H. A. Bonneville ... ..	Hydraulic Press for separating Liquids from Solid Matters ... ..	6d.
1327	P. A. E. Brémond ... ..	Medicated Bath Apparatus ... ..	2d.
1358	D. Whitehouse ... ..	Pickling Sheet Iron for Manufacture of Tin and Terne Plate ... ..	8d.
1392	T. J. Smith ... ..	Liquid Sulphate of Alumina ... ..	2d.
1396	G. H. Fish ... ..	Apparatus for Compressing Air ... ..	6d.
1402	R. S. Best and R. Morris ... ..	Sulphates of Sodium and Potassium ... ..	2d.
1405	J. Jackson and T. R. Mellor ... ..	Evaporating Liquids ... ..	6d.
1414	J. Eckart ... ..	Preserving Food ... ..	6d.
1462	J. Livesey ... ..	Filters for Water and Air ... ..	6d.
1465	J. Holloway ... ..	Production of Metallic Silicides ... ..	4d.
1536	H. B. Condy ... ..	Manufacture of Soda ... ..	4d.
1556	W. L. Wisc... ..	Preparing Caustic Alkalies and Preparations... ..	4d.
1563	E. L. Mayer ... ..	Separating Silver from Cuprous Solutions ... ..	4d.
1618	F. W. Kalbfleisch ... ..	Concentrating Sulphuric Acid ... ..	6d.

### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette; Brewing Practically and Scientifically Considered, by E. R. Southby, M.R.C.S.; Preventive Medicine in Relation to Public Health, by Alfred Carpenter, M.D.

# THE ANALYST.

---

## THE GERMAN GOVERNMENT AND ADULTERATION.

THE Questions submitted to the Society of Public Analysts by Dr. Rottenburgh, on behalf of the German Government, together with the Answers of the Society, cannot fail to interest our readers. They show that the steps taken by our legislature, in passing the Adulteration Acts of 1860 and 1872, and the Sale of Food and Drugs' Act of 1875, have proved so far satisfactory in practice that the most powerful of the continental nations intends to follow our leading. Having come to this decision it is also satisfactory that the German Government should apply to our Society as the best exponent of the results obtained by the working of the Acts. We do not wish to imply by this that we alone have advised the Imperial Government on the matter, for we know that the Local Government Board have also given some information, and we also advised the Commissioner to apply to the Trades Protection Societies, in order that he might judge for himself how slender is the foundation on which their much-talked of grievances rest. On this point we can hardly do better than refer our readers to an extract we reprint from a recent leading article in the *Grocer*. This trade journal has ever been one of the foremost in denouncing analysts and analytical work, and has over and over again spoken of the Adulteration Acts as if they were used simply to harass honest tradesmen. Now, however, its tone is changed; it appears at last to have been educated up to the standard of purity, and directly its education is complete it finds, as we found long ago, that adulteration is rampant. Nothing that we have ever written or published in these pages has been such a scathing condemnation of tradesmen as adulterators as the first paragraph from the *Grocer's* leading article. We sincerely hope that having got thus far on the road to common sense we may cease to see the *Grocer* using such childish phrases as "incompetent analysts," and that it will boldly co-operate with us in the attempt to suppress adulteration. By doing this all honest traders (and we believe they are the majority) will be benefitted, and dishonest ones will be "stamped out." This is a consummation sincerely to be hoped for.

Leaving this part of the subject, we consider next the replies to the questions of Dr. Rottenburgh. Of course many of these replies are of comparatively minor importance, but there are others which show that the German Commissioner has really put his hand upon some of the defects which still exist in our Act, and has in many cases pointed out as well as we could have done the parts which need amendment. This of course is satisfactory, because the report which he will make to his Government will unquestionably have some weight with our legislature next session in the discussion of the alterations to be made in our own law.

The replies to Questions 1, 2 and 3 are of great importance; they embody the principle for which our Society has all along contended, viz., that analysts should have certain definite limits laid down, according to which it should be their duty to work, and from which there should be no appeal. The present state of things in this country is eminently unsatisfactory. The Society, after long deliberations, adopted a limit in the case of milk which allowed the milk of an ordinary healthy cow to be diluted with five per cent. of water and yet pass without condemnation; this in itself was a doubtful proceed-

ing, but the employés at Somerset House have apparently capped it by taking, as a standard, the poorest possible milk that ever man extracted from a cow under any circumstances, and they have seemingly finally decided that as far as they are concerned average milk with 20 per cent. of added water should be passed as genuine, lest by chance the proprietor of a diseased or underfed cow should accidentally suffer, say once in 20 years. Such a conclusion is, we hold, as lamentable as it is ridiculous, and against all preconceived notions of public morality. We hope that the German Government will not allow this sort of thing to happen, and we believe our own will set it right in the Bill to be brought forward next session.

The answer to Question No. 10 is also of much importance, and is another of the points which will form a basis of legislation. Nearly all the publicans in London are now labelling their bottles, "This is diluted spirit," and under the protection afforded by this evasive label they are selling gin and water. Such an abortive result was certainly never contemplated by the Select Committee of 1874.

The Questions Nos. 23 and 27 are also important, and in these cases again the replies embody the opinions which have been previously expressed by our Society. The German Commissioner—who had himself been put in communication with the Somerset House authorities—has detected the flaw in the theoretically good idea of making them act as a Court of Appeal, and virtually suggests the reply. It does not need any words of ours to show that as during one year they had only five samples to analyse under the Act, that hasty generalisations are all that could be expected. Five minutes of cross-examination is generally enough to dispose of such witnesses.

---

#### SOCIETY OF PUBLIC ANALYSTS.

An Extraordinary General Meeting was held at Burlington House, Piccadilly, on the 7th December, the President, Dr. Dupré, F.R.S., in the Chair.

The Minutes of the previous Meeting were read and confirmed.

Mr. A. Anthony Nesbitt was proposed for election as a member, and Mr. F. W. Gear and Mr. W. J. Williams (assistants to Mr. Wigner), as associates.

The Ballot will be taken at the next Meeting.

Mr. Wigner proposed, and Mr. Heisch seconded a resolution "That the name of the Society be changed, by omitting the word 'Public.'"

The proposal was discussed at great length, and ultimately a division was taken, when it appeared there was a tie, on which Mr. Wigner withdrew the proposal.

The Meeting was then made Special, for the purpose of considering the amended Report of the Council in reference to the replies to be made by the Society to the questions submitted by Dr. Rottenburgh on behalf of the German Government. The replies suggested were considered *seriatim*, and after some alterations had been made in them it was proposed and unanimously resolved that they should be forwarded, as amended, to Dr. Rottenburgh, as the replies of the Society to his questions.

Mr. Angell exhibited to the Meeting two pieces of apparatus made by Cetti & Co., one a colorimeter for comparing the colours of waters, and one for the estimation of fat in food stuffs, by washing with ether vapour. The former consists of two long, clear glass tubes, each furnished with a mirror at the bottom; the tubes when full are closed



lightly with small pieces of clear glass, by which means all refraction is destroyed, and clear discs of light are produced, by this means a column of three feet in length can be examined for colour and turbidity.

The ether extraction apparatus consists of a glass capped funnel, furnished below with a stoppered flask; the substance, enclosed in a filter paper, is placed into the funnel, and ether in the flask, the whole is then attached to an upright condenser, and the ether is boiled for two hours, when all fat will be extracted. Mr. Angell did not claim anything new in the principles involved in these processes, but thought that he had improved the necessary appliances.

---

The next Meeting of the Society of Public Analysts will be held on Wednesday, the 16th inst., at Burlington House, Piccadilly, at 8 o'clock.

---

### REPLIES TO THE INQUIRIES BY THE GERMAN GOVERNMENT AS TO THE WORKING OF THE SALE OF FOOD AND DRUGS' ACT.

THE following are the Questions submitted to the SOCIETY OF PUBLIC ANALYSTS by DR. ROTTENBURGH, the Representative of the German Government, and the Answers as agreed to at the Special General Meeting of the Society on 7th December last.

1. Is the definition of offences in the Sale of Food and Drugs Act a satisfactory one?

Certainly not; the definition of our Society should be adopted. See "Proceedings of the Society of Public Analysts," page 2,\* (a copy of which has been sent to DR. ROTTENBURGH.)

2. Is it desirable to define adulteration in relation to a fixed standard of composition for each article of food, or should the definition be a general one?

The definition should be general except as regards the articles mentioned in the "limits," see "Proceedings" referred to above, page 2.\* Power should be given to

---

\* *Extracts from "PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS,"* vol. i. p. 2.

*Definition of an Adulterated Article.*—An article shall be deemed to be adulterated—

(a.) In the case of food or drink.

1. If it contain any ingredient which may render such article injurious to the health of a consumer.
2. If it contain any substance that sensibly increases its weight, bulk, or strength, or gives it a fictitious value, unless the amount of such substance present be due to circumstances necessarily appertaining to its collection or manufacture, or be necessary for its preservation, or unless the presence thereof be acknowledged at the time of sale.
3. If any important constituent has been wholly or in part abstracted or omitted, unless acknowledgment of such abstraction or omission be made at the time of sale.
4. If it be an imitation of, or be sold under the name of another article.

(b.) In the case of drugs.

1. If when retailed for medicinal purposes, under a name recognised in the *British Pharmacopœia*, it be not equal in strength and purity to the standard laid down in that work.
2. If when sold under a name not recognised in the *British Pharmacopœia* it differ materially from the standard laid down in approved works on "*Materia Medica*," or the professed standard under which it is sold.

*Limits.*—The following shall be deemed limits for the respective articles referred to :—

Milk shall contain not less than 9 per cent. by weight of milk solids not fat, and not less than 2·5 per cent. of butter fat.

Skim milk shall contain not less than 9 per cent. by weight of milk solids not fat.

Butter shall contain not less than 80·0 per cent. of butter fat.

Tea shall not contain more than 8 per cent. of mineral matters, calculated on the tea dried at 100C, of which at least 3·0 per cent. shall be soluble in water, and the tea as sold shall yield at least 30 per cent. of extract.

Cocoa shall contain at least 20 per cent. of cocoa fat.

Vinegar shall contain not less than 3 per cent. of acetic acid.

the Home Secretary or some other similar officer as the Central Authority acting on the advice of the Body of Referees to make such additions to those limits as from time to time might be desirable.

3. Would it be advisable to have several authorities, with power to fix the standards, or would it be better to have only one Central Authority with that power?

The definition of standards and limits should be embodied in a schedule to the Act passed by the Imperial Parliament, subject to revision as before mentioned by the Home Secretary or some other similar officer, on the advice of the Body of Referees.

4. Suppose an Analyst fixed a certain minimum of standard, *e.g.*, in the case of milk, would not all dealers in milk dilute it down to that standard?

Most probably, but no Analyst should have power to fix such a standard without the consent of the Body of Referees.

5. Has the punishment of imprisonment often been employed, or has the fine been sufficient?

As far as we are aware imprisonment has only been inflicted in a few cases; fines, if heavy enough, have generally been sufficient, but in many cases the fines are not heavy enough.

6. Would it be advisable to publish the punishments inflicted?

Yes, at the discretion of the Court.

7. Would it be advisable, besides either money-fine or imprisonment, to authorise the confiscation of the stock which has been found to be adulterated?

Yes, when possible after conviction, at the discretion of the Court.

8. Ought the retail dealer to be compelled to give the name of the wholesale dealer of whom he purchased the adulterated article?

Yes.

9. In a case of adulteration found to be *injurious to health*, would it be advisable to provisionally seize the article as soon as the Analyst has given his certificate?

Yes, decidedly.

10. Would it be advisable to state on the label of a mixed article the percentage of that mixture?

Yes, the label should state the maximum percentage of foreign ingredients contained in the mixture.

11. Would it be advisable to make the appointment of an Analyst in every district compulsory?

Certainly.

12. Is it advisable to leave the appointment of an Analyst to the local authority?

Yes, subject to confirmation by the Central Authority.

13. Have the selected Analysts often been rejected by the Local Government Board?

Very rarely.

14. In what manner should Analysts be paid?

By yearly salary for a fixed number of samples; an increased payment to be made if more than that number of samples are analysed, at a fixed fee for each such additional sample.

15. Is it advisable to have Analysts' Districts large or small?

Large.

16. Has it often happened that several local authorities have the same Analyst, and where it is so, has it proved successful?  
It has frequently occurred, and is certainly desirable.
17. Does it often occur that a private person prosecutes in adulteration cases?  
Very rarely.
18. Have the provisions of section 14 of the Act proved sufficient?  
They are open to objection, but have answered moderately well.
19. Have the Analysts' reports been collected?  
Yes, collected and collated by the Local Government Board and the numerical results published in abstract.
20. Is it advisable for the Analyst to appear in court, and does that often occur?  
It is advisable that there should be power for either party to call him if required, on payment to him of a suitable fee. It occurs occasionally here.
21. Have the Inland Revenue Chemists often been appealed to?  
In a very few instances.
22. Have they often differed from the Public Analysts?  
In about half the number of the very few cases referred to them.
23. Would it be desirable to have a different Court of Appeal?  
Yes, decidedly. A Body of Referees should be nominated by the Central Authority, and should consist of Analysts of special experience, to each of whom should be deputed the reference in all disputed cases as to a particular article of food, drink, or drugs—*i.e.*, each referee should have made a special study of some one or more articles, and all disputed cases in reference to those articles should be submitted to him, and he should be liable, on the application of either party, to be called upon to appear in court.
24. Has Section 25 of the Act proved successful?  
No. Quite abortive.
25. Would it be advisable that the Analyst should state in his certificate simply that the article is "pure" or "adulterated," or would it be better to state the nature of that adulteration exactly?  
It would be better to state as exactly as possible the nature and proportion of the foreign admixture.
26. Would it be advisable to empower the police, with the sanction of the magistrate, to visit suspected beershops, tea stores, factories, &c., to search?  
It is desirable that the police or other officers should have power to enter places wherein it is suspected that articles of food which are unfit for the food of man are kept.
27. What qualifications should an Analyst possess?  
Analysts should be thoroughly educated chemists, of practical experience, possessed of sufficient skill in the use of the microscope, and of some general knowledge of the more common kinds of poisons and substances injurious to health. The chief point, however, is that their education as chemists, &c., &c., should enable them out of their own resources to meet difficulties as they arise, and to recognize clearly all cases in which their own general or chemical knowledge or the authorities available are not sufficient to enable a decided opinion to be pronounced on a sample.

## ON THE EXAMINATION OF HOPS.

By W. E. PORTER, F.C.S., &amp;c.

HAVING been engaged the last few weeks in making a number of examinations of Hops by the ether process or method, which I published in THE ANALYST for August, 1877, I now send the results of the examination of twelve samples of 1877 or new Hops; these are all what would be called fair samples according to their quality:—F., fine; M., Medium, and L., Low. It will be seen on referring to the 1876 ones,\* that the yield of oil, resin, and bitter principle is rather higher than in the new or 1877, the cause of this I believe to be that by age some of the oil is partially oxidised, thereby increasing the weight.

1.—WORCESTER, F.	2.—SPALT, F.
Moisture ... .. 4.02	Moisture ... .. 6.96
Oil, resin, and bitter principle 14.98	Oil, resin, &c. ... .. 14.08
3.—EAST KENT, F.	4.—WORCESTER, M.
Moisture ... .. 6.15	Moisture ... .. 8.10
Oil, resin, &c. ... .. 13.60	Oil, resin, &c. ... .. 13.35
5.—KENT, M.	6.—SUSSEX, M.
Moisture ... .. 8.20	Moisture .. ... .. 7.05
Oil, resin, &c. ... .. 13.27	Oil, resin, &c. ... .. 11.75
7.—BAVARIA, M.	8.—AMERICAN, M.
Moisture ... .. 9.97	Moisture ... .. 7.87
Oil, resin, &c. ... .. 13.08	Oil, resin, &c. ... .. 12.63
9.—SUSSEX, L.	10.—SUSSEX, L.
Moisture ... .. 8.55	Moisture ... .. 9.87
Oil, resin, &c. ... .. 9.95	Oil, resin, &c.... .. 9.23
11.—POPERINGHO, L.	12.—WORCESTER, L.
Moisture ... .. 10.25	Moisture ... .. 9.20
Oil, resin, &c.... .. 9.25	Oil, resin, &c.... .. 8.60

The ethereal residues from Nos. 1, 2, and 3 had a bright golden tint, all the others were of a greenish hue. The American was of a dark green tint, and when a few drops of the residue was placed in the palm of the hand and rubbed it gave a strong black currant or cat-like odour—evidently valerianic—probably due to too much heat employed in the drying.

The highest yield of oil, resin, &c., was found in Nos. 1 and 2, Worcester and Spalt, both these were dried upon Hopkins' patent kilns. The Spalt were partially dried in the sun and then brought over and finally dried in these kilns. As the process is interesting, and I believe it to be the right method for drying hops in this country, I may perhaps be allowed to state it. It consists of the ordinary square or rectangular kiln, with two floors instead of one, the lower floor being placed about 18 feet above the fires, the second or upper floor a few feet nearer the roof, in the apex of which, under a cowl, is fixed an exhaust fan. By means of this fan a large current of dry warm air is rapidly and continuously passed through the hops at a temperature which should not exceed 100° Faht., enabling the planter to cure his hops without burning them, and without any loss of quality or flavour by the volatilization of the oil, resin, &c. In the process of drying by Hopkins' plan, the upper floor is loaded with green hops, which are there partially dried, all "reek" being carried off by the fan, no matter how dull or heavy the external

\* See ANALYST, August, 1877, p. 76.

atmosphere. The upper floor being then opened by a simple apparatus, the partially-cured hops fall gently on to the lower floor nearer the fires, where they are thoroughly deprived of moisture by the current of dry warm air (caused by the exhaust fan), and when finished are drawn out from the lower floor on a moveable tray to the bagging chamber, never once trodden upon, unbroken, without the loss of any farina, full of aroma and bright as when picked from the poles. Meanwhile a fresh load of green hops has been put on the upper floor, a duplicate tray replaces the one drawn out, and by the time the hops as described above are finished, the green hops partially dried on the upper floor are again let down, and so the series continues.

I have been informed that one or two brewers object to my process of analysis because it does not estimate the tannin, but this is easily remedied by estimating it in another portion of the hops. No doubt hops that contain a good per centage of tannin have their value increased as it precipitates the mucilaginous matter in the beer, but the oil, resin, &c., must be of the most value. Out of some number of samples that I have examined I find the tannin to range from 2 to 4.5 per cent.

I find some errors are published respecting the constituents of hops, and it is as well to call attention to them, as they have evidently been copied from one source. The analysis of hops is given as—

Oil	...	...	...	...	...	...	...	...	...	2.00
Lupulin	...	...	...	...	...	...	...	...	...	10.30
Resin	...	...	...	...	...	...	...	...	...	55.00
Lignin	...	...	...	...	...	...	...	...	...	32.00
Loss	...	...	...	...	...	...	...	...	...	.70
										<u>100.00</u>

and directly after an analysis is given of the lupulinic grains containing just the same amount; this of course is a mistake, as hops yield about one-sixth part of these grains; at this rate the oil, lupulin, and resin would be about 11.20 per cent., something near what I find to be the mean of the medium and low samples average.

### NOTES ON WATER ANALYSIS.

By OTTO HEHNER, F.C.S.

*Read before the Society of Public Analysts on 14th November, 1877.*

ALL chemists who have to perform water analysis are aware of the importance of examining samples of water in as fresh a state as possible, in order that change in the quantity of the nitrogenous organic constituents may be avoided.

Wanklyn recommends to determine these constituents if possible within 48 hours after the collection of the samples, but I was unable to find any record of experiments made with a view to watch the changes which take place when waters are kept for any length of time. Some numerical results may therefore be of interest after the many general statements which have been made.

I will touch at the same time one or two other questions in relation to the ammonia-process of water analysis.

A sample of very bad water, analysed on January 15th, 1877, yielded—

Free Ammonia	...	...	...	...	0.6640 in 100,000 parts.
Albuminoid Ammonia	...	...	...	...	0.0265

The same sample, on September 13th, after eight months, only contained—

Free Ammonia...	...	...	...	...	...	...	...	0.0012
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0252

that is to say, the free ammonia had almost entirely disappeared, whilst the albuminoid had remained stationary.

A sample of water, taken from the Croydon sewage outfall, yielded in January—

Free Ammonia...	...	...	...	...	...	...	...	0.1563
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0476

The same sample after being kept for eight months—

Free Ammonia...	...	...	...	...	...	...	...	0.0008
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0207

Water from the Bourne Culvert, at Croydon, in January—

Free Ammonia...	...	...	...	...	...	...	...	0.0079
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0063

And had changed after eight months to—

Free Ammonia...	...	...	...	...	...	...	...	0.0006
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0037

Water from the Waddon Mill Ponds, near Croydon, directly after being collected—

Free Ammonia...	...	...	...	...	...	...	...	0.0144
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0099

After eight months—

Free Ammonia...	...	...	...	...	...	...	...	0.0169
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0067

Water from the Croydon Pumping Station, taken in January, 1877, yielded—

Free Ammonia...	...	...	...	...	...	...	...	0.0018
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0018

After eight months—

Free Ammonia...	...	...	...	...	...	...	...	Nil.
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0020

And, lastly, a Well Water, analysed in January, 1877, contained—

Free Ammonia...	...	...	...	...	...	...	...	0.0006
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0054

And on September 14th, same sample contained—

Free Ammonia...	...	...	...	...	...	...	...	Nil.
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0055

In all but one of these cases the free ammonia had almost entirely disappeared, whilst the albuminoid ammonia had either remained stationary or had diminished. Why these changes were so different in the different samples I am at a loss to explain.

As it has been said that distilled water, containing a little free ammonia, after some time, becomes entirely free from it, I thought it quite possible that also the very dilute standard solution of ammonia, or rather of chloride of ammonium, used in water analysis might lose much of its ammonia.

To test this I prepared a new solution of chloride of ammonium and compared its strength with an old one which had been in use in my laboratory for at least four or five months. Both solutions were found to contain exactly equal amounts of ammonia. It was scertained, also, that the large amount of ammonia contained in the Helenen spring water had not changed to any appreciable extent after a lapse of four months.

I imagined that *life* might have had something to do with these changes, especially as it is known that bacteria have the power of reducing nitrates into nitrites. I therefore started some series of experiments with a view of ascertaining whether animalcules and other organisms had the power of acting upon or eating up the ammonia.

A number of stoppered Winchester quart bottles were filled with ordinary Companies' London water ( $2\frac{1}{2}$  litres), 1 cubic centimetre of very dilute albuminous urine was added to each, and to some of the bottles 1 cubic centimetre of a sample of Dutch water, swarming with animal and vegetable life of all kinds.

The following are the results of the analyses made day by day ;—

## WITHOUT INFUSORIA.

Date.	Free Ammonia.	Albuminoid Ammonia.
Nov. 1	0.0149	0.0239
2	0.0133	0.0262
3	0.0161	0.0234
4	0.0126	0.0174
5	0.0319	0.0098
6	0.0348	?
7	0.0345	0.0061

## WITH INFUSORIA.

Date.	Free Ammonia.	Albuminoid Ammonia.
Oct. 31	0.0138	0.0277
Nov. 1	0.0133	0.0264
2	0.0193	0.0229
3	0.0191	0.0238
4	0.0184	0.0182
5	0.0210	0.0153
7	0.0241	0.0089

During the first two days the composition of the water to which infusoria had not been added remained nearly stationary. On the third day, November 4th, the albuminoid ammonia began to diminish, and suddenly, on November 5th, it had greatly fallen, whilst the free ammonia had risen to nearly its threefold amount.

Some allowance must of course be made for the experimental error, unavoidable especially in the case of the determination of ammonia, where we have to deal with exceedingly minute quantities, but on the whole it is certain that the free ammonia increased, whilst the albuminoid substances disappeared.

In the second series the changes are far more regular, the free ammonia not rising as high as in the case of the waters to which infusoria had been added, but the general result being the same.

These results seem entirely at variance with the figures I have quoted of waters which had been kept as long as eight months, but it appears from a third series of experiments that on keeping waters for some time the free ammonia in its turn disappears, by oxydation or otherwise.

Date.	Free Ammonia.	Albuminoid Ammonia.
Sept. 17	0.0580	0.0817
Oct. 30	0.0151	0.0397
Nov. 10	0.0139	0.0279

All these experiments were made in the colder autumn months, and it is probable that the changes would have taken place in a shorter time had the temperature been higher. But yet it seems established that the amounts of both the free and the albuminoid ammonia alter considerably in the course of very few days. As a further instance I may

quote the following results obtained by the analysis of a water sent to me. On November 7th it yielded—

Free Ammonia...	...	...	...	...	...	...	...	0.0155
Albuminoid Ammonia...	...	...	...	...	...	...	...	0.0204

On November 10th it had changed to—

Free Ammonia...	...	...	...	...	...	...	...	0.0189
Albuminoid Ammonia...	..	...	...	...	...	...	...	0.0186

these results have been checked by duplex determinations.

It was formerly generally recommended to add to half a litre of water, to be tested for free ammonia, either 2 grammes of carbonate of soda or 15 c.c. of a saturated solution of this salt. But in the latest edition of Wanklyn's "Water Analysis" it is stated that this addition may be dispensed with, except in the case of acid waters; and, I believe, many chemists now altogether omit the use of carbonate of soda. Feeling some doubt as to this point, I made the following experiments:—

500 c.c. of ordinary London companies' water were boiled in a retort, without any addition until all free ammonia had distilled over. 10 c.c. of standard chloride of ammonium solution, containing 0.0001 gramme of ammonia, were then added; the distillation continued until no more ammonia could be detected in the distillate, and the amount of free ammonia which had come over determined. Found 0.0192 free ammonia in 100,000 parts of water, instead of 0.020 as added.

To decide whether the carbonates of lime and magnesia played any part in this decomposition of the chloride of ammonium solution 10 c.c. of standard solution were added to 500 c.c. of pure distilled water without any further addition being made. The distillate contained 0.0194 ammonia in 100,000 parts of water, instead of 0.020 as added.

A similar experiment with distilled water, magnesium chloride, and 0.1 milligramme of ammonia yielded in the distillate 0.0211 ammonia per 100,000 parts of water. Magnesium chloride is therefore without influence upon the result. The addition of carbonate of soda may consequently safely be dispensed with in the case of alkaline waters, and such as contain either carbonates or chlorides of calcium and magnesium.

The possibility of distilling all ammonia from such waters, without any addition of carbonate of soda, is therefore solely due to the fact that dissociation takes place in the boiling solution, the ammoniacal salts splitting up, as Fittig has shown in 1863, into free ammonia, which volatilises with the aqueous vapours and acid remaining in the retort. According to the experiments of Dibbitz (*Zutschri f. anal., Chem. xiii. 4*) dilute solutions of chloride of ammonium lose up to 1 per cent., of sulphate of ammonia up to 2½ per cent., and of oxalate of ammonia as much as 24 per cent. of the total ammonia.

Acid waters, no doubt, are exceedingly rare, yet I also made an experiment to ascertain the influence of the presence of a strong acid on the determination of the free ammonia.

500 c.c. of pure distilled water were boiled with 0.5 c.c. deci. sulphuric acid, containing 2 milligrammes of SO<sub>2</sub> and 10 c.c., or 0.0001 ammonia, were added. The distillate contained but 0.0011 of ammonia calculated for 100,000 parts. The acid had therefore almost completely retained the ammonia.

In conclusion, I beg to direct your attention to the graduated tapped nesslerizing cylinders, which I have used for some years past. I find them extremely convenient effecting a great saving of time, trouble and distilled water.



## SANITAS.

So long as the notices of the new disinfectant "Sanitas" in the various periodicals of the day were limited to the "advertisement" or "trade notices" columns, it was not the business of anyone to examine, except privately, its merits or demerits. Now, however, that the representatives of the papers have been invited to inspect its manufacture, and a long article has appeared on it in the leading journal, the matter becomes public property. We purpose, we hope dispassionately, and certainly with no hostile intention, to give our views upon its advantages or otherwise, from a purely scientific point of view. Our remarks will be chiefly directed to ascertain whether or not Mr. Kingzett's discoveries have made any real advance in practical sanitary science by giving us an agent both cheaper and more active than we already possess.

Sanitas consists, essentially, of a dilute aqueous solution of camphoric acid and peroxide of hydrogen. To the former its antiseptic, and to the latter its disinfecting properties are mainly due; both these, however, are, we fear, of a comparatively feeble character. Thus, in some experiments, we made an addition of as much as 5 per cent. of sanitas to milk, the result being only that it kept it sweet for an extra 16 hours, while additions of 2 or 3 per cent. had no appreciable effect whatever. As an antiseptic, such a dilute solution of camphoric acid may therefore be dismissed from consideration. Its disinfecting power are, we fear, but little higher. The sample (bought at the rate of 1s. for 5 ounces) contained 0.55 per cent. of peroxide of hydrogen, equal to 0.26 per cent. of available oxygen, or one volume of sanitas contained 1.82 volume of available oxygen; we are informed, however, that in some samples this proportion rises to 2 volumes. Taking, then, this latter proportion as the basis for our calculation, we find that 1 litre of available oxygen when bought in the form of sanitas, will come to 8d., since we are given to understand that, at wholesale price, 1 gallon of sanitas (about  $4\frac{1}{2}$  litres) could be sold for 6s.\* Now the kilo. of permanganate of potassium can be bought retail for 8s., and contains no less than 175 litres of available oxygen, or at the rate of a little over one halfpenny per litre. As a disinfecting or oxydizing agent sanitas thus can bear no comparison, at least in price, to permanganate, and it is a curious illustration of the superior oxydizing power of the latter that the organic matters contained in sanitas, and which are not acted on by the peroxide, are further oxydized by permanganate. A further advantage of the permanganate is. that in the solid form, or at its maximum concentration, it is absolutely staple, whereas even dilute solutions of peroxide of hydrogen are liable to suffer decomposition, and consequent deterioration. One great advantage sanitas certainly possesses over permanganate, it does not stain, and its being used at all is, we are inclined to believe, entirely due to this fact.

Sanitas is an attempt, and we freely confess, a very creditable attempt, to imitate one of the great purifying processes of nature. Mr. Kingzett has, however, overlooked one great factor in this process, or at least he does not enable us to realize it in its entirety. Nature not only makes use of certain agents, but uses them in, practically, limitless quantities, and we are expected to follow her example by using drops where she would employ rivers. Sanitas may have many good qualities, but we [fear cost will bar its practical use.

\* In our above-mentioned samples of sanitas the litre of available oxygen comes to no less than 4s.

## A TEST FOR CITRIC ACID.

BY A. SABANIN AND N. LASKOWSKY

*(Zeitschr. f. Anal. Chem., xvii. 1).*

SARANDINAKI was the first to show that on heating an aqueous solution of citrate of ammonia, or of citric triethyl ether to 110°C in a closed tube, a substance is formed possessing an intense bluish green colour.

The authors, on heating citric acid with an excess of ammonia (for about six hours) to 120°C, obtained a liquid of a slightly yellow colouration, which on exposure to the air in a porcelain basin, in the course of a few hours assumed an intensely blue tint, which in the course of a few days changed to green. Exposure to light hastened the appearance of the blue colour, whilst on prolonging the heating, or raising the temperature to 150°C, the green product was at once obtained.

10 milligrammes of citric acid, and 2 or 3 c.c. of ammonia thus yielded a very strong and decisive reaction, half that quantity of citric acid sometimes failing to yield the blue liquid.

Oxalic, tartaric, malic, and similar organic acids, with the exception of aconitic acid, do not produce the reaction.

To detect citric acid in the juices of fruits, they are mixed with an equal volume of alcohol, and after some hours the filtrate is precipitated by means of acetate of lead solution. The precipitate is washed, ammonia is added to it, the solution evaporated to remove excess of ammonia, and then decomposed by means of sulphuretted hydrogen. To the filtrate acetate of baryta is added, the liquid is boiled, the precipitate separated by filtration, washed and decomposed by means of dilute sulphuric acid. The liquid thus obtained is concentrated, super-saturated with ammonia, and heated in closed tubes as directed.

Thus citric acid may readily be detected in the juices of the bilberry and the currant, whilst contrary to usual statements the juice of the apple was found to be entirely free from it.

Though complicated, this is claimed to be the most characteristic and delicate test for citric acid known.

## CORRESPONDENCE.

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

TO THE EDITOR OF "THE ANALYST."

SIR,—Referring to the salt in beer question, I think I ought to state that I have several times found as much as 58 and 60 grains salt per gallon in Allsopp's best quality of pale ale, supplied to my own house in barrels, and I think also in other brands; and that I long ago, before the passing of the Adulteration Act of '72, decided not to find fault with any ale which was of good strength, and contained no more than 70 grains per gallon, or 0.1 per cent.

Of course this quantity never came entirely from water, malt, and hops; but it is not objectionable to use a *small* quantity of salt in extending the malt.

Yours, &c.,

J. CAMPBELL BROWN.

TO THE EDITOR OF "THE ANALYST."

My letter to you, respecting amount of salt in our Beers, of the 23rd October, as published, is totally incorrect as to substance; the figures are right.

My assertion and assurance to you should be that none of our Beers that I have examined contain salt 50.87 grs. = 20 grs. sodium per gallon; that our usual brewing waters contain chlorine = to 5.10 or 5.35 grs. sodium; and that the sample of Beer reported on contained chlorine = to 15.6 grs. sodium. The quantity of sodium found being 15.05 grs. only.

Hoping in a day or two to be able to trace the cause of the inaccuracy, when I will write you again and send subscription,

I am, Sir, yours faithfully,

WILLIAM KIRK.

*Chemist to the Burton Brewery Company.*

[Mr. Kirk has since informed us that the incorrections in his first letter to which he refers were caused by some mistake in his office—part only of his letter having been sent to us.—ED. ANALYST.]

#### TO THE EDITOR OF "THE ANALYST."

SIR,—On June 2nd, 1876, Mr. W. C. Young gave us an account (Proceedings pp. 159), of some interesting experiments made by him on the volumetric estimation of chlorides in the presence of alkaline phosphates, his very cogent deductions were, that "the volumetric estimation of chlorine in the ash of vinegar, beer, milk, or cocoa is affected more or less by the alkaline phosphates present."

Now in the face of this, he on the 14th November, 1877, recommends us to estimate with standard nitrate of silver, the total chlorine, and this in the presence of alkaline phosphates; if the substance of the former paper is correct, the second must necessarily contain fallacious information, and *vice versa*.

Mr. Young does not in his second paper make any mention of the fact, that he found the phosphates to interfere seriously with the determination. If he had done so one would have inferred that the phosphoric acid has to be removed before the chlorine could be estimated, the method would then become still more complicated.

Two quantitative determinations according to Mr. Young are necessary in order to arrive at a qualitative result; namely to decide in the first instance whether a given sample of vinegar, contains sulphuric acid or no.

Again in mentioning the methods "most commonly used for the determination of sulphuric acid in vinegar," Mr. Young has either completely forgotten Hehner's method given in August, 1876, (ANALYST, page 105, vol. 1,) or else he has tried it, and finds it not reliable, if the latter, then his experience is diametrically at variance with my own. As far as I have gone I have found Hehner's method to be quick and reliable, and believe it to be based upon good chemical principles. The qualitative examination of a sample can be conducted in a few seconds, and the estimation of mineral acids can be safely made in a reasonable time.

Yours, &c., ARTHUR ANGELL.

#### ANALYSTS' REPORTS.

Mr. E. W. T. Jones, Public Analyst for the County of Stafford, in his Report for the quarter ending Michaelmas last, states that he examined 207 samples, of which 32 or 15.45 per cent. were adulterated. These included 4 samples of coffee adulterated with chicory; 13 of gin, varying from 37.0° to 54.4° under proof; 1 of milk, adulterated with 19 per cent. added water; 2 samples of mustard contained wheat flour; 6 samples of oatmeal contained sharps and barley meal; 1 sample of whisky was 47.4° under proof, and 5 samples of pills were not what they were sold as.

Mr. A. J. M. Edger, Public Analyst for the County of Durham, reports that during the quarter ending Michaelmas last he analysed 208 samples. 74 of them being adulterated, viz., 50 samples of various spirits, 2 of oatmeal, 8 of pepper, 5 of soda water, 1 of mustard, 1 of cider, and 7 of milk.

The ungenial weather has not damped the ardour, nor abated the contentions of the analysts. Into that troubled region we shall decidedly not venture; it is simply our duty to call attention to the doubts expressed as to the sufficiency of the authorities at Somerset House to be constituted as a Court of Appeal. Recent circumstances have deepened those doubts, particularly a dictum pronounced on Burton ale, which stated that strong Burton beers contain about 60 grains of common salt per gallon, solely derived from the water, malt, and hops used. Naturally the Burton brewers resent the statement, and assure the world that the water used contains from 5.10 grains to 5.35 grains of chlorine per gallon; that no ale leaves the brewery containing 20 grains of salt per gallon; that in no case is there a concentration to one half, and that salt is not used nor any matters to form it. The general public, moreover, must be credited with common sense—the community at large is not likely to extend its patronage to a beverage which is nothing but a flavoured solution of sodium chloride.—*Chemist and Druggist.*

## LAW REPORTS.

AT SOUTHWARK, Messrs. Walter Jacob Maas, James Frith, and Alexander Frith, of Ewer Street, Union Street, Borough, were summoned by Alexander Francis, of 24, Barford Street, Islington, for that on the 21st Nov. they did sell him 2 cwt. of white clover seed dyed, with intent to defraud him, and they were further charged with causing the same to be dyed. Mr. Besley prosecuted; Mr. Edward Clarke appeared for Messrs. Maas & Co., and Mr. Washington for Mr. Harley. Mr. Besley said the proceedings were taken under the Adulteration of Seeds' Act, rendering the defendants liable to penalties of £5 on the first and to £50 on the second conviction. Mr. Benson asked what was the object of killing seed. Mr. Besley replied that charlock seed was similar to turnip seed, and it was killed and mixed with good seed. These cases were for dyeing seed, which fortunately had not proceeded to any great extent, and it was with the view of putting a stop to such fraud that the present proceedings were taken. He was glad to say that there were only two or three firms which carried it on, and after calling the necessary evidence he would ask his worship to inflict the penalties according to the Act of Parliament. Mr. Clarke observed that it was not an offence to dye the seed. Mr. John Charles Ostler said he lived at Walthamstow. On the 12th of August he called at Messrs. Maas and Frith's place, in Ewer Street, and saw James Frith. On the 16th Nov. he was with Mr. Robinson, and a sample of low white clover was shown to Mr. Francis. Mr. Clarke objected to the evidence of this witness, when Mr. Besley called Mr. Francis, who said he was a commercial traveller, and on the 16th Nov. he was at Robinson's place, in Snow's Fields, when a sample of seed (produced) was handed to him. It appeared to be the screenings of white clover. He saw some of it was worm-eaten and unfit for sowing. There was grass seed in it. Mr. Robinson produced him an invoice. He gave Robinson a £10 note. He gave witness the receipt. At the same time the delivery order was handed to him. Mr. Ostler, resuming his evidence, said he saw the seed come to Robinson in two sacks, and it came from Frith and Co., Ewer Street. The sacks were opened, and their contents smelt strongly of sulphur. He took samples, and handed them to Mr. Dyer, consulting chemist, 17, Great Tower Street, E.C. Mr. Bernard Dyer, F.C.S., Member of the Society of Analysts, said on the 7th ult. he received two samples from Mr. Francis. On examining them and submitting them to chemical analysis he found that a great deal of sulphur in the form of sulphuric acid, one grain to the ounce, had been introduced. He would not say that sulphur would kill seed. Mr. Benson asked if he knew anything of the process. Witness replied that he did not know what the defendants did, but worthless seed was usually placed on hair cloth and submitted to sulphur fumes. It was entirely worthless. The only object was to give it the appearance of genuine seed. By Mr. Clarke.—Many of the seeds so called were hollow shells. He had been in practice three years, and prior to that had been for three years assistant to Dr. Voelcker. Mr. Benson asked if a farmer would know whether the seed was good or bad. Witness replied that many farmers were deceived by such seeds. Mr. Besley here said that was all the evidence he had to offer in the case. Mr. Clarke contended that there was no evidence before his worship. Mr. Benson said he regretted very much that such was the case, and he was bound to dismiss the summons.—*Times*.

BOW STREET.—MILK ADULTERATION.—Edward Stone was charged on remand, before Mr. Flowers, with putting eight quarts of dirty water to some milk belong to his employer, Mr. Henry Hanson, milk dealer, at 76, Great Queen Street. The prisoner on the last occasion did not deny that he put the dirty water into the milk, but cross-examined Mr. Hanson to show that he had been in the habit of making his men, when the milk run short, mix a quantity of white stuff that was kept in a cellar with water, and take out to the customers to make good the deficiency in the supply of good milk. This process he called the "fake" of the trade. Mr. Hanson admitted that he kept condensed milk to make up the supply when the demand was too great. The "white stuff" referred to by the prisoner was the condensed milk. On the prisoner being now placed before Mr. Flowers, Mr. Winch, for the prosecution, said since the adjournment inquiries had been made and these had resulted in showing that the prisoner had been a respectable man, and under these circumstances the prosecution did not wish to press the charge. The prisoner's cross-examination had elicited from Mr. Hanson that he did use condensed milk with water put to it. Mr. Hanson did not wish to withdraw that admission; but he urged that there was no evidence that that milk was sold to customers without their knowing what it was.—Mr. Flowers: No, there's no evidence of that. Mr. Winch said he hoped, therefore, his worship would not assume that it had been sold without such knowledge.—Mr. Hanson also called attention to the fact that the condensed milk cost him more than the good milk sent up by the farmers. It was well known in the trade that at this time of year milk sellers were put to great difficulty to supply their customers, and had to submit to loss by using this condensed milk. Mr. Hanson wished the case to be dealt with as one of wilful damage to property.—Mr. Flowers was of opinion that the prisoner had really stolen the milk, and he should therefore not impose a fine, but should sentence him to two months' imprisonment.—*Daily Telegraph*.

BEER ADULTERATION.—Robert Kirby, landlord of the Albert beer-house, Milford-street, Clapham, was summoned at the Wandsworth Police-court, to answer two counts in an Excise information,

for having a certain article upon his premises as a substitute for malt and mixing sugar with beer.—It appeared from the evidence of two officers of Inland Revenue, named Pargeter and Cook, that on the 24th September last they visited the defendant's house for the purpose of examining the cellar. On the stairs Mr. Pargeter found two stone jars, one full of treacle, and the other partly full. Half-way down the stairs he found three bags containing loaf sugar. He examined a cask of ale which had recently been refined, and found traces of sugar, salt, and water. He told the landlord that he had been mixing his ale. He said he had not. He told him that he had mixed sugar, water, and salt with it. He replied that it was of no use to deceive him; that he had put 1lb of sugar, a gallon of water, and a handful of salt in the barrel. The officer examined a barrel of porter, and found that it had been mixed. The defendant said he used the treacle in the porter and the sugar for the ale. The sugar and treacle were seized by the officers.—Mr. Paget dealt with the first count, the second being withdrawn. He said he should reduce the penalty of £200 to one-fourth. If deleterious articles had been found he should have imposed the full penalty, as it was most important that a pure article should be sold. He then imposed a penalty of £50. *Standard.*

**ADULTERATED BUTTER.**—At Lynn Petty Sessions, before the Mayor and other magistrates, William Clark, a "peripatetic provision merchant," who regularly attends various markets in the Eastern Counties was charged by Superintendent Ware, with selling in the Lynn market a spurious article, which he alleged to be butter. Defendant was represented by Mr. Oliver, of 23, Newington Road, London, who stated that he was instructed by the defendant to plead guilty to the charge. Superintendent Ware said the defendant represented himself as of 2, St. Pauls-terrace, New Southwark, London. He visited defendant's stall on the Market place on Tuesday, October 30, and found thereon a quantity of cheese, bacon, and what appeared to be butter, and these he was offering for sale. There was a crowd standing round the stall, and witness saw several persons purchase the butter. Witness proved the purchase and division of the sample. Defendant had been in the habit of attending Lynn Market for months past. Mr. W. M. Hamlet the Public Analyst produced his certified analysis of the butter handed to him by Superintendent Ware, and it showed that the sample contained:—Foreign fats other than butter, 83.19; salt, 3.06; insoluble residue, 5.61; water, 8.14; total 100.00. Specific gravity at 100° Fahr., 908.6. Soluble acids—i, 1.1; ii, 1.1. Insoluble acids—i, 95.0; ii, 94.8. Defendant was fined £5, including costs.

**A MILK ADULTERATOR CAUGHT "IN FLAGRANTE DELICTO."**—At the Barrow Magistrates' Court James Hexton was charged with selling adulterated milk. Mr. Nalder appeared on behalf of the defendant. Supt. Barker stated that the defendant was a milk dealer, and on the 3rd inst. he purchased a pint of new milk from him, for which he paid 2d. He produced the certificate of the county analyst, who had analysed the sample forwarded to him, which showed it to be adulterated to the extent of 10 per cent. with water.—Mr. Nalder: Have you always found defendant to be a respectable dealer in milk?—Supt. Barker: I have found he is not a respectable dealer in milk.—Mr. Nalder: Then you have not complied with your duty, in not bringing him before the magistrates before. John Marshall Tyson, farmer, Billingcoat, stated that on the 3rd inst. defendant purchased 20 gallons of milk from him. When he received it, it was just as they had got it from the cows. The price was 11d. per gallon in winter, and 10d. in summer. P.C. Pincock, stationed at Furness Abbey, said in consequence of information received from Supt. Barker, he, from behind a hedge, watched defendant on the 3rd inst. returning from Billingcoat farm. On the road there is a water trough, and witness saw him fill a can, which would hold three gallons, with water, and add it to the milk. Supt. Barker: This well is not a very clear one. Inspector Barlow spoke to serving summons upon the defendant, when he admitted having watered the milk, but gave as a reason for doing so that his customers were determined to have the milk, and in order to keep them, he had watered it to make the quantity larger, as he could not get any more from the farmer. Supt. Barker asked for the imposition of the full penalty. He could show that the defendant could not have been making less than £2 or £3 a week more than he would ordinarily have done. The bench inflicted a fine of £5 and costs.

**A MILK CASE.**—Richard Thompson, Pond Street, sued James Morris, River Street, Pond-hill, milk dealer, for £2 19s. 6d. being the amount of fine and costs which the former had to pay through having sold milk obtained from the latter, and which at the Town Hall was pronounced to be watered. Mr. Clegg was for the plaintiff, and Mr. A. S. Binney defended. The plaintiff's wife got a quantity of milk from the defendant for sale, but when a quart was bought by the inspector, and it was analysed, it was found to be adulterated with water. Consequently Mr. Thompson was fined £2 and 19s. 6d. costs, which she tried to get Morris to pay. He had promised to see her "all right" at the Town Hall, but did not, nor could she induce him to pay the amount. She had never watered the milk herself. Morris also denied having watered the milk, and a servant of his said she had never seen it watered. His Honour supposed it would not be done publicly if it were done. The defendant however admitted having been fined for selling watered milk, but then that had been bought from another dealer. His Honour who commented strongly on the fact that the defendant had not appeared at the Town Hall when we knew his character as a dealer in milk would be challenged, gave judgment for the amount claimed with costs.

## NOTES OF THE MONTH.

We commend the following advertisement to the notice not only of brewers who may be in trouble, but also to those professional chemists who are of opinion, as we are, that the analysis of a water "for brewing purposes" involves a considerable amount of work. There can be no doubt that it would be more respectable to be a crossing sweeper than to practise the analysis of water "for brewing purposes" on the terms this advertiser professes to do (of course we suppress the address):—

"Waters tested, examined, and reported on with reference to their fitness for brewing purposes. FEE, TEN AND SIXPENCE. A half-gallon sample must be forwarded, carriage paid. Complete analyses 3gs. and 5gs. Analyses and examinations of barley, malt, sugar, hops, beer, yeast, &c. Advice and consultations upon all matters relating to the Chemistry of Brewing, either personally or by correspondence. Instructions given in Practical Chemistry.—T.A.B.Sc., F.C.S., Chemical Laboratory. • • •"

---

Chemistry is evidently becoming more and more an exact science. One of our contemporaries recently went out of its way to inform its readers that carbolic acid is soluble in water, while the other oils are not.

---

When *The Grocer* weeps over the sad fact that "adulteration flourishes," it is not out of place for us to regret it. Certainly it is a sign of the times that the adulterating community are no longer defended even by their trade journal. Perhaps soon we may have an immaculate *Grocer* advocating purity instead of floured mustard and watered milk.

---

The Gin dealers are in hard straits. The recent decisions really mean that they are prohibited from watering their gin at all. We say quite right. There is no reason at all why a milkman should be fined and a publican let off. One of the most curious features of the whole matter is the way in which the publicans have rushed over to the teetotal side of the argument, and urged that they only diluted the gin, because if they did not it was too strong for their customers. Poor customers—Was the price reduced as well as the spirit? Of course the *Brewers' Guardian* sees a "very broad distinction between adulteration and dilution." We cannot. Why should water be sold at the price of gin any more than at the price of milk?

---

We notice with great pleasure that Professor Abel has been made a *C.B.* Probably it would have been hard to find among chemists a more fitting recipient for such an honour.

---

We publish more letters this month as to the Salt in Beer question. Dr. Campbell Brown's results are of course unquestionable, but it is quite clear that the Burton brewers must draw their water and salt from sundry and diverse springs, for we recently had a sample of Allsopp's ale which contained less than three grains of salt per gallon. We would also call attention to Dr. Bernays' report to the Camberwell Vestry, where he refers to some very astonishing instances of the quantity of salt he has found in beer since the recent Somerset House dictum (?) was issued.

The following paragraph, which we reprint from a leading article in the *Grocer*, and refer to more fully on another page, will be read with interest and probably amazement:—

“In one form and another, adulteration seems to be rampant everywhere; and what is still more serious, it almost defies both the vigilance of inspectors and analysts to suppress it, and stern Acts of Parliament to stamp it out. Adulteration flourishes in defiance of all enactments and safeguards; and, humiliating and deplorable as it is to confess, no one can scarcely lay his finger upon an article of food, clothing, or manufacture that is not in some respects shamefully adulterated. To combat with and describe one-tenth part of the evil would occupy more time and space than we can devote to so vast a subject, and we therefore merely allude to it incidentally for the purpose of bringing more prominently under the notice of our readers the case of adulteration of seeds reported in our last issue, where the offender was convicted on the clearest evidence, and substantially fined.”

ALDERMAN ROOKE ON GIN AND HIS OWN TRADE.—Yesterday afternoon a Meeting of the York Licensed Victuallers' Association was held at the York Hotel, to consider the recent prosecutions against publicans and others for selling diluted gin. Mr. Alderman Rooke occupied the chair. . . . “Mr. Rooke went on to say that the other day an acute friend of his, for whom he had the greatest regard, asked him why, if people were fined for mixing water with milk, the same course should not be adopted with regard to gin. His reply was then, as now, that milk was an article of food; that it was the only food which infants could take, and that therefore water added to it injured its nutritive properties. This was not the case with gin. Gin was an intoxicant, and water did not injure its properties. Besides, many people had died from the effects of taking strong gin. The ignorance of the laws and customs regulating the trade, which pervaded the minds of the magistrates and the judges, seemed to him to be extraordinary. The great vice of all these convictions was that it was an attempt to limit the profits of the publicans, thus setting aside every sound maxim of political economy.” . . . . “What was the trade of the publican? His house was never his own. He had to suffer all the taunts and insults of every blackguard who enter it, and if he refused to serve a man there was very often a scuffle, in which he perhaps came off the second best. The present state of affairs must not go on much longer, and they must do what they could to prevent it.”—*York Herald*.

A correspondence has appeared in a Glasgow contemporary as to what is called by the writers “adulterated sugar.” They complain of the noxious smell and want of sweetening property which are the leading features in most of the sugar sold in the “metropolis of Scotland.” Two writers in a recent issue of the paper explain the cause—viz., the large quantity of beetroot sugar which finds its way into the market, which, either for smell or for sweetness, cannot be compared to the produce of the cane. As a proof of the increase in the quantity of beetroot sugar used, one writer says that, out of 28,000 tons landed last month at Greenock, about 24,000 tons were beetroot. We think it probable that changes now in progress will soon largely increase the importation of cane sugar.

#### OBITUARY.

WE regret to announce the death on Dec. 20th, at Paris, of Henry Daniel Ruhmkorff, whose name is so closely connected with the history of magneto-electricity. He was born in Hanover in 1803. In 1844 he brought out his first invention, a thermo-electric battery, and in 1851 the famous “Ruhmkorff Coil,” which was rewarded by a medal and decoration at the Exhibition of 1855, and in 1858 it received the prize of 50,000fr. at the French Exhibition of Electrical Apparatus. M. Ruhmkorff was a Member of the French Physical Society.

Professor Abel, the late President of the Chemical Society, and one of the honorary members of the Society of Public Analysts, has been nominated to the Companionship of the Bath. Dr. Playfair, another honorary member, is said to be the only other chemist who enjoys that distinction.

Mr. Arthur Angell, Public Analyst for the county of Southampton, has been appointed Public Analyst for the Borough of Guildford.

SUBSCRIBER will most satisfactorily obtain the information he requires by consulting Church's *Laboratory Guide*, published by Von Voorst, London.

**SALT IN BEER.**—We extract the following from the last report of Professor Bernays, Public Analyst for Camberwell:—"In the past quarter I have examined eleven specimens of beers, ales, and porters. As to alcohol, except in a spruce beer which contained 14·3 per cent., the variation was only between 8 and 10·5 per cent. The same lack of hops is exhibited as of old; at least a little goes a long way. But the most curious feature is in the increase of salt. It will perhaps be remembered how often I have mentioned the almost absence of salt in days gone by. Now, however, we have arrived at a quantity, in the case of No. 70, so large that I ventured to obtain a magisterial decision and a penalty, reduced at the request of Mr. Marsden from £10 to £5, together with costs. May I give examples, stating the grains per gallon?—No. 57, not estimable; 58, 5·60; 59, 11·20; 68, 13·30; 67, 30·10; —, 32·90; 63, 34·30; 61, 44·10; 60, 47·69; 69, 58·10; 70, 82·60. Here, then, we have, from a merely nominal presence, as much as 82 three-fifths grains in a gallon—a quantity sufficient to induce thirst and to encourage drunkenness."

Publicans are now being fined throughout the country for gin as high as twenty-seven and thirty under proof; and although gin is known to be sold at two or three prices, and necessarily, therefore, at two or three qualities, still whatever sort be asked for the magistrates seem to conclude that the best ought to be sold. Without any desire to encourage adulteration in any shape, we cannot but think that the same Legislature which derives so enormous a revenue from spirits that they cannot be sold at a reasonable price, did not intend by legal enactment to make the sale of them impossible; and that the trade are in the right in asking some redress. There is a very broad distinction between *adulteration and dilution*—although to the latter there must be some limit—and the law, as at present strained, is equally hard on the honest as the dishonest trader.—*Brewers' Guardian*.

### RECENT CHEMICAL PATENTS.

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

1876. No.	Name of Patentee.	Title of Patent.	Price.
638	J. C. Swan ... ..	Purifying Drainage from Alkali Waste ... ..	2d.
1587	J. and J. Kidd ... ..	Carburetted Gas and Air ... ..	2d.
1619	M. H. Syngé ... ..	Apparatus for Filtering and Purifying Sewage ... ..	6d.
1632	G. W. Weatherhogg ... ..	Apparatus for Carburetted Atmospheric Air ... ..	6d.
1640	W. R. Lake ... ..	Chemical Telegraphs ... ..	10d.
1668	G. S. Hazlehurst ... ..	Condensing Noxious and other Gases and Vapours ... ..	6d.
1733	E. K. Muspratt ... ..	Furnaces for the production of Sulphate of Soda or Potash ... ..	2d.
1760	W. James and J. Walsh ... ..	Apparatus for Manufacture of Sulphates of Soda and Potash, &c. ... ..	2d.
1835	L. Locurental ... ..	Gases for Purifying Noxious Vapours, &c. ... ..	6d.
1806	J. H. Morgan ... ..	Disinfecting Compound ... ..	2d.
1910	F. W. Heinke ... ..	Producing Electric Light ... ..	2d.
1958	B. C. Molloy and J. D. Warren ... ..	Using and Producing Nitric Acid ... ..	4d.
1982	J. Fenton ... ..	Defecating and Deodorizing Sewage... ..	2d.

### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette.



# THE ANALYST.

---

## MIS-INTERPRETATIONS OF THE SALE OF FOOD AND DRUGS' ACT.

SEVERAL recent decisions under this Act present such striking instances of mis-interpretation that we think it necessary to call special attention to them, in order, not only that they may be considered by analysts in the certificates they give, but also that the ground may be more prepared for bringing them at the earliest opportunity under the notice of Parliament.

The first, and perhaps most important of these decisions, is in a case reported on another page, in which a milk dealer at Glasgow had been summoned for selling to an inspector, cream containing "more than 50 per cent. of the other ingredients of milk;" the Sheriff convicted the defendant, and imposed a fine of £2. The defendant appealed to the Justiciary Appeal Court, and the argument against the conviction was that the inspector was not prejudiced by having purchased an article of this quality, that in fact it was quite immaterial to him as a public officer, buying the article solely for analysis, whether it was pure or impure, as under no circumstances would he consume any part of it. Several other questions were raised, all of them with the singular persistency which seeks technical points of defence, instead of accepting the broad principle of appeal to the chemists at Somerset House laid down by the Act, but the point as to prejudice was the only one on which the decision was given in favour of the defendant, and here the Lord Justice Clerk was distinctly of opinion that the conviction could not stand, and four of the other lords who sat with him arrived at the same conclusion and concurred in the decision, while two other judges thought that the judgment should be allowed to stand. It is worth noting, however—if the reports in the Glasgow papers of the grounds on which Lord Adam and Lord Craighill dissented from the opinions of the other judges is correct—that they did not dissent because they thought the inspector was really prejudiced, or that the terms of the Act had been fulfilled, but simply because they thought that, under the circumstances, it was not competent to the defendant to have appealed at all—in other words, they thought the original conviction was wrong, but that they had no power to set it right. It does not need any words of ours to show that if such a decision as this is to be upheld, the Act is entirely a dead letter, except as regards those other clauses, under which it is still possible to charge offenders. Thus for instance, it would still be possible to charge a vendor under the 3rd, *i.e.* the injurious to health section, or under the 4th, which is the drug section, or under the 7th, *viz.*, the compound article section, or under the 9th section, which relates to abstraction, but it is seldom that it is convenient to proceed under any of these different sections. Should the English magistrates or judges on appeal, follow this Scotch decision, it is clear that any Bill to be brought before Parliament for amending the Act, must deal with the question as to "prejudice."

The next case to which we must refer, is the prosecution of a publican for selling beer containing a quantity of salt, which was commenced before the issue of our last number, but as the decision was not given we held over the report. We now reprint a rather full report, and it will be seen that the magistrate's decision amounts virtually to this:—that if, as he believes is the case, the brewers have put the salt into the beer, it

is impossible to proceed against the publican; and carrying it still further, we may infer from his remarks that he has very great doubts whether the salt was put in as a necessary constituent of the sugar or as a deliberate adulteration. This case has evoked a considerable amount of discussion in the brewing papers, some of which has taken an undesirable personal tone. It seems to be generally admitted now by nearly all the parties to the controversy, that the sugar introduced in the brewing of the beer in question was specially prepared sugar, sold under the name of "brewers' concrete," which contained a larger quantity of common salt than could ever be present in genuine sugar made either from cane or beet. If this is so, it appears to us that the adulteration is quite as clearly shown by the proof of the addition of salt to the sugar, as if the salt had been added to the beer itself. One of the defendant's witnesses swore that he had analysed this sugar, and that the quantity of salt it contained was sufficient to account for more than 50 grains of total chlorides per gallon. As pure sugar is absolutely free from chlorides, and even the grossly impure sugar used for brewing purposes contains only an infinitesimal quantity, this certainly appears to us a bad case of adulteration.

Another case we must allude to:—A Metropolitan magistrate has decided that the note to the Schedule of the Act, giving the form of certificate which should be adopted, and which states "where the article cannot conveniently be weighed, this (the weight) may be omitted," is insufficient to protect analysts from the necessity of weighing every sample as they receive it. The magistrate thinks that it is quite convenient for an analyst to have balances in his laboratory capable of weighing anything up to a quarter loaf or a gallon of beer, and although considerate enough to say that he thought the nearest ounce would be sufficient, yet he insisted on the weight being put in the certificate. If this decision is followed generally, analysts work will be again inconveniently increased to serve no useful purpose whatever.

We do not think we ought to conclude this article without calling attention to the resolution passed at the last meeting of the Society of Public Analysts with reference to the Inland Revenue Chemists, and expressing our earnest hope that the latter will accede to the Society's request.

---

#### SOCIETY OF PUBLIC ANALYSTS.

THE ANNIVERSARY MEETING was held on the 16th January, 1878, at Burlington House, Piccadilly, the President, Dr. Dupré, F.R.S., in the Chair.

The Minutes of the previous Meeting were read and confirmed.

The President delivered the annual address. He said:—

It is a pleasant thing for me for the second time to congratulate the members of this Society on the return of an Anniversary Meeting, when we may take, as it were, a fresh start on our career, and it is still more satisfactory that we can make this fresh start with an outlook for the future which certainly embraces some points more satisfactory than was the case at our last Anniversary Meeting.

The past year has not been free from analytical troubles and disturbances, and the Society of Public Analysts has certainly not been exempted from them. Referring, as briefly as I can to the principal events which have interested us as a Society during the year, it is natural to notice first of all the erroneous interpretations which, from time to time, have been made of the Sale of Food and Drugs' Act, and as a natural conse-

quence, the several miscarriages of justice which have taken place. Among the latest of these mis-interpretations I may notice that the Glasgow Magistrates have positively refused to convict tradesmen selling adulterated goods on the evidence of an inspector, because, they say, the inspectors were not prejudiced by the purchase, as they only bought them for the purpose of analysis. It is scarcely necessary to remark that such a decision as this is in direct contradiction to the spirit of the Act, as well as, in my opinion, to the wording of it, and also to the intentions of the legislature in passing it. Of course if such a decision is allowed to stand the Act would be rendered entirely void, and it is to be hoped that Scotch Magistrates will speedily return to the interpretation put upon the Act by English Magistrates.

Serious hindrances have been produced in the working of the Act by the steps which the Inland Revenue Chemists have taken. First among the mistakes they have made I ought probably to notice the quantity of salt they are passing as permissible in beer. It is interesting and I must say sad to note that the very same officials who some few years ago examined a large number of samples of beer (which it should be noted were not purchased direct from the brewers, but from the retailers throughout the whole kingdom), and who then agreed to a maximum of 50 grains per gallon as being the utmost which it was necessary to allow, have recently signed a certificate and added to it a gratuitous statement that 68 grains is sometimes found in genuine ales. It certainly needs very serious consideration whether these Chemists, acting as they do as a kind of Appeal Court on purely chemical matters, should be allowed to make any addendum of any kind to their certificate. On the first appearance of the thing it certainly seems wiser that they should be compelled to state the facts only, leaving others who are perhaps better qualified than themselves to draw inferences from the facts. There is another class of cases in which their proceedings have repeatedly rendered prosecutions abortive, viz., that in analysing samples of decomposed milk, they have in many cases made an unknown, and, as far as I am aware, uncertain allowance for decomposition. Now although decomposition may doubtless require to be taken into account in the case of the analysis of very stale milk, it is perfectly clear that when any correction is made for the decomposition, that correction should be stated on the face of the certificate in such a way as to allow evidence to be taken to either confirm or disprove the accuracy of the data used. It appears to me that this defect is due to a bad feature in the system. It is customary among chemists, as among other professional men, to publish every new discovery or improvement which they may make in processes of analysis, medicine or surgery, in order that it may be fairly criticised and examined by those who are free from the bias which inevitably attaches to an inventor, and the weak points, if any, of the process or of the discovery are fairly pointed out. I think it is clear that this criticism not only tends to improve the process itself but gives information to all other workers in the same field. As regards the Inland Revenue Chemists, however, this rule has not been adhered to. The first time their peculiar process for the analysis of butter was ever allowed to be known outside the walls of their laboratory was when it was extracted in examination in Southwark Police Court, and, as far as I am aware, no publication of any kind has taken place in reference to the data on which they work for the analysis of stale or slightly decomposed milk. The consequence is that their processes, not being published, and not being open to public criticism, cannot possibly command confidence.

This is not as it should be; both parties to the controversy lose by such a state of things. Public Analysts lose the benefit of the experience and work of the Inland Revenue Chemists,—and differ as much as we may from them we must certainly admit that they can do some good work—while on the other hand the Inland Revenue employés lose the benefit of that criticism which is the only true means of fairly judging the value of work. When they were first appointed under the Sale of Food and Drugs' Act to act as referees in disputed cases they took what was perhaps under the circumstances a right and proper view of their position—they considered that they were appointed by the Legislature virtually to act as defenders of tradesmen in all cases in which they could be fairly and honestly defended; in other words their standpoint was to some extent opposite to that of the Public Analyst. Under the Act it is unquestionably the duty of the Public Analyst to endeavour to defend the consumers of food, drink, and drugs from imposture or fraud, and they being so protected, the Inland Revenue Chemists were not required as far as the general public was concerned, but the traders complained that in some cases too much heed was given to grievances which were only imaginary and not real on the part of the consumers, and consequently the Inland Revenue Chemists were appointed to protect the vendors. This necessary, although somewhat unfortunate conflict of interests has been perhaps, to a great degree, the cause of the discrepancies which, upon two or three occasions, have been shown by the results obtained by the different chemists.

Passing from this on to another subject, I may note that during the year a Limited Liability Company called the Institute of Chemistry, has been formed, and has duly received a license from the Board of Trade. The object of the Institute, as put forward by its promoters, is to discriminate between competent and incompetent chemists. The matter has been often referred to at our meetings, and especially in the discussion which took place recently on the desirability of changing the name of this Society, so that I need say little more in reference to it, except that the new Institute is—like our own Society—entirely a voluntary association of members, and that it has no power to confer degrees or diplomas of any kind. Our Society being essentially a working society,—that is, one for the reading of papers on practical subjects, which scarcely enters into the programme of the Institute—there is ample scope for both Societies.

As regards ourselves during the past year we have prospered fairly well, considering the influences which have been brought to bear against us. Tradesmen, until recently, have been in the habit of denouncing not only the members of this Society, but all analysts, as impertinent intermeddlers, and it has been uncommon to see an analyst's name without the prefix "incompetent," but now times have changed, and even the trade journal of the grocers acknowledges that "adulteration is rampant." If any proof were needed that there is plenty of work for the members of this Society to do, this statement supplies it. As public officers, analysts must dismiss every personal question, and simply do their duty as laid down by the law, and suppress adulteration in whatever form, or in whatever quarter it may exist.

There is one point on which I think analysts err, and that is in appearing in court as witnesses for the defence—there seem to me to be very few cases in which a public analyst holding as he does a government appointment, should appear as a witness for the defence in a case where the certificate of another public analyst is in question. The law has already provided a tribunal to which appeal can be made, and though this tribunal

has not up to the present erred on the side of too great stringency in prosecutions, yet it is amply sufficient for the purpose. No Excise officer would be allowed to appear for the defence in Excise prosecutions, and similarly it appears to me that no public analyst should be allowed to appear as a witness for the defence in a prosecution under the Sale of Food Act.

Our Society during the year has increased slightly in numbers, though of course we have lost a few members by withdrawal, and one, Professor Apjohn, by death. Seven new members have been elected in addition to the four we have elected this evening. In looking at the figures we must bear in mind how small is the constituency from which we can at present draw our members; there are probably less than 200 men in England who are eligible to become Members of the Society of Public Analysts under the present constitution, and we have now a tolerably good percentage of these as members. Under the present constitution however, the income which the subscriptions from the present members brings in is barely sufficient for our needs. A journal like *The Analyst*,—which publishes from month to month probably more original papers on strictly analytical work than any other periodical except the Journal of the Chemical Society, 22 papers having been read last year before this Society, and published in *The Analyst*, while 11 more papers were published which were not read before the Society, or a total of 33 in all,—cannot be conducted without considerable expense, and we have to pay those gentlemen who have so kindly undertaken the responsibility of conducting it, for the expenses they incur in publishing our proceedings, but even this payment has been very little more than half the cost which was incurred by the Society during the year when *The Analyst* was published at the cost of the Society itself. In order to meet this cost and possibly enable *The Analyst* to be enlarged, and to do what no other similar journal does, viz., report the papers read at these meetings closely up to date, we shall need more money. The Council have had this matter under their serious consideration, and although they have come to the conclusion that it would be a great mistake to alter in any way the real limits laid down by the constitution, as defining those who should be eligible for membership of this Society, viz. analysts in practice, they are considering whether assistants, who have been in salaried employment for not less than two years after the expiration of their term of pupilage, may not fairly be classed as analysts in practice within the meaning of the rules the difference between them and the present members being simply that their fees are received in the shape of a fixed salary and not as a certain sum per sample.

If this should be done I think the Society might fairly expect a fresh access of members, whose subscriptions would bring the balance of the accounts on to the right side. This alteration would give to a class of men, who, by the mere fact of their receiving for a term of years definite salaries for pure chemical work, are proved to be qualified, the opportunity of joining our Society, and although we cannot and do not desire to grant a diploma, yet the fact of membership will, we think, be considered by the public as some kind of guarantee that a man has a certain status in the chemical world.

The Session of Parliament which opens to-morrow seems likely to prove a busy one on analytical matters, for legislation on more than one point appears imminent. The question of impure drugs is to be raised, and probably following the abortive bill, which was introduced towards the close of last session, Parliament will again be asked to

decide on a fixed strength for spirits. Water and gas are also likely to come forward again as prominent questions, and on all these and any other points of chemical legislation, the Society of Public Analysts ought to have something to say, and that, I think, is another strong reason why we should have a little more money.

One word more,—we as a Society ought certainly to try to suppress the practice of underbidding, and of advertising certificates of milk analyses at 2s. 6d., and water analyses at 7s. 6d.; I have seen advertised in many a grocer's shop certificates of the purity of nearly everything in the place. All this should be done away with. I am quite sure that the low fees cannot pay for honest work, and that no fees, however high, can pay for risking a reputation made by years of work and study in certifying to the purity of the goods which other people sell.

A ballot was then taken for the election of Officers and Council for the present year, and for new members proposed for election. Messrs. Adams and Slater were appointed scrutineers to examine the voting papers, and they reported that the following had been elected :—

*President.*

A. DUPRE, PH.D., F.R.S., F.C.S.

*Vice-Presidents.*

A. H. ALLEN, F.C.S.

A. H. CHURCH, M.A., F.C.S.

J. MUTEF, PH.D., M.A., F.C.S.

*Treasurer.*

C. W. HEATON, F.C.S.

*Hon. Secretaries.*

CHARLES HEISCH, F.C.S.

G. W. WIGNER, F.C.S.

*Other Members of Council.*

J. C. BROWN, D.Sc., F.C.S.

C. A. CAMERON, M.D.

W. H. CORFIELD, M.D., F.C.S.

J. FALCONER KING.

H. C. BARTLETT, PH.D., F.C.S.

J. W. TRIPE, M.D.

Those Members of Council whose term of office has not expired, and who consequently do not retire this year, are Messrs.

A. WYNTER BLYTH, M.R.C.S., F.C.S.

JOHN CLARK, PH.D.

ALFRED HILL, M.D., F.C.S.

E. W. T. JONES, F.C.S.

W. W. STODDART, F.C.S.

The scrutineers also reported that Messrs. J. H. Martin, J. W. Gatehouse, J. Whitla, and A. A. Nesbit had been elected members of the Society, and Messrs. F. W. Gear and W. J. Williams as associates.

Dr. Dupré proposed, Mr. Wigner seconded, and it was unanimously resolved that the President of the Chemical Society, Dr. Gladstone, F.R.S., be in accordance with precedent, elected an honorary member of the Society, and that the late President F. A. Abel, C.B., F.R.S. be re-elected as an honorary member, his official term having expired, and they were accordingly elected.

Dr. H. W. Hake was proposed as a member, and will be balloted for at the next meeting.

A discussion took place as to the analyses made at Somerset House, and Mr. Wigner said that considering the unsatisfactory character of the decision in those cases in which appeal is made to Somerset House, not only because there was often a difference between the Somerset House Chemists and themselves, but because they did

not know on what basis the Somerset House Chemists were working, he should propose that the Society pass a resolution directing the secretaries to address a letter to the principal of the Somerset House Laboratory, asking him to read a paper at the Society's next meeting, or at a special meeting to be called for the purpose, to lay definitely before the Society the bases on which they work as regards milk and other things, pointing out their reasons for differing from the Society's standard, and the modes of procedure which they adopt.

Dr. Muter seconded the proposal, saying that at present they were all working in the dark as regards the views of the Inland Revenue Chemists.

Dr. Bartlett supported the proposal and said he thought it would be most desirable if they could get the authorities at Somerset House not only to give them the benefit of their ordinary working methods, but also to forward papers on any matters which could be tested out.

Dr. Dupré cordially agreed in all that had been said, and observed that people soon found out what the standard or the limit of Somerset House was, and they began to adulterate down to that standard, and he thought it would be very desirable if they could induce the Somerset House Chemists to come there, and he did not see if they were met fairly why they should refuse to come.

The resolution was put to the meeting and carried unanimously.

The Secretaries submitted the accounts for the past year, and Auditors were appointed to audit and report on them at the next meeting.

Mr. Wigner gave a short abstract of a note on some samples of Canadian butter, which will be published in our next number.

After the meeting the Anniversary Dinner took place at the "Criterion," Piccadilly, and among the visitors were Dr. Cameron, M.P. for Glasgow, Mr. A. P. Bower, and Mr. Gee.

---

### SOME CONSTITUENTS OF HOPS.

BY EMERY GILBERT BISSELL, PH.G.

*From the American Journal of Pharmacy, December, 1877.*

It is pretty generally supposed that lupulin contains all the active principles of the hop. Some doubt in regard to this having been recently expressed, the writer has endeavoured to settle the question, with what success may be judged from the following experiments. The best of hops were selected, those as nearly ripe as could be found during picking; from these the bracts were carefully removed; the ends next to the achenes, to which part of the bracts most of the lupulin adheres, were trimmed off with scissors; the remainder of each bract was then passed between the thumb and finger to remove the remaining particles of lupulin, a magnifying glass being used from time to time to see that the work was thoroughly accomplished. This process is a difficult and tedious one, the lupulin adhering to the bracts with considerable tenacity. The bracts were then allowed to dry, without the aid of artificial heat, and were found to shrink about three-fourths in weight; after much perseverance one troy ounce of the dried bracts was obtained. Some difficulty was next experienced in powdering them; rubbing them with sand in a mortar was first tried, and found to be exceedingly slow work; grinding in a drug mill was next attempted, but found to be simply impossible; the method finally resorted to, and found to work nicely, was to cut the bracts in pieces with

shears. This may readily be done by grasping the hand full of them and passing the shears repeatedly through many of them at once, sifting out the fine particles from time to time. The powder thus obtained was exhausted with stronger alcohol, and a tincture obtained possessing a bitter taste and some odour, neither of which would, however, hardly remind one of hops. The alcohol was distilled off from the tincture, and an extract obtained weighing seventy grains. To the distillate was added some water, the alcohol distilled off at a gentle heat, and the heat then raised. The distilled water was observed to have a slight foreign odour, but could not be recognized as the odour of hops; it had no effect on litmus paper, and produced no change in colour with a solution of permanganate of potassa, evidently containing not more than the merest trace of volatile organic matter.

Of the extract obtained twenty grains was reserved for further experiment, the remaining fifty grains being tried in the following manner:—One half of it was given to a healthy person; no effect being experienced, in one hour the remainder was given; no effect whatever was noticed upon either pulse, temperature or respiration. The portion reserved was dried by means of the water-bath until it ceased to lose weight, after which the weight was found to be 1.013 gram; of this, .225 gram, or about 22 per cent., was insoluble in water; the portion soluble in water was found to give the reactions characteristic of tannin, and also to contain a small amount of bitter extractive. The amount of the extract reserved was, however, too small to admit of many experiments.

I then endeavoured to determine the nature of the tannin contained in hops, 700 grains of which were exhausted with boiling water, the decoction evaporated nearly to extractive consistence, and treated with alcohol to remove the gummy matter. The alcohol was evaporated and the residue dissolved in water; the percentage of tannin was then estimated by means of a standardized solution of gelatine containing alum; only about 6 per cent. of tannin could be found. The remainder of the solution was then precipitated with neutral acetate and with subacetate of lead; the two precipitates had much the same appearance, and both were soluble in acetic acid. They were each thoroughly washed, then suspended in water, and decomposed with sulphuretted hydrogen. The filtrate from each was found to contain the tannin, which gave a blackish-green colour with ferric chloride, and precipitated a solution of gelatine containing alum. The two solutions were mixed and the tannin precipitated with an excess of common salt, from which an unsuccessful attempt was made to entirely free it.

For the final experiment six ounces of hops were taken and exhausted with boiling water; the decoction was concentrated, treated with alcohol, filtered, the alcohol evaporated off, the residue dissolved in water, and the percentage of tannin estimated as before; only a little more than five-tenths per cent. being found. The solution, being acid to test paper, was carefully neutralized with ammonia and precipitated with neutral acetate of lead, a bright yellow precipitate being obtained; the filtrate gave no reaction with subacetate of lead and contained no tannin. The precipitate was thoroughly washed, suspended in water, decomposed with sulphuretted hydrogen, the precipitate washed until the washings gave no colour with ferric chloride, and the filtrate evaporated to a small bulk, and shaken with ether in hopes that the tannin might be dissolved; the ether, however, failed to take up any of the tannin, and portions of the solution were therefore treated with the following re-agents:—Tarter emetic, which produced a nearly



white precipitate on standing; ferrous sulphate, no effect; sulphuric and hydrochloric acid at once produced precipitates; protochloride of tin, no effect; sulphate of copper, no effect; solution of potassa gave a dark reddish-brown colour, but no precipitate; gelatin gave a precipitate on standing. The green-black precipitate with ferric chloride certainly indicates that this is not gallotannic acid, which in other respects it resembles, and the reaction with the mineral acids would seem to show with equal certainty that the tannin is not moritannic acid, which it is stated by Wagner to resemble.

---

#### NOTE ON A METHOD OF VALUATION OF THE RELATIVE IMPURITIES OF DRINKING WATERS.

By G. W. WIGNER, F.C.S.

I HAVE been engaged for some time past in the preparation of a numerical scale so as to enable an approximate estimate to be made of the amount of impurity represented by every figure in a water analysis. I have been experimenting on this scale as applied to some 200 analyses of water which have been made for and published in the *Sanitary Record*, and I hope to bring the subject before the Society of Public Analysts at their next meeting. The point which I am seeking to bring out is, that certain definite allowances should be made for the nitrogen in every other form of combination as well as in that of albuminoid ammonia, and that the salt, loss on ignition, oxygen absorbed and microscopical results should also each be credited with a certain value.

---

#### PUBLIC ANALYSTS' WORK DURING 1877.

THE Local Government Board have issued to all local authorities, circulars referring to the Quarterly Reports made by Public Analysts under the Sale of Food and Drugs' Act, and enclosed with the circular are forms which the Board desires may be filled up for its information, in order that the Analysts' Reports may be embodied in the Board's Annual Report. It is unnecessary to print the forms here, as we have had several hundreds printed and sent to nearly all Public Analysts in the Kingdom, as we thought it would be very desirable, on account of the length of time which must necessarily elapse before the Board's Report appears, that we should publish in the March number of *The Analyst*, a tabulated statement similar to that which, by the kindness of Public Analysts generally, we were enabled to place before our readers last year. In our letter accompanying the form we point out that the returns for our purpose need not be quite so full as those the Local Government Board require, as we only want details of each adulterated sample, while the Board require details of every sample—adulterated or genuine. We trust that Public Analysts will endeavour, as far as possible, to follow the form sent by the Board, so that after the great trouble it has taken on the question, the Board may soon be enabled to put its valuable Report in the possession of the public, and allow them to be the judges, from the work done, as to the desirability of permitting such conduct as that of the Faversham and Dover Justices, in refusing to appoint analysts.

If any Public Analysts, whether belonging to the Society or not, have not received copies of the form of Report and will communicate with us, we shall be happy to send some, and we shall be glad if all analysts would let us have their forms filled up by at latest the 21st of next month.

## LAW REPORTS.

## GLASGOW CREAM.

In the Justiciary Appeal Court, Edinburgh recently, an important decision was given in an alleged adulteration of cream case. In April last, Mr. Walker, an inspector connected with the Sanitary Department in Glasgow, purchased from James Davidson, milk dealer, 36, Norfolk Street, Glasgow, sixpence worth of cream, which, he stated, was for the purpose of analysis. The sale was made by Davidson's wife. Thereafter, Kenneth M'Kenzie M'Leod, inspector of nuisances in Glasgow, and who was appointed by the Police Board to enforce the Sale of Food and Drugs' Act, 1875, presented a complaint to the sheriff, in which he stated that the article supplied to Walker "was not of the nature, substance, and quality demanded." Davidson pleaded not guilty, but the sheriff-substitute (Lees) held that the charge had been proved, and imposed a fine of £2. It was stated that the cream contained, besides fatty matter, a considerable proportion—more than 50 per cent.—of the other ingredients of milk; that within certain limits, genuine cream varies in richness or percentage of fat; and that the quantity of cream sent up from milk depends on the period during which the milk is allowed to stand or settle, and also upon the disposition of the cows and the nature of their food. In convicting the appellant, the sheriff held, in fact, that the article sold on this occasion, whether or not it contained the various ingredients from which a certain quantity of cream might be formed, was not as a whole, of the nature, substance, and quality of the article known as cream; and in law (1) that where, as here, the purchase was made under the 13th section of the Act, it was not necessary in order to justify a conviction that the sale should be to the pecuniary prejudice of the purchaser, but only that the article sold should not be of the nature, substance, and quality of the article demanded, and of an inferior nature, substance, or quality; that in the event of there being any special circumstances—temporary or permanent—in the nature of the cow, owing to which its milk was unfit to yield cream, except of an inferior quality, the seller was not entitled to sell such an inferior product as cream, if, in truth, it was not of the nature, substance, and quality of cream; (2) that the mere presence in milk of the various ingredients from which cream is formed, and had been to some extent formed, did not justify a dairyman, even though he had done nothing to impoverish the milk, in selling the compound as cream any more than in selling new milk as cream; and (3) that the non-adulteration of the article sold, or the premature period at which it might have been taken from the milk, though they might explain the result and mitigate the penalty, could not, to any extent, relieve the seller of the responsibility imposed on him by the statute.

Davidson appealed to this court against the conviction, and the questions put to the court by the appellant were—whether the sale of the cream was to the prejudice of the purchaser, as stated in the complaint; seeing that genuine cream varies in quality, whether the law has fixed a minimum percentage of fat for cream, and settled that any combination of milk and fat containing less than that percentage shall not be held to be cream, so that a magistrate may convict a party of a contravention of the section of the statute founded on in this case, who sells as cream an article with less than that percentage of fat; whether the city analyst of Glasgow or any other man is entitled to set up a standard for cream so as to make any party who sells a cream under the standard guilty of a contravention of the section of the statute founded on; and whether the facts of the present case warranted a conviction under the section of the statute founded on. On behalf of the respondents the questions were put—whether in this instance a stated case was a competent proceeding; whether the questions put by the appellant or any of them were questions of law; and whether the finding of the Sheriff-Substitute that the article in question was not cream, or in the words of the statute, "not of the nature, substance, and quality demanded," was one of fact or not, subject to review.

The Lord Justice-Clerk was of opinion that the conviction could not stand. The Sheriff was of opinion, on the construction of the statute, that the offence specified in the 6th section had been committed. While the analysis bore that the cream did not come up to the commercial standard, it also proved quite clearly that no extraneous or foreign substance had been added to it, and the question truly involved in the finding of the Sheriff was this—whether it was enough to constitute a statutory offence under this 6th section, that the article sold was not of the quality demanded. His lordship considered this question of very great moment as regarded the operation of this undoubtedly important statute. It was one thing to legislate for defects in the quality of the article sold, and it was another thing to provide against adulteration by the introduction of foreign substances. If they read this clause as regulating defects in quality, the construction opened so wide a door for the questioning of familiar contracts in commerce, that it was difficult to see what importance could be attached to it. Every new article of ordinary consumption might be said not to be of the quality ordered, and in this way many difficult questions might arise. He was of opinion that the statute intended no such thing. It was intended, like all preceding statutes, to strike only at the introduction of foreign substances into articles of food and consumption; and that he conceived to be a very important element in the consideration of this clause. The 6th clause was intended to apply to the mixture of articles of food or drugs with substances foreign to the thing

itself, but not injurious to health; and the offence consisted in selling to the prejudice of the purchaser any article not of the nature, substance, and quality demanded by him. These were ambiguous words. He read them one way, and the Sheriff read them in another. They might mean, as the Sheriff thought, where the article was deficient in any of the three qualities specified, or where it was deficient in any of them, and it was in this latter sense his Lordship thought the words ought to be read. The evidence on which the Sheriff founded showed that no foreign substance or extraneous matter had been introduced into this commodity. If it were enough that the cream was not up to the commercial standard, then the conviction would stand; but his Lordship was of opinion that this was not sufficient, and he said it would lead to the greatest inconvenience if they were to construe it to mean that if the quality of the article sold in open market was not up to that which was demanded, a general offence had been committed under the clause. On the other point his Lordship said that it must be proved that the article sold was under the 6th section to the prejudice of the purchaser, yet the Sheriff found that this was an offence, although the prejudice had not been proved. This was where the Sheriff had entirely misconstrued the section, and on this ground his Lordship thought that the appeal must be sustained.

Lords Deas, Young, Mure, and the Lord President arrived at the same result, each stating their opinions at great length.

Lord Adam, with whom Lord Craighill concurred, thought the judgment of the Sheriff should be allowed to stand. A decision of matters of fact was not admittedly subject to review, and the facts being admitted, there was nothing in this case which, as he thought, seemed or suggested that in any of his conclusions the Sheriff had been misled by an error in law.—*Glasgow News*.

#### SALT IN BEER.

ON Wednesday, December 19, at the Thames Police Court, James Scott, landlord of the Wellington beerhouse, St. Leonard's Road, Bromley, was summoned at the instance of the Metropolitan Board of Works for the Poplar district, for selling beer adulterated to the extent of 63 grains of salt to the gallon. Mr. Charles Young, solicitor, appeared for the prosecution on behalf of the Board; Mr. Besley, barrister, for the defendant.

William Harrison, one of the inspectors of nuisances to the Board, said that on Thursday, the 29th ult., he went to the Wellington beerhouse, St. Leonard's Road, Bromley, kept by the defendant, and asked his wife, who was serving behind the bar, for a pint and a half of porter. He was served, and then told the wife that he had purchased it to have it analysed. He also applied for a pint of fourpenny ale, but was told it was thick. A few minutes afterwards the defendant entered the house and went into the cellar, and shortly afterwards his wife served the witness with the liquor applied for. He divided it into three parts, and did the same with it as he had done with the porter.

Mr. William Young, analyst to the Board, said that on the 29th ult., he received a sample of porter and ale from the last witness to be analysed. The certificate produced was his, and he there stated it was adulterated to the extent of 63 grains of salt per gallon. In cross-examination by Mr. Besley, the witness said he had never made any beer, but had seen it made. He did not know how much salt there might be in hops. He was not aware of the natural quantity of salt in Burton water. He found that a pot of Truman and Hanbury's strong ale contained 16 grains of salt.

Mr. Charles Heisch, consulting chemist to the Corporation of London, said he found 66 grains of salt to the gallon in the porter, and 70 in the ale. He did not say its presence would be injurious to health. He could not tell the quantity of common salt or the amount of hops used in a gallon of beer.

Laurence Burleigh, head brewer at Truman and Hanbury's, Spitalfields, said he had been in their service over 30 years, and had sole charge of the brewery department. All articles used in the brewery department would come under his personal cognizance. Salt was not bought or used in any shape or form. Saccharine matter was imported, and the duty paid to the Excise. Breweries were always open to inspection. Ale contained hops, saccharine matter, and water. He found some ale of the same brewing as that which had been sold to the defendant. That brewing he superintended. There was no salt put into it, and he did not dare to use bad water. Saccharine matter was not used in ale to the extent it was in porter. No salt whatever came on the premises for brewing purposes. In reply to Mr. Young, the witness said the firm used Hartley's deep-well water and the East London water. He had heard that, on some water they had used being analysed, three and a half grains of salt to the gallon had been detected. In answer to the magistrate the witness said he had heard country brewers used salt to some extent, but London brewers did not. If it were used to a large extent, it would spoil the beer. The quantity of malt they used was rather more than one half, the other half was saccharine matter.

Mr. Dugald Campbell, an analyst, said he was well acquainted with the ingredients used in brewing beers, and he was surprised at not more than 63 grains of salt being found in the samples referred to. The salt was attributable to the hops, malt, and saccharine matter. Dr. Henry C. Bartlett gave similar evidence.

John Scott, the defendant, was then sworn, and said he did not put a particle of salt in the beer.

Mr. De Rutzen said that before he decided the case he wished to see the invoice delivered with the beer to the defendant. He adjourned the case for two weeks.—*Times*.

At the adjourned hearing on the 31st December, Mr. Young submitted that the sale came within the meaning of the Act, and that there was no warranty delivered with the articles, but simply an invoice such as could not be sued upon at common law. The magistrate remarked that there must be a written warranty.

Mr. Young said that according to the Act the warranty must state that the goods delivered were of "the nature, quality, and substance" demanded by the purchaser, but what was sent with the goods in this case was a mere invoice, and not a warranty to prove that the goods were unadulterated.

Dr. Auguste Dupré, examined by Mr. Young, said he was Lecturer on Chemistry at Westminster Hospital, Fellow of the Royal Society, President of the Society of Public Analysts, and Chemical Referee to the Medical Department of the Local Government Board. He had analysed beer, porter, and ale, and had an opportunity of seeing hundreds of different analyses made, with the special object of estimating the amount of salt contained in them. He should say that 63 grains of salt in a gallon of beer or porter was an excessive amount, such as could not possibly be derived from the malt, hops, and water employed. In a gallon of beer or porter the quantity of salt would be from 5 to 15 grains, and no more. Burton strong ale contains from 16 to 18 grains.

Cross-examined, the witness said, if anyone swore that there was no salt put into the beer manufactured in the ordinary way, witness would not believe him, if he found 63 grains of salt per gallon in it. He should think the other person had made a mistake. When the law prohibited the use of salt in beer, the Excise Department (under his recommendation) would not allow proceedings to be taken for anything under 50 grains. After some further evidence had been given for the defendant, Dr. Bartlett being re-called,

Mr. De Rutzen said:—One thing in this case is quite clear, and that is that the defendant did not adulterate this beer after he received it from the brewers. That is proved from what he himself said in the witness-box, and it is corroborated by Messrs. Truman & Hanbury, who bring forward their own scientific witnesses to say that the beer had not been adulterated by the defendant, for they not only agree with the public analyst as regards the quantity of salt he gives as the result of his analyses, but they go further and say that if he had been a little more careful he would have found it contained a still greater proportion of salt than he did. That is how the matter stands with respect to the defendant. Now, then, comes this invoice, which is put in by Mr. Besley as a warranty. I confess I have some difficulty in saying that this is a warranty; but, as it seems to me, it is quite sufficient of itself to lead the beer-seller who buys this beer to believe that, when he orders single X, double X, treble X, stout, or whatever it may be, and sells it to his customers in exactly the same state as he receives it, he is committing no offence. I have listened throughout this case to hear what exactly is the nature, quality, and substance of beer, as a general rule. I have heard over and over again that it is made from malt, hops, saccharine matter, and water, and I must say I have never heard such an amount of contradictory evidence as that which has been given in this case as to the quantity of salt that should be found in beer made from these articles. Taking the whole of the facts into consideration, I think I must dismiss this summons. Whether salt has or has not been introduced into this beer over and above what may be considered the natural quantity, I am not called upon to determine. I shall hold that this invoice is a sufficient warranty under the circumstances, and that the beer having been sold with this warranty, the defendant is absolved under section 25 of the Act, and therefore the summons must be dismissed. The only other question which remains for me is whether the prosecutor is not entitled to his costs. I shall certainly have to allow them if the defendant relies upon the warranty, unless he has given the prosecution notice of such intention. After some discussion the summons was dismissed, and ten guineas were allowed for the prosecutor's costs.

**ADULTERATION OF SEEDS.**—Thomas Strangeways, Seed Merchant in Mile End, was summoned before the Lord Mayor for an infringement of the Adulteration of Seeds Act, 1869, in having, with intent to defraud, sold killed seeds, or seeds in which the vitality or germinating power had been destroyed by artificial means. Mr. Besley, barrister, conducted the prosecution; Mr. Walter Beard, solicitor, appeared for the defence. Mr. Besley, in opening the case, said this was a very important matter, as it was the first instance in which the Act of Parliament had been put in operation. The Act recited that to "kill" seeds meant to destroy their vitality; and that every person, with intent to defraud, who sold killed seeds, would be duly punished. By the Act, killing or dyeing seeds was prohibited, as was also the sale of such seeds, and for the first offence the penalty imposed was not to exceed £5, and for the second or any subsequent offence £50 or under. The proceedings under the Act must be taken within twenty-one days. The defendant was well known as a practitioner in this kind of business, and had been heard to say that he could snap his fingers at the Act of Parliament. The killing of seed was done by steaming, and then drying on the kiln. The case was brought at the instance of the same gentlemen who promoted the Act of Parliament, and it was most desirable that such nefarious practices should be repressed. Mr. A. Francis said that on October 22nd, he saw W. Chapman, who produced a sample bag containing killed charlock seed. It bore marks in defendant's handwriting. He offered seven sacks at 6s. 6d. per bushel. He (witness) took away a small quantity. Eventually he agreed to take the seven sacks. Afterwards he saw Strangeways, who produced an invoice, but there was no name on it. Defendant said the seeds would not grow—not a seed of it; if it did he said he would put it on the kiln again for nothing. He further added

that in consequence of the law he could not put anything into writing. He gave up the sample bag produced by Chapman. He also produced a sample bag of 6¼qrs. of the same kind of seed—another lot. He said he had killed this for a party in the country, who had refused to accept delivery because bulk was not equal to sample. He did not want to fall out with the party, who was a good customer, and he wanted to sell it to some one else. The seed would do well for "mixing" purposes. Witness made another appointment about the matter, which he broke. Afterwards he paid defendant £9 10s. in gold for the seed bought. Mr. J. C. Ostler, of Walthamstow, proved having taken a sample of the seed in question to Mr. Sharpe. Mr. C. Sharpe, Seed Merchant, of Sleaford, said with Mr. Burnell he was one of the promoters of the Act of Parliament. Charlock seed was worth from 3s. 6d. to 4s. a bushel. Its *bona fide* use was to crush it for oil, and for the purposes of manure. When charlock was killed it was not fit for crushing. It had no commercial or agricultural purpose when it was killed. Killed seed had no value whatever, and was only sold for mixing with seed of a higher value. If the seed were not killed it would grow and betray the fraud. He had proved that in this case the seeds were killed. Mr. Beard said Mr. Besley need not call further evidence. He could not deny that defendant had sold the seed. With regard to intent to defraud, he urged that Francis was not defrauded, inasmuch as he knew the seed was killed, and did not intend to sell it again; fraud would not therefore be perpetrated on anyone else. The Lord Mayor: In my mind the case is fully made out. I inflict the full penalty. It is a very serious matter. We pray for a good harvest, and such men prevent us from having it. I shall allow £5 5s. costs. The penalty in all was £5 for the offence of killing the seed, £5 for selling the killed seed, and £5 5s. costs.

At HAMMERSMITH, Robert Edwards, dairyman, of the Mall, Kensington, appeared to answer an adjourned summons, at the instance of the Kensington Vestry, for selling milk adulterated with water. There was another summons taken out against Mary Sheen, of St. Clement's Road, Notting Hill. Both had been adjourned in order that analyses of the samples might be made at Somerset House, the defendants being dissatisfied with the certificates of the Vestry's Analyst. Mr. Harding, clerk of the Vestry, supported the summonses; Mr. Ricketts appeared for the defendant Edwards. The certificate of Mr. Cleaver, the Vestry's Analyst, stated that the sample of milk in the case of Edwards contained 8 per cent. of added water. The certificates of the analysts at Somerset House stated that the milk contained not less than 4 per cent. of added water. In the other case the certificate of Mr. Cleaver stated that the milk contained 15 per cent. of added water, but the one sent from Somerset House certified that the adulteration was 7 per cent. only. Mr. Harding said the difference arose in consequence of the analysts at Somerset House taking a lower standard for solids than that of the analysts of the metropolis. Mr. Bridge remarked that the difficulty which he saw was owing to the words in the Somerset House certificate, which stated that the fat was equal to that found in milk of good quality. Looking at the opinion of the analysts a jury might say there was not any added water. Mr. Hardy said it was an important question for the public. If the standard were allowed to pass, all the dairymen in the metropolis would adulterate their milk up to a certain amount. The analysts at Somerset House took the standard of milk from a poor cow. Mr. Bridge agreed that mixing water with milk was a serious matter, but the question he had to consider was, whether water had been added to the milk. He adjourned the summons to consider his decision.—*Times*.

At Greenwich police court, a grocer was charged with selling butter adulterated with 66 per cent. of foreign fats. The defendant was represented by Mr. Carttar, solicitor, who, without objecting to the statement of the analysis itself, raised a technical objection, that the certificate was insufficient, inasmuch as it did not state the weight of the sample when received by the analyst. After some argument the case was adjourned for the attendance of the analyst. On the adjourned hearing, after the analyst had given his evidence, and a long argument on the part of Mr. Carttar, the magistrate, Mr. Slade, decided that it was necessary to insert the weight of the sample in the certificate, and in this case, as it was the first decision on the point, he allowed the amendment to be made in Court, and convicted the defendant, who was fined 10s. and costs.

A DISPUTED ANALYSIS.—At the Bromsgrove Police Court, before Sir Richard Harington and Mr. Robert Smallwood, Thomas Fisher, of Worcester Street, was summoned on a charge of adulterating milk. Mr. Buller, of Birmingham, represented the defendant.—Superintendent Tyler proved that he purchased a pint of new milk from defendant, divided and sealed it, gave one part to the defendant, and sent another part to the County Analyst. Dr. Swete, County Analyst, was examined, and produced a certificate of his analysis, which showed that the milk contained—total solids, 12.98; fat, 1.76; ash, .70. *This gave a total of solids not fat, 11.22.* He considered that new milk ought to contain more than 3 per cent. of fat, and no cow in health could give as small an amount as found in the sample. Mr. Buller, for the defence, submitted that the summons was taken out under the wrong section of the Act of Parliament, and argued that the milk was not sold "to the prejudice of the purchaser." It should have been taken out under the 9th section, which provided against the abstraction from the article sold, or any part of it. With respect to the analysis, he considered it imperfect, and hardly reliable. It was important to consider what time the milk was taken from the cow, as it had been stated that constant dipping in the can caused a diminution of one-third of the cream when the vessel was half empty. He contended that the milk was sold exactly as it was taken from the cow.

The defendant was called, and proved that he milked the cows himself, and the milk had not been out of his sight when he sold complainant the sample produced. Dr. Alfred Bostock Hill, analyst for the county of Warwick, was examined, and stated that he had analysed the sample of milk sent to him by defendant, and found it contained 9.22 solids not fat, 3.47 fat, and .69 ash. Total solids, 12.69. He agreed as nearly as possible with Dr. Swete as to the quantity of solids. If the sample had been sent to him in his official capacity he should have pronounced it a perfectly genuine milk. In cross-examination he admitted that the sample was badly sealed, although the seal had not been tampered with, and it was impressed similar to the other samples. The Bench thought it possible the contents might have been tampered with by an interested person, and taking into consideration the discrepancies in the opinions of the analysts, they thought the best course was to send the remaining sample, under the care of Col. Carmichael, to Somerset House, for analysis by the Government authorities. The case was adjourned until the 13th February.—*Birmingham Daily Gazette.*

**ALLEGED MILK ADULTERATION.**—At the Stonehouse Police Court recently, John Luscombe, dairyman, Martin Street, Plymouth, was summoned before Major Trist and Mr. W. E. Matthews, on a charge of selling adulterated milk. Captain Brutton, Superintendent of Police, stated that on the 19th inst he saw the defendant with a horse and cart in Union Street, Stonehouse, and purchased a pint and a half of raw milk of him for 3d. He put the milk into three bottles, gave the defendant one, kept one himself, and sent the third to the county analyst, Mr Wynter Blyth, who certified that 10 per cent. of water had been added, and a small quantity of cream abstracted. The analyst observed that in each hundred parts there were—water, 89.10; caseine, &c., 8.19; ash, .62; milk fat, 2.09; total solids, 10.9; solids not fat, 8.81. The defendant said that the milk was perfectly pure. Some cows that he had yielded twenty quarts of milk a day, and others did not yield above five quarts a day. The milk of the latter was not so good as that of the former. He added that he was not satisfied with the certificate of the analyst, and wished the milk to be sent to Somerset House to be analysed. The Bench adjourned the case until January 11th, in order that the milk might be sent to Somerset House. On January 11th the case again came on. Mr. R. G. Edmonds appeared for the defendant. Captain Brutton said that the Somerset House analysts—Messrs. J. Bell, R. Bannister, and G. Helm, had reported that in each hundred parts of the sample there were:—solids not fat, 7.84; fat, 3.38; water, 88.78; and ash, 0.68. They also added that the amount of fat was fully equal to the average found in genuine milk of good quality. After making allowance for natural losses arising from the decomposition through keeping, the amount of solids not fat was lower than was found in genuine milk of low quality. From the consideration of these results they were of opinion that the milk could not be pronounced deficient in cream, but that it contained not less than 5 per cent. of added water. Mr. Edmonds, on behalf of the defendant, contended that as there were such discrepancies between the report of Mr. Wynter Blyth and the report of the Somerset House analysts, his client was entitled to an acquittal. The Bench said that as there were such discrepancies between the two reports of the analysts, they had decided not to convict the defendant.

John Taverner, dairyman, King Street, Plymouth, was summoned for refusing to supply Capt. Brutton with milk. Capt. Brutton stated that on the 19th ult., he saw the defendant with his cart in East Street, and told him that he required some milk. The defendant replied that he had none for sale, and commenced to drive off. Witness told him that he was bound to supply him with some, as he was the inspector, and the defendant again replied that he had none, and drove away. He was prepared to prove that the defendant, after leaving East Street, went into a shop and offered some milk for sale. Mr. Square, who appeared on behalf of the defendant, remarked that the section under which the defendant was summoned was to the effect that if any officer, inspector, or constable should apply to purchase any article of food, or any drug, exposed for sale by retail, he should tender the price for the quantity he required. This Captain Brutton did not do, and consequently the case must fall through. The Bench dismissed the summons.—*Western Morning News.*

**THE GASLIGHT AND COKE COMPANY (Limited)**, Horseferry Road, Westminster, was summoned before Mr. Bushby for having, on the 11th ult., supplied gas of a less illuminating power than allowed by the Act of Parliament. Mr. Fry appeared on behalf of the Metropolitan Board of Works, the complainants; Mr. Bedford for the company. Mr Fry stated that on the 11th ult. the gas examiner at the Shoreditch station found that the gas delivered to the public from that station was only of the illuminating power of 14 candles 7-10ths, the *minimum* allowed by the Act being 16 candles, rather more than one candle deficient. The penalty for this default, computed in accordance with the words of the 50th section, amounted to £74, and the proceedings were taken to obtain a warrant for the recovery of that amount. Mr. Bedford, though not complaining of the act of the Board of Works as guardians of the public rights, said that, on behalf of the company, he wished it to be known that so far from this being at all usual there had been no complaints before. He produced certificates of the gas examiners for all the months of 1877, showing that the average illuminating power of the gas supplied during the year was 17.61, or more than a candle and a half in excess of that required. Mr. Bushby said his duty was merely executory, and the warrant for the payment of the £74 would issue.—*Times.*

## ANALYSTS' REPORTS.

THE report of Mr. J. Carter Bell, analyst for Salford, was submitted to a Meeting of the Town Council. It showed that during the past quarter he had examined 127 samples; of these forty six were adulterated, viz., eight of bread, one of flour, nine of milk, three of tea, four of whisky, nine of gin, four of port, four of sherry, and four of claret. In twelve of these cases summonses were taken out, and convictions obtained.

At Somerset Quarter Sessions, Mr. W. W. Stoddart, county analyst, reported that during the last quarter he had analysed 249 samples, of which 211 were good commercial articles; three were received from the public, and 246 from police superintendents. The Chairman announced that the appointment of Mr. Stoddart, which was for two years, had expired. A discussion took place relative to his re-appointment. In answer to the chairman the chief constable stated that analyses in the county were considerably on the decrease, and the duties of the analyst were not so heavy. Ultimately Mr. Stoddart was re-appointed for a year.

Dr. Brown, analyst for Liverpool, at a meeting of the Water Committee of the Town Council on Tuesday, reported that, by an increased supply of Rivington water to the Kensington district, a larger proportion of soft water was given to that district, and this affected a decrease in the waste of soap, which amounted, on a very low estimate, to at least £3,000 per annum for every 100,000 inhabitants.

LABORATORY VINTAGE.—The chemists of Berlin have been occupied lately in analysing the wares of the wine merchants, and no little excitement has been caused by the discovery that the entire stock of one of the largest houses dealing in wines for medicinal purposes consisted entirely of artificially prepared mixtures of spirit and sugar solutions, flavoured with various herbs.—*Brewers' Guardian*.

PERUVIAN WINE.—A writer in the *Northampton Mercury* says: "I have discovered why English travellers dislike Peruvian wine. In Mr. William Clarke's work on 'Peru and its Creditors,' to be published next week, I read that in that country the grapes are placed in a circular walled enclosure, into which numbers of oxen are admitted and kept in motion by men armed with whips. I am not surprised that many Englishmen become tectotallers during their stay in the rainless clime."

## CORRESPONDENCE.

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

TO THE EDITOR OF "THE ANALYST."

SIR,—Will you allow me to point out that Mr. Young's process for the determination of sulphuric acid in vinegar (*ANALYST*, No. 20) is identical with that described three years ago by Mr. Thresh? (*Pharma. Journ.*, 1875.)

I remain, yours faithfully,

OTTO HEHNER, F.C.S.

TO THE EDITOR OF "THE ANALYST."

SIR,—With reference to Mr. Angell's letter in your last issue, permit me to say that in my process for estimating sulphuric acid in vinegar there is an excess of chloride of barium in a neutral solution before estimating the total chloride, and also in estimating the chlorides after ignition, so that it is impossible for alkaline phosphates to be present. Mr. Angell will thus see he has found a mare's nest.

With regard to Mr. Hehner's process, I did not hear of it until after my paper was read, and on looking for *THE ANALYST* for August, 1876, I found it in its postal wrapper; it had been delivered at a time when I was away from home on my holidays, was mislaid, and so escaped my notice. The process no doubt answers its purpose admirably as a quantitative method, but the qualitative test is insufficient, as on account of the frequent presence of sulphate of lime in vinegar, many samples which are free from uncombined mineral acids, give a neutral ash, and in such cases it would be necessary to go on with the quantitative process. With regard to the relative value of the two processes, I think most chemists would prefer making two volumetric estimations of chloride to one of alkali, certainly no more time is required. In Mr. Hehner's process it seems you must guess the quantity of mineral acids present before proceeding, and if you should be below the proper amount it is necessary to repeat the experiment until an alkaline ash is obtained, whereas in my process no repetition is needed.

On reading Mr. Hehner's paper my attention was directed to a method devised by Mr. J. C. Thresh, published in the *Pharmaceutical Journal* for 3rd July, 1875, in which I find he has anticipated me, Mr. Thresh's process is shortly as follows:—After ascertaining the amount of chlorides present, a known quantity of a standard solution of chloride of barium is added to the vinegar, the whole evaporated to dryness, burnt, the ash washed out with water, boiled with a slight excess of bicarbonate of soda, filtered, and the chlorides estimated volumetrically in the filtrate; the loss of Cl being calculated as  $H_2SO_4$ .

It will be seen that the principle of the process is identical with mine, but differs in detail, and I may state that the use of a standard solution of chloride of barium is unnecessary, and that more accurate results are obtained by applying the standard solution of nitrate of silver to the ash in the presence of the insoluble matter, and as little water as is necessary to wash the contents of the crucible into a beaker.

I know by repeated experiment that unburnt carbon and sulphate of barium, which has been heated with chloride, will retain considerable quantities of chlorides even after what would be considered excessive washing.

Plaistow, E.,

11th January, 1878.

I am, Sir, yours etc.,

W. C. YOUNG.

Mr. Wynter Blyth, of Barnstaple, reported a sample of milk to be adulterated with water, and on the hearing of the case, a report of which appears on another page, the duplicate sample was referred to the chemists at Somerset House. Mr. Blyth wrote to them, enclosing copies of his duplicate analysis of his portion of the sample in question and requested them to supply him with a copy of their results. The following is a copy of the reply sent to him; it seems to us of sufficient importance to publish it, as showing the views which the Inland Revenue Chemists take with reference to milk standards:—

Laboratory, Somerset House, London, W. C.,  
January 3rd, 1878.

DEAR SIR,—I duly received your letter of the 28th ult., and you may rest assured that we will do our utmost to arrive at a just conclusion on the Stonehouse appeal.

We operate with weighed quantities, and all our results are determined by weight. We duplicate the experiments, and we are not satisfied if the results differ by more than a tenth of a grain.

The position which we occupy being entirely a neutral one, you will no doubt agree that we could not supply either side with our results, the Magistrates being the only persons with whom we have to deal.

I have seen Mr. Carter Bell's paper on milk, and the result of our experience differs materially from his. If you should be in town and call, I shall be happy to show you the results of the analyses of upwards of 300 samples obtained from various parts of the country. The cows were milked in the presence of an assistant from this laboratory, and we can vouch for the genuineness of the samples.

I am, yours faithfully,

Dr. Blyth.

J. BELL.

Mr. J. West Knights has been appointed Public Analyst for Cambridge, Cambridge-shire, Huntingdonshire, and the Isle of Ely, in the place of Professor Apjohn, deceased.

Mr. James M. Milne, Public Analyst for Kinning Park and Dunfermline, has been appointed Public Analyst for Fifeshire.

Mr. A. Wynter Blyth, Public Analyst for the County of Devon, has been appointed Public Analyst for the Borough of Totnes, on terms similar to those of the county.

Mr. J. Walker Montgomery has been appointed Public Analyst for the County of Cumberland.

The *Grocer* says that last week, for the fourth time, the Town Council of Dover received a letter from the Local Government Board, urging them to appoint a Public Analyst. The Council ordered the receipt of the letter to be acknowledged, but took no action in the matter.

**PUBLIC ANALYST.**—The Town Council of Faversham have had under consideration a letter from the Local Government Board, calling their attention to the fact that they had not appointed a public analyst for the borough, under section 10 of the Sale of Food and Drugs' Act, and that it was desirable to give effect to the intentions of the Legislature. It was proposed and seconded by Councillors Wyles and Fagg, two grocers, that an analyst should not be appointed. Alderman Johnson pointed out that town councils which evaded Acts of Parliament lost weight and influence, and that the Council would probably be compelled to appoint an analyst if they did not do so voluntarily. Nevertheless, the resolution referred to was carried by seven votes against two.—*Times*.



## NOTES OF THE MONTH.

Since the replies given by our Society to Dr. Rottenburgh, on behalf of the German Government, were published in this journal, our amusing friend the *Chemist and Druggist*, has printed a series of replies to the same queries on behalf, as it says, of the victims. Unfortunately we have not space to reproduce them in all their unique entirety; but it is exceedingly flattering to our vanity, as a body of men, that we should have been able to actually produce six answers out of twenty-seven which even the great torpedo of Cannon Street cannot find heart to blow us up about.

---

The champion of the "victims" does not, however, stop at this negative praise, but it actually says, referring to answer 27, "We thank the Analysts for this reply, especially the last clause of it. We have only to add that an analyst should also possess so much modesty as should enable him to recognize, first, that the science of chemistry is not personified in perfection in his individuality; and, secondly, that he is simply the analyst, and not, in addition, the prosecutor and the judge." Why this is exactly what we have been all along trying to get our friend's grand intellect to grasp. The analyst is not the prosecutor, and consequently not responsible for the action taken by others. Where, then, is the ground for all the diatribes we have read charging analysts as being alone responsible, and entirely to blame for the failure of prosecutions.

---

To the question as to publication of offender's names (to which our Society answered, "Yes, at the discretion of the court") the victim's friend answers, "Yes, if we can have some guarantee that the court possesses such discretion." What guarantee could ever be had of this, unless we made the judge refer to the *Chemist and Druggist* before ordering publication! Unfortunately for our friend, the Legislature will not go so far, and we hope that he also will possess so much modesty as to be brought to recognize, first, that the whole science of interpreting chemical results, and deciding on disputed standards, "is not personified in perfection in his individuality"; and, secondly, that he is only a trade journalist, and not, in addition, both defendant and judge.

---

In dealing with answer 23, in which our Society recommends the appointment of a body of referees, each possessing some special knowledge of a particular set of substances from having made a study of, and written about them, instead of the present reference to the Inland Revenue chemists, the victim's friend says,—“There is no reason whatever to imply that the Inland Revenue chemists have been in any degree unfit for their duty, *au contraire*.” Doubtless the chemists at Somerset House will fully appreciate the value of this most disinterested compliment, and when we consider the little bit of French thrown in, why they must feel flattered indeed.

---

On the same principle that the great king of old kept a disagreeable party, who continually reminded him that he was mortal and must soon die, we print the following extract from a paper representing the greatest of the victims, to wit, the public, who buy grease for butter, water for milk, and take daily doses of copper in their pickles and peas, lest the court of reference should begin to fancy themselves immortal.

“The Government analysts at Somerset House—apparently an utterly irresponsible body—have paralysed the action of the public analysts by declaring that as much as 68 grains of salt in ale was legitimate, and that milk might yield only an absurdly low

quantity of solids, and yet not be adulterated. The result will be that standards must be fixed by Act of Parliament, and nobody is more competent to say what they should be than the Society of Public Analysts."—*Echo*.

Mr. Cleaver has been more successful than most analysts in reference to cases of milk adulteration, where the amount of added water is small, for the Somerset House chemists only differ from his results by a very small percentage. It would be interesting to know what Mr. Cleaver's figures were, and what standard of milk adulteration he adopted. We will gladly publish any communication from him on this subject.

We are afraid our worthy President was somewhat too sanguine in his remarks at the anniversary meeting, as to the cessation of personal attacks on analysts, and if anyone thinks that the day for such attacks has gone by, they will be speedily undeceived if they turn to the last number of the *Country Brewers' Gazette*, where, among other things, it is seriously stated that no public analyst is competent to undertake the analysis of beer, in order to determine whether it contains salt, unless he also possesses knowledge of the actual process of brewing beer—in other words, he must serve his apprenticeship as a brewer, and then turn public analyst!

The next meeting of the Society of Public Analysts will take place at Burlington House, Piccadilly, on Wednesday, the 20th February, at 8 o'clock, when Dr. H. W. Hake will be ballotted for, and Mr. H. P. Harris will be proposed, as members; and amongst other papers Mr. Wynter Blyth will read one "On the Fatty metamorphosis of caseine in Milk and Cheese."

#### RECENT CHEMICAL PATENTS.

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

1876. No.	Name of Patentee.	Title of Patent.	Price.
2085	A. Budenberg and F. Hurter ...	Pressure Vacuum and Speed Gauges ...	8d.
2090	C. H. Gill ...	Apparatus for Moulding and Pressing Sugar ...	10d.
2094	A. M. Clark ...	Electric Light Apparatus ...	8d.
2105	T. & T. B. Redwood ...	Manufacture of Gas ...	4d.
2106	J. H. W. Biggs ...	Apparatus for Manufacturing Salt and Carbonate of Soda	—
2147	F. Delori ...	Measuring, Controlling, and Registering Juices of Beet Root, Alcohol, &c. ...	6d.
2182	J. M. Granville ...	Thermometers and Spirometers ...	4d.
2183	M. K. G. Lieber ...	Manufacture of Soda and Potash ...	2d.
2249	M. H. Strong ...	Manufacture of Gas ...	6d.
2250	B. & W. Foster ...	Extracting Tannin Matter from Old Scrap, or Waste Leather ...	4d.
2257	A. C. Collineau & M. E. Savigny ...	Process of Greening Preserved Vegetables ...	4d.
2327	W. Black and D. Hill ..	Manufacture of Sulphates of Soda and Potash ...	6d.
2362	R. W. Wallis and C. F. Claus ...	Purification of Gas, &c. ...	4d.
2645	J. C. Mewburn ...	Pressing and Filtering Beet Root Juice, &c. ...	6d.
2839	P. Jablochhoff ...	Distributing and Increasing with Atmospheric Electricity Currents from a Single Source of Electricity for supplying Several Lighting Centres ...	4d.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette.

# THE ANALYST.

## THE SOCIETY OF PUBLIC ANALYSTS AND THE SOMERSET HOUSE ANALYSTS.

OUR readers will see by the correspondence published on another page that Mr. Bell, the principal of the Inland Revenue Laboratory, has declined to comply with the request of the Society to favour them with a paper on the standards adopted in that Laboratory for the analysis of milk and butter. This seems to us a decision to be greatly regretted, because, if we mistake not, as is pointed out by a correspondent in a letter we publish, Mr. Bell did once give a lecture on the Adulteration of Food before the Chemical Society not many years since. At that time less interest would probably have been taken in the particular standards or methods which may be adopted in disputed cases than is shown now, because adulteration was so prevalent then that a mere question of a few per cent. more or less was of little moment, but now that the methods for detecting adulteration have been so simplified, and the processes so much improved, it is, we think, a matter for great regret that public analysts should not be put into possession of the information which Mr. Bell's own latest report (which we have thought it right to reprint in this number) states that they have found of such great value in dealing with disputed cases of adulteration. As, however, the matter is still under the consideration of the Council of the Society, we will make no further remarks on the subject at present.

---

### SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING was held on 20th February last, at Burlington House, Piccadilly, the President, Dr. Dupré, F.R.S., in the chair.

The minutes of the previous meeting were read and confirmed.

Messrs. Williams and Broadbent were appointed scrutineers to examine the voting papers, and they reported that Dr. H. W. Hake was unanimously elected a Member.

Mr. H. P. Harris, F.C.S., Rotherham, Dr. S. T. Rowe, Redruth, Mr. J. West-Knight, Cambridge, and Dr. H. Goode, Derby, were proposed for election, and will be balloted for at the next meeting.

The accounts, as audited, were presented, and ordered to be printed.

The letter which had been sent by the Secretaries to Mr. Bell at Somerset House, and the correspondence which had subsequently taken place (all of which will be found on another page) were read, and Mr. Wigner reported that the matter had been considered by the Council, who had decided to take such a course, which he mentioned, as they considered best under the circumstances.

Dr. Muter read a paper "On an Adulteration of Milk which cannot be detected by the ordinary process of Analysis."\*

Mr. Wigner read a paper "On the mode of statement of the results of Water Analysis, and the formation of a numerical scale for the valuation of the impurities in Drinking Waters."

Mr. Hehner read a paper "On experiments on the chemical action of Chlorate of Potash on the system."\*

A paper by Mr. Wynter Blyth "On the Fatty Metamorphosis of the Albuminoids of Milk and Cheese" was also read.\*

---

The next Meeting of the Society of Public Analysts will take place at Burlington House, on the 20th March, at 8 o'clock, when amongst other papers to be read is one by Mr. Wynter Blyth, "On the Amendment of the Sale of Food and Drugs' Act."

---

\* In consequence of the great pressure on our space this month we are obliged to postpone the publication of these papers till our next number. We especially regret this in the case of Mr. Blyth's paper, which shows that the analysis of stale samples of milk may give results even more illusory than any that have hitherto been suspected.—EDITORS ANALYST.

ON THE MODE OF STATEMENT OF THE RESULTS OF WATER ANALYSIS  
AND THE FORMATION OF A NUMERICAL SCALE FOR THE VALUATION  
OF THE IMPURITIES IN DRINKING WATERS.

By G. W. WIGNER, F.C.S.,

*Read before the Society of Public Analysts, at Burlington House, on February 20th, 1878.*

A GREAT deal has been written about the analysis of drinking water, but in my opinion, the ground is by no means entirely covered, and although I am prepared to expect a difference of opinion on some of the points I am about to bring forward, I think it will be admitted that most of them are to some extent at least new. Samples of drinking water come into the hands of analysts, probably in larger numbers than samples of any other article used for food or drink, and yet we find, that while, as regards a sample of milk, or oil cake, or bread, the statement of the results obtained is made by most analysts in a somewhat uniform style, when we come to water, scarcely two analysts will be found who will express the results obtained from the analysis of a given sample, or the deductions from those results in the same way.

One of the earliest attempts to which I need refer at systematizing the methods of water analysis was made in 1865 by Dr. Miller, the then President of the Chemical Society, but his paper went very little further than carefully detailing the systems and the processes to be adopted for the determination of the various constituents which were then usually determined in the process of a full water analysis, and although Dr. Miller unquestionably did good service in some ways by his paper, he was also probably the first to lay the foundation of the objectionable system which has since sprung up of reporting the results of water analyses in foreign instead of English measures. It may be that through his position as one of the Royal Commissioners of weights and measures, Dr. Miller became more deeply imbued with the *supposed* advantages of the foreign metrical system over the English system, but, at any rate, although he did not go so far as to advise that the reports of water analyses should be made entirely in foreign measure, he did advise what it is pretty certain no analyst would ever think of carrying out, viz. :— that duplicate reports should be sent in, one in English weights and measures and the other in the foreign system,—thus duplicating the work of writing the report and turning the analyst into a feeble parody of a popular teacher.

Dr. Miller's suggestions bore their full weight however, and consequently we find that he was followed not long after, first by Frankland and Armstrong, and then by Wanklyn, Chapman, and Smith, who were the next workers in the field of water analysis, and who both adopted, one fully, and the other, in part, the metrical system. On this point my opinion is very strongly in favour of the adoption of the English weights and measures only. Water analyses are ordinarily made not for the information of analysts or scientists, but for the guidance of the public, and especially for those members of the public who have in their official capacity to arrange for the water supply of the people. To any of these persons who are of ordinary average intelligence, a gallon is a quantity of which they have to some considerable extent a fairly accurate conception, and I think, that to the majority of them, a drop and a grain would be viewed as very nearly synonymous terms. They have therefore a true mental conception of what are the units of volume and weight, in which the results of the analyses are expressed, and are therefore able to form some idea on their own account of what degree of impurity is indicated by a certain given figure, say for instance, 5 grains of salt per gallon.

On the other hand I have never yet met with an Englishman of ordinary average intelligence who, unless he had given some special attention to the study of science, could form the remotest idea of the quantity or weight represented by a litre or a milligram. I will go still further, and say that, as regards the unfortunate notation of parts per million, it has not yet fallen to my lot to meet with any Englishman (myself not excepted) who could form a fair mental conception of what a million really is. I am aware that it will be urged against my arguments that the reports of analysts are made to stand as permanent records for the guidance of future analysts, but to that I reply that, should the metrical system be so far advanced in the 20th century as to be generally adopted, trained analysts will then be as readily able to translate the grains per gallon of the 19th century into the milligram per litre, or parts per million, or whatever other denomination may by that time have been invented, as we are to-day able to translate Frankland's or Wanklyn's statements into grains per gallon.

If the advocates of the metrical system of weights and measures should so far succeed as ultimately to get that system adopted in this country, then by all means let analyses be reported according to it, but until it is so adopted—not merely, as at present, optionally (which option is never exercised), but as a matter of necessity—I think the report should be made in such a way that a person of ordinary intelligence has a fair opportunity of understanding what the statements mean.

I am also aware that it may be urged by some that the processes of analysis are simplified by the adoption of the metrical system, but I dissent from this. In my own Laboratory I use and recognize no other unit of weight than a grain, and in an analysis of water no other unit of measure, than the decimal parts of a gallon. The grain, as a unit of weight, cannot, at any rate, be simplified, and the measure of 1-10th, 1-100th, or 1-1000th of a gallon is not worthy to be called a complication. I therefore express my opinion most decidedly in favour of the adoption of the system of grains and gallons only, for reporting the results of water analyses.

Having now referred to the figures which I think should be employed to report the results in, I come to consider what results should be reported, and this naturally resolves itself into the question of whether the Frankland process or the Wanklyn process should be followed, and whether either of these processes should be supplemented by means of other determinations. It is to be noticed that in both cases the latter part of the instructions for carrying out these rival processes, contain full details for sundry other determinations than the organic carbon and nitrogen, and previous sewage contamination, which are the bases of the Frankland process, and the albuminoid ammonia, which is the basis of the Wanklyn process; but it is not by any means clear in what way these supplemental determinations are to be used or considered in appraising the results of the analyses.

Let us see first what are the objections to each of these processes. First, as regards the Frankland process, the personal equation or amount of experimental error involved in working the process is so excessively great that an allowance amounting to more than the degree of impurity present in ordinary drinking water has to be made before the results can be even *supposed* to be correct. No doubt it is extremely easy to make a few blank experiments and to deduct a constant found by these, from the impurities found in the course of a water analysis, but, in my opinion, a constant found in this way is not either identical or fairly comparable with the constant which really

occurs when a water residue is treated—that is the two constants are obtained under different conditions, and therefore are not directly comparable with each other, and as a necessary consequence the deduction made by those who use the Frankland process is only by accident an accurate one. If my view on this point is right it is clear that all attempt to rely upon the determination of organic carbon and nitrogen as an indication of present sewage contamination, even when the process is carried out by a skilful manipulator, must be useless; but we have, in addition, to bear in mind that the manipulation involved in the process is so difficult and tedious that, although the process has been before the public for ten years, viz., since 1868, it would hardly be possible to find ten analysts in the United Kingdom who regularly use it.

I pass now to the Wanklyn process—this certainly possesses the advantage of extreme simplicity, and with the slightest care in manipulation, it is also accurate, *i.e.*, it gives uniform results from the same samples provided it is analyzed while moderately fresh. There are, however, one or two defects in the determination of albuminoid ammonia which are not always sufficiently considered, among these is that urea—which, if not the most dangerous, will be admitted to be one of the most significant indicators of impurity—is not detected by it, and that some of the other nitrogenous compounds, which are quite likely to occur as occasional impurities in drinking water, yield up their nitrogen in the form of albuminoid ammonia in such an irregular proportion that the difficulty of forming a judgment from this one estimation only is considerably increased. So while I still consider that the determination of albuminoid ammonia, according to Wanklyn's process, is the most important and the most valuable determination in the whole analysis, I do not assent to the extreme weight or value (practically excluding all other determinations) which is now placed upon it by its inventors. Wanklyn, in the preface to the fourth edition of his treatise on Water Analysis, says that he is “now prepared to trust to a direct test for the actual presence or absence of organic matter, and can afford to discard indirect and in many instances delusive signs.” Carrying this statement to the extreme, we make a *reductio ad absurdum* of it, for we find that if 20 grains of urea were present in a gallon of water the sample would still be passed as absolutely pure.

I think, therefore, that this determination of albuminoid ammonia, valuable as it is, as indicating present contamination, in the form of a very large number of nitrogenous compounds, must be supplemented by determinations which show also whether there has been previous contamination, or, in other words, what nitrogen in other forms is present. I do not view the estimation of nitrates, to quote Wanklyn's words again, “as a step in the exhaustive mineral analysis of a water residue,” but I view it as essential in the analysis of a water for ordinary potable purposes. This, therefore, raises the whole question of what are the determinations necessary, and here I take what seems to me the plainest and most common-sense view of the matter when I state that the report should specify every determination which has been made in the analysis of the water, and that the opinion given upon the water should be based upon the deductions drawn from *every one* of those determinations. If an opinion is given upon determinations which are not specified in the report itself it is very possible that some analyst at a future time may be misled, as I was not long since by a report which stated that a water only contained 17 grains of total solid matter, and was therefore quite free from organic impurity. If a determination is worth making at all it is

worth writing, and if it is worth writing it certainly ought to be worth consideration of some kind in forming an opinion on the results—if this is not the case time has been wasted in making it. For instance, if it is worth determining the salt, it must be because salt in some proportion or other, may be a deleterious constituent in water, and therefore in deciding what general report should be given upon the water in question due weight (whatever that may be) should be given to the proportion of salt found to be present; and again, if it is worth while to determine hardness, it must be because hardness, in some proportion or other, is injurious, and due weight should be given to this point also.

Therefore I think that, not only should all the figures be stated in the report, but that the statement should be made to assume a uniform style, and that due weight should be given to every figure in the analysis.

In drawing the inferences both Frankland and Wanklyn have, to *some* extent but not fully, adopted this view, for when we look to the original instructions for the Frankland process, or the amended instructions contained in the latest edition of Sutton's volumetric analysis, or when we take the 4th edition of Wanklyn's Treatise on Water Analysis, we find instructions for a considerable number of other determinations, beyond those which are distinctly included in the figures upon which Frankland and Wanklyn respectively base their opinion as to the character of the water. Thus, for instance, Wanklyn is quite prepared to trust to albuminoid ammonia only, yet he gives full instructions for the determinations of salt, hardness, and numerous other constituents, and Frankland bases his opinion of present contamination upon organic nitrogen and carbon only, yet he also gives rules for the determination of salt, hardness and other constituents. Both however are alike, as far as I know at present, in giving absolutely no instructions whatever for what I consider one of the most important points, namely, a microscopical examination. It is clear that Dr. Frankland does not think this unnecessary, because, in his reports on the water supply of the metropolis, we frequently find reference to the living organisms which, by the aid of the microscope, he has found in water, but whether these living organisms are those which may strictly be called microscopic, or whether they belong to that larger class which may be detected by a good pocket lens, I am not able to say.

Having so far pointed out the difference of opinion which I hold from the statements of the inventors of these two processes, I will next point out what I do really consider essential. I think the determination of total solids is essential, because they may be so heavy as to be sufficient to condemn a water, and I certainly have a statement by Wanklyn in favour of this opinion: for he says, "unless the water contains more than 40 grs. of total solids per gallon no exception need be taken to the total solids as such." If these words mean anything at all, they mean that 40 grs. and upwards of total solids are injurious to the character of the water. I carry it further still, and say that I prefer to have a water like that of Loch Katrine rather than that supplied by the Kent Company, and, therefore, I give a certain, and, in my opinion, due weight, to the proportion of total solids per gallon contained in the water. I also think it necessary to determine the volatile matter, or loss on ignition, and here I differ entirely from both Frankland and Wanklyn, although I am in accord with Miller, who says that an error of weighing in this case is one of the most important errors in the whole analysis. Again, I think it necessary to make a determination of the amount of salt, and Miller, Frankland, and Wanklyn, all think so as well, but none of them seem to place any

special value upon the determination when it has been made. The nearest reference to it that I can call to mind now is in the Fourth Edition of Wanklyn's book, p. 15, where he says, "It occasionally happens that the finding of a little or no chlorine in water is a valuable criterion of purity." I would only alter this sentence by substituting "always" for "occasionally." On the next page he says, "When water is found to contain much chlorine, there is reason for suspecting the presence of sewage." I quite agree with this, and therefore I consider it essential to give a distinct value to every unit of chlorine in the form of chlorides which the water contains. I think, too, the hardness should be determined, because independently of the mere waste of soap which is incurred by the use of hard water, those who have (as I unfortunately have) daily experience in the use of an objectionably hard water, are well aware of the unpleasant sensations produced in washing with it, and of the great difficulty of making tea or coffee, or similar infusions of an equally palatable quality to those which can be obtained from a soft water. The free ammonia should also be determined, and in this respect I agree with both Frankland and Wanklyn; but, unfortunately, the latter's statement in reference to it appears in such an obscure manner on p. 40 of his Fourth Edition, that it would be frequently overlooked, although, as I think, it is one of the most important statements in the book. He says, "when the free ammonia exceeds .08 parts per million, it almost invariably proceeds from the formation of urea into carbonate of ammonia, and is a sign that the water in question consists of diluted urine in a very recent condition." I can scarcely think of any words to condemn a water more strongly than those I have quoted. "*Diluted urine in a very recent condition*" must be one of the very worst waters which can possibly be used for drinking purposes. Therefore I have Wanklyn's authority to confirm me in putting a certain definite value upon the free ammonia present. I also determine the nitrates and nitrites, and consider these determinations necessary, because they are, to a very great extent, an index, although *not an accurate measure* of the *previous* contamination of the water. Nitrites are, of course, worse than nitrates, because the oxidation has not proceeded so far; but in either case these so-called mineral salts have organic origin, and, therefore, they are proof of contamination, which, although it is not exactly dangerous at the time the sample is being examined, shows that at some time contamination has occurred, and where it *has* occurred, it may recur again at any time.\* The estimation of oxygen absorbed by organic matter from a solution of permanganate of potash comes very much in the same category. Water which is thoroughly oxidised, and, therefore, fairly freed from deleterious substances in an active form, will decolourise only a very small portion of permanganate solution, and I think there can be no question on the part of anyone who has been in the habit of working with this solution on a variety of samples of

\* Mr. Stoddart, of Bristol, writes in reference to the water supply of that place that it is brought 20 miles from the Mendip hills, that there is no possibility of sewage contamination, that it is brought in closed iron pipes into a very large reservoir, which is made of limestone, and slopes very considerably. There are no bacteria or animalculæ whatever that he has seen, but it is a very good collecting ground for diatomaceæ; when the sides of the reservoir get dry the diatoms die and furnish a large quantity of ammonia, which give rise of course to nitrates; many a time when he has made a good collection of diatomaceæ in a small bottle he had not had time to look at them when he reached home, and had consequently put them aside till the next day, when the ammoniacal smell was so abominable and just like animal matter that sometimes he thought it was a misnomer to call them vegetable. The only fault of the supply is that it is not perfectly filtered and free from minute portions of the dead diatoms. All the nitrates are solely derived from the dead diatoms.



water, that it does form a very fair and reasonable test as to the amount of organic impurity present. I quite agree with the remark Miller makes in reference to it, that as a substitute it is probably useless, but that as an accessory it does good service.

Passing now from the strictly chemical results, it is quite possible to meet with samples of water, and I have in fact seen several such, which contain so much recent urine that the urea, and in some cases the urate of potash, can be distinguished by the microscope in the residue left by the evaporation of one or two drops. It is obvious that such waters as these are totally unfit for human consumption, and yet the albuminoid ammonia would fail to detect this impurity: the oxygen absorbed would indicate it in part only, and the free ammonia to an even less extent; while I apprehend that there is hardly any chemist who would object to the statement that living organisms of any kind whatever, and all growths of the bacteria class, are injurious; and yet the microscope, and that alone is the only means by which these impurities can be detected. I consider that no sample of water should be passed as good unless it has been microscopically examined, and this examination should be credited with its due weight in the report, and, if necessary, the water should be condemned on the result of that examination alone.

Taste and smell also afford valuable indications when they are taken in the proper way. Not long since I analysed a sample of water which was in almost every respect chemically satisfactory, and it showed no objectionable features under the microscope, but when it was slightly warmed and the smell ascertained by drawing air through a tube, the walls of which were moistened with it, there was such an offensive odour of sulphuretted hydrogen as to fully account for all the complaints which had been made about it. Surely then this is enough to condemn a water upon. I condemned this water without any hesitation, and yet the albuminoid ammonia was low. Nor is this offensive smell of sulphuretted hydrogen confined to this particular sample, for some of the deep well chalk waters, which are taken by Frankland as a standard of purity, and in which the nitrates are ignored by those who report simply according to the albuminoid ammonia, contain enough sulphate of lime and organic matter to cause decomposition to set up, and a distinct smell of sulphuretted hydrogen is produced when the water has been standing in a cistern for twelve or twenty-four hours. I have known cases too, and that not a few, where the determination of colour is of value. I am quite aware that a difference of opinion prevails as to whether peaty matter is objectionable; my opinion is that it is. I think the gathering grounds should be free from peat as well as from other impurities, and probably no other test so readily recognizes the presence of peat as the colour of the water when seen through a stratum of 2-ft. deep.

I think there are cases where the determination of magnesia and the alkalies and phosphoric acid may be necessary, but these cases occur comparatively seldom, and the determinations, on account of the small quantities present, are attended with so much difficulty and uncertainty that for the present I omit them from my remarks.

Summing up the whole, therefore, I consider it necessary in every case to determine the total solids, loss on ignition after deducting combined carbonic acid, hardness before and after boiling, chlorine calculated as chloride of sodium, nitrogen in the four forms of free ammonia, albuminoid ammonia, nitrates and nitrites, oxygen absorbed by organic matter, colour in 2-ft. tube, taste and smell when warmed, and the absence or presence of suspended matter, and also to examine the residue microscopically. If these results show

a doubtful character in the water, I think it necessary to consider the results of Heisch's sugar test, so as to get a confirmation or otherwise of my opinion on the other results, but this examination should be made while the sample is fresh.

Of course I am quite aware that a complete investigation of this kind renders it quite impracticable to analyse waters for a guinea, but I confess that I have no regret on this point, as I think it is very much better, both for the public and the analyst, to have one sample thoroughly examined and fully reported upon in a report which shall have a reliable basis, than to have half a dozen samples analysed and reported upon with so few determinations made that the opinions given are unsatisfactory.

Having pointed out what determinations I make, the next question is how to appraise or estimate each of them at its true value. Of course the difficulty of doing this is considerable, but having once granted that these determinations are desirable, and also that, if a determination is desirable and has been made, some weight should be given to it in the calculations of the results, the matter is somewhat simplified. The first mode, according to which a scale of this kind can be formed, is to consider what amount of any one of the constituents shown by the analytical figures already referred to would be sufficient to keep the water from ranking as first class, supposing that all the other constituents were of a fairly satisfactory character, or, to put it in another way, supposing that the ammonia, albuminoid ammonia, nitrates and nitrites, were all good, what amount of total solids would condemn the water and relegate it to the second class; or supposing that the total solids were also good, what amount of salt would be sufficient to lower its rank. I take this as the starting point for the formation of a valuation scale, and I think we may say that 75 grains of total solids per gallon, or 15 grains of loss on ignition after carbonic acid has been deducted, or 15 grains of salt, or .015 of a grain of albuminoid ammonia, or 1.5 grains of nitrogen as nitrates (equal to nearly 10 grains of nitrate of soda per gallon,) or .15 of a grain of oxygen absorbed from permanganate, should each be held to be decidedly objectionable chemical characteristics, while as to the physical ones I think that a water which has a urine yellow colour when viewed through a tube two feet long, or which has a decidedly offensive taste or smell of sulphuretted hydrogen, or which shows any traces of copper, or when examined by the microscope shows fungoid growths, or a large proportion of peaty matter, should also be considered as lower than first class. Therefore, here we have the basis of a valuation scale for reports on water analysis.

Of course what I have said at present relates simply to the ratios which subsist between the different constituents, but it is perfectly clear that we must take some definite figure as the basis upon which to calculate these ratios. Now I have come to the conclusion that the easiest mode of forming this scale is to adopt the smallest basis of measurement as the unit of the scale, therefore as I consider that albuminoid ammonia is the most injurious factor in the analysis, and that .001 of a grain per gallon of that constituent is probably the most minute measurement to which it is really necessary to carry the valuation at present, I consider that .001 of a grain per gallon of albuminoid ammonia is equal to 1 degree of impurity; nitrogen in the form of nitrites takes rank next because it indicates that some organic matter has become converted into so-called mineral nitrogenous compounds, but yet has not been fully oxidized; still I view nitrogen when present in this form as of only half the importance or value that I do when it is present in the form of albuminoid ammonia. I therefore estimate

that .002 of nitrogen as nitrites equals 1 degree of impurity. Next I rank the oxygen absorbed by organic matter, and here, though I am quite aware that it will be one of the most disputed points in the whole scale, I have assumed that .01 equals 1 degree of impurity, *i.e.*, I estimate oxygen absorbed at 1/10th of the value I give to the albuminoid ammonia. Free ammonia comes next, and considering that it may be derived and frequently is derived from other sources than the decomposition of urea I value this at one-half the value I give to oxygen absorbed, that is .02 of free ammonia is equal to 1 degree of impurity. Nitrogen as nitrates is of course far less important, and I estimate this at 1/5th of the value of free ammonia, so that .100 of nitrogen as nitrates equals 1 degree of impurity.

Leaving the nitro-compounds I come to the general mineral constituents of the analysis, and here I have not only valued the total solids, but also to some, although to a different extent, the constituents of which these total solids consist, that is for every 5 grains of total solids, I allow a definite value of 1; for every 1 grain of loss on ignition, carbonic acid being deducted, I give a definite value of 1, as I also do to every 1 grain of salt, and I add together the hardness before and after boiling, and for every 5 degrees of the total hardness so obtained I count 1. This amounts to the same thing as giving a value of 1 to every 5 degrees of temporary hardness, and a value of 2 to every 5 degrees of permanent hardness. For traces of copper or traces of lead, both of which, however minute, I consider are exceedingly objectionable characteristics in drinking water, I allow a value of 6.

Passing now from the strictly chemical tests to the physical ones, I class a good taste as 0; a taste of decaying leaves or flat rain water as 2, while for more offensive tastes still, I allow higher values up to 10. For a yellow green colour, giving decided indications of either vegetable or urinary contamination or both, I allow a value of 4; for a full urine yellow, 6, and the values of the microscopical results range from 3, for the presence of a few bacteria, up to 12, for a residue full of animal organic remains, and even as high as 18 where urea and muscular fibre can be detected in the dried residue of a few drops.

From my remarks further on it will be evident as regards the physical as distinguished from the chemical tests, that these values must at present be viewed as an outline only, because the intermediate numbers have to be filled up. It is extremely difficult to discriminate in mere words between the different gradations of smell, taste, and microscopic appearance. But taken as an outline the table stands this way:—

5 grs. total solids ... .. =	1	Taste, decidedly offensive ... .. =	6
1 gr. loss on ignition ... .. =	1	Smell, flat rain water ... .. =	2
1 gr. chlorine calculated as chloride of sodium =	1	Ditto urine ... .. =	6
.0200 gr. free ammonia ... .. =	1	Colour, pale yellow ... .. =	2
.0010 gr. albuminoid ammonia ... .. =	1	Ditto yellow green ... .. =	4
.1000 gr. nitrates ... .. =	1	Ditto urine yellow ... .. =	6
.0020 gr. nitrites ... .. =	1	Ditto opaque yellow in 2-ft. tube ... .. =	9
.0100 gr. oxygen absorbed ... .. =	1	Microscope, bacteria ... .. =	3
5 degrees total hardness ... .. =	1	Ditto, other similar growths in greater quantity ... .. =	4
Traces of lead ... .. =	6	Ditto, few living organisms ... .. =	6
Ditto copper ... .. =	6	Ditto, animal remains ... .. =	12
Heisch's sugar test ... .. =	6	Ditto, urea and urates and muscular fibre... .. =	18
Taste, good ... .. =	0	Suspended matter, traces ... .. =	2
Ditto, slightly saline ... .. =	1	Ditto heavy ... .. =	4
Ditto, decayed leaves ... .. =	2		
Ditto, flat rain water ... .. =	2		

The question now arises how does this scale work out, and where are the limits of purity fairly to be drawn upon ordinary waters. I reply, it is only by undertaking, as I have recently done, the somewhat difficult task of sorting nearly 200 waters in as far as could be an approximate order of merit, that it is possible to answer this question, and I have come to the general conclusion that a valuation falling below 35 may be taken to

indicate a first-class water, to which no exception can fairly be taken; that a valuation of between 35 and 55 may be taken as a 2nd class water; and one between 55 and 75 as a third class water which is of a suspiciously dangerous character, while those samples which give a higher value than 75 should be considered as waters of such a dangerously contaminated character that they can only rank as sewage. To take a comparatively familiar illustration of the first class waters. The ordinary supplies of the London water companies, when in good condition, will show a value on this scale generally ranging between 15 and 22.

As regards the chemical results obtained, it is evident from what I have said, that all analysts who adopt this scale would agree in the calculation of the results, but a certain difficulty, and by no means an inconsiderable one, arises when we come to the physical tests. Every analyst is able to make an accurate determination of 5 grains of total solid matter per gallon, but it is extremely difficult for me to convey to others, or for others to understand from me what I mean by a flat or an offensive smell. At present I am hardly able to bring forward such illustrations as I should wish on the matter, but I am endeavouring to make standard solutions which shall serve as representations of the numbers or values which I attach in my scale to smell, colour, and taste. The microscope will then be the main point on which a true difference of opinion may exist, which will of course lead to a difference of valuation. I scarcely know in what way this difficulty is best to be overcome, but should the suggestions I am making, and the scale I am proposing, meet with fair acceptance at the hands of the analysts generally, I should have great pleasure in attempting to prepare a series of say 3 or 4 different slides, giving actual microscopical illustrations of what I understand by the numbers in my scale. As regards urea and such salts there is no difficulty, for of course a standard solution can be made to which a certain amount of sulphate of lime and salt, and other ordinary constituents of drinking water, may be added, but as regards the confervoid and other growths, and animalculæ, it is evident that no plan can be adopted but the preparation of a standard set of slides. If I can succeed in this as I hope, the valuation will then so far be strictly comparable with a standard, and will be free from every trace of personal equation or personal bias.

It is right now that I should give some illustrations of these figures and the analyses of some few samples, and showing the manner in which this valuation works, the figures are those of actual analyses recently made. The figures are grains per gallon.

No.	1	2	3	4	5	6
Total Solids .....	5.00	25.50	6.12	228.80	103.80	141.80
Volatile matter .....	0.95	0.25	1.92	3.68	11.30	28.50
Chlorine calculated as Chloride of Sodium .....	0.94	3.51	2.00	182.87	29.07	59.67
Hardness before boiling .....	0.8°	13.2°	1.9°	20.8°	36°	52°
Ditto after boiling .....	0.7°	2.4°	1.9°	7.2°	19°	42°
Nitrogen as free ammonia .....	0.0030	0.0025	0.0118	0.0020	0.0029	0.0291
Ditto as albuminoid ammonia .....	0.0020	0.0030	0.0102	0.0024	0.0270	0.0158
Ditto as Nitrates .....	0.0240	0.0700	0.0670	0.7696	4.1300	5.4604
Ditto as Nitrites .....	0.0043	trace	-0.0030	0.0058	0.0040	0.0064
Total combined Nitrogen.....	0.0333	0.0755	0.0920	0.7798	4.1639	5.5117
Oxygen absorbed .....	0.0300	trace	0.0240	0.1088	0.0540	0.1200
Suspended matter .....	trace	none	trace	trace	none	heavy
Colour .....	pale blue	pale blue	—	fair	{ dirty opaque yellow	urine yellow
Smell .....	satisfactory	good	—	„	fair	fair
Taste .....	fair	„	—	briny	„	saline
Microscope .....	} amorphous & rootlets	satis- factory	satis- factory	earthy matters	unsatis- factory	satis- factory
Lead and Copper .....	none	none	none	none	none	none
Iron .....	none	trace	trace	trace	trace	heavy
Value according to my scale .....	12	14	24	185	159	256

The best water in the above series is, in my opinion, the No. 1 sample, and on looking through the figures it will be seen that there are only five lines in which a higher value than one is given to any determination. Nitrogen, as albuminoid ammonia, showing .062 ranks as 2; oxygen absorbed ranks as 3; suspended matter ranks as 2, the taste which is flat like rain water is also 2, and the microscope, which shows amorphous sedimentary matter and rootlets but no animal matter, ranks as 2. I may take next the case of No. 2, which is another good water, and here the total solids value at 5, the salt 3, double hardness 3, albuminoid ammonia 3, while the physical tests are all so satisfactory that there is no addition to be made for any of them. As the next illustration I may take No. 3. Here we have a rather large proportion of albuminoid ammonia, namely, .0102, this amount being heavier than often occurs in first class water, yet when the other figures are viewed, and especially the low proportions of total solids and salt, the softness and the entire absence of unsatisfactory physical characteristics, it is not surprising that the value of the water is as low as 24.

Passing now to one or two cases where the proportions of impurity are larger still. Nos. 4 and 5 will illustrate the scale very well. In the No. 4 sample the albuminoid ammonia was only .0024, and the only objectionable physical characteristic was the presence of earthy matter, shown by the microscope, but the chemical tests disclosed the presence of 182.87 grains of chlorine calculated as chloride of sodium, per gallon, and combined with this there is a considerable proportion of nitrogen as nitrates, and the valuation therefore runs up to 185. This sample consequently ranks as unmistakable sewage, despite the low albuminoid ammonia. We have another illustration in No. 5, where the albuminoid ammonia is high enough to already condemn the sample, even if no other determination were made, that is, this factor is 11 times as high as in the last sample referred to; but this sample being considerably less saline, the valuation of it, although still placing it in the sewage class, is somewhat lower than No. 4.

In No. 6 we have a still heavier valuation. Here also the albuminoid ammonia is so high that the water would have passed as third class on that alone, but when other circumstances are taken into account, the condemnation is proved to be still greater, and the water ranks as one of the very worst I have seen for a long time. Thus it contains  $28\frac{1}{2}$  grains of volatile matter, nearly 60 grains of salt, the permanent hardness is 42, and the nitrogen as nitrates is 5.46 grains per gallon. This water affords a very good illustration of the fact, that although in some cases it may appear that I have placed an undue value on physical tests, yet that on the whole, my scale must be a fair approximation to the truth, for in this water I find that the smell was fair, the microscopical results satisfactory, the taste saline, which of course must be expected, the colour was only a pale yellow, and the only really unsatisfactory physical determination was that there was a considerable quantity of suspended matter. This water therefore takes worst rank without the physical tests having any particular weight.

I think I have now explained as fully as space will permit, the scheme I propose for the valuation of drinking waters, and the manner in which I think the results should be stated, and I invite the criticisms, not only of the members of this Society, but of all analysts on the proposals. It must be borne in mind in the discussion, that I do not propose any new methods or new processes. I think the discussion would be far better not complicated by any extraneous matters of that kind at present, I am simply considering the recognized determinations and methods, and the deductions which should be drawn from them, and the modes in which they should be stated.

The first question asked will naturally be:—What do I claim for this scale? My reply is a far better method of estimating or valuing the relative degrees of impurities in water than has hitherto been proposed. I do not claim that at present the scale is perfect in all its figures. I am quite aware that difference of opinion may, and to some extent must exist, as to the relative importance to be attached to some of the determinations in question, and these are points which are fairly open to argument, and which I should like to discuss so as to make the scale one which can be uniformly adopted; but while admitting that some of the figures are open to discussion, I claim that the broad fact, that every determination made should be stated and should be taken into account, is one which lies at the very foundation of any system of forming an accurate opinion upon the character of a water.

In the discussion which took place:—

Dr. Bartlett said he thought the plan Mr. Wigner had adopted was an excellent one, but the valuations were of course to be discussed, as that was one of the main issues. He should take exception to the salt in moderate quantity being considered as a measure of sewage impurities. Many waters originally pure contain large quantities of chloride of sodium or other alkaline earths, and he believed there was no objection to a water containing a moderate proportion of salt, but he declined to discuss then the question of how much was wholesome or unwholesome, but there would be no objection to a pure water containing 20 to 30 grains per gallon, but when we come to 185 grains that is different. He found Mr. Wigner had not estimated the  $\text{SO}_3$ , which he (Dr. Bartlett) considered a very objectionable element in drinking water,—especially sulphates of lime and magnesia. Mr. Wigner said he intended to give illustrations of bad smells, and he (Dr. Bartlett) was curious to know how he would do it, but he thought there should be plus and minus signs, so that waters which were moderately objectionable might be excused by reason of their being in some other respects good. He had always condemned waters which had an unpleasant smell. He also had had waters which, according to the Frankland and Wanklyn methods were pure, with a very small amount of total solids, and yet they came from medical men who attributed illness to a slight smell and a slight peaty colour. One water was analysed nine times, and nothing found except a smell of sulphuretted hydrogen, and a peaty colour, and yet this water was almost conclusively proved to have caused illness.

Mr. Hehner did not know why Mr. Wigner objected so much to the metrical system, he did not suppose Mr. Wigner reported the analyses of sugar in grains per gallon but in percentages, and therefore to report water in parts per million would be only carrying it one step further. He did not think urea and urates could be present in such large quantities that they could be determined; the presence of fæces would be much more objectionable than urea or urates. If the sulphates were determined, and very little found, it would be clear that as urine contains a very large amount of sulphates, the chlorine did not come from urine.

Dr. Dupré said there was little doubt but that Mr. Wigner had begun the right way in stating that everything that was worth determining was worth giving a certain weight to. As to the valuation he thought there ought to be some squares and cubes, so that the figures should not be simply multiplied, but increased in a greater ratio. He was quite sure that nitrates in a deep well water ought not to be put on the same footing as nitrates in a shallow well; in the one case it is an impurity almost harmless, but in the case of a

shallow well it is different. And the same remark would hold good to a great extent with ammonia, which, however, is not found in such large quantities. As to potash and soda, the determination of the relative proportions of the chlorides might show whether the contamination was of human or animal origin, and this is important, because human beings are not so liable to catch disease from an animal, whereas the urine from a human being is much more likely to cause disease.

In reply, Mr. Wigner pointed out that an indirect value was given to sulphates, inasmuch as permanent hardness was in the majority of cases a fair measure of their amount, and this, by the scale adopted, was valued twice as high as temporary hardness. The plan proposed by Dr. Bartlett, of passing salt or other impurities up to a certain point as harmless, appeared to him wrong. Small quantities of salt *may be* of minor importance, but if so, and the scale is wrong, let it be altered. The first rule should be to give a certain condemning influence to *every* impurity. Mr. Wigner considered Mr. Hehner's remark, comparing percentages with parts per million, rather an unfair comparison, because every man of common sense could grasp the 100 parts, whereas no fair conception could be formed of a million units. The difficulty was increased just ten thousand-fold. As to Dr. Dupré's remarks he (Mr. Wigner) considered there was force in what he said as to the increasing values as the proportion increase, but unless an exhaustive examination of the well had been made he could not assent to give a lower value to nitrates in a deep well water than in a shallow well water, because deep wells were in very many cases contaminated with surface drainage. In illustration of this Mr. Wigner pointed out that in the 6th Report of the Rivers Pollution Commission it was stated that out of "21 samples of water from indisputably unpolluted sources" only two were condemned, and these were both from St. Boniface's Wishing Well. But anyone who knew this well and St. Boniface Down as thoroughly as he did, would immediately find the cause of the pollution to arise from a large natural hollow on the surface of the down where the droppings of cattle pastured on the Down gradually accumulated and were washed down by the collected rain, which really formed the true supply of the "Wishing Well." The rain soaked through so rapidly that there was a great increase in the flow of the well so soon as one hour after rain. Therefore this "unpolluted source" was really a polluted one.

#### ADDITIONAL NOTE ON THE ABOVE SUBJECT—

I think there is considerable weight in the remarks made after the reading of my paper by Dr. Dupré, as to the desirability of an increasing scale of value when certain figures in the analysis are excessive. The effect which this alteration was intended by Dr. Dupré to have was to render certain high values of certain constituents absolutely prohibitory by ensuring the condemnation of the sample. I think this result will be very readily achieved by a slight modification of the scale. It will be seen by an examination of the specimen analyses (and perhaps still better by the application of the scale to other *complete* analyses already available), that a water of even passably good quality will rarely show any single determination in the analysis of a value so high as 10. Therefore if the simple rule is taken of doubling the excess of value over 10 attached to any single determination, the scale will not be any more stringent as regards the pure waters, while it would be a stronger condemnation of the impure ones.

It would act in this way, if the albuminoid ammonia in a sample is .009 grains per gallon it would value as 9. If it were .014 the excess above .010 would be valued at the doubled ratio, and we should consequently have  $.010 = 10 + .004 = 8$ , total 18; similarly if the nitrogen as nitrates were 1.000 grains, the value would be 10, but if the constituent were present in the proportion of 2.000 grains, the excess proportion would be doubled in importance, and the value would be 30. I think this modification will improve the scale without greatly complicating it.

G. W. W.

---

#### PUBLIC ANALYSTS' WORK DURING 1877.

IN reply to the request contained in our last number we have received a large number of returns from various public analysts, but we are unable at present to give a tabulated statement of the number of samples examined, &c., as the list is not complete. We therefore again call the attention of those gentlemen who have not yet sent us in their returns, and we trust they will kindly favour us with them by the 20th instant, in order that our table may be as complete as possible.

---

#### REPORT BY THE PRINCIPAL OF THE SOMERSET HOUSE LABORATORY.

WE extract the following from the 20th Report of the Commissioners of Inland Revenue just published :—

“The number of samples examined during the year ended 31st March last amounted to 13,128, representing an average of 43 samples examined and reported upon during each official day. These numbers, however, do not fully represent the whole work of the Department, as in every case referred under the Sale of Food and Drugs' Act, and in cases where a prosecution is likely to arise, or where data are to be furnished for future guidance, the experiments are performed in duplicate. The total number embraces 200 different articles, and as many of these were special in their composition and character, the general processes of analysis published were only partially applicable to them, and consequently the processes given had either to be modified, or new ones to be devised to meet our requirements.

“Under the Sale of Food and Drugs' Act, 32 cases, embracing samples of butter, milk, bread, oatmeal, arrowroot, mustard, tea, whisky, and preserved peas were referred to us by the magistrates. In the majority of cases the reference was made at the request of the defendants, but several were referred at the solicitation of the prosecution. In some instances we arrived at conclusions which differed from those of the local analyst, but in a large majority of the cases his results were confirmed.

“Among the cases referred to us from Scotland was a notable one of whisky which was adulterated with nearly one ounce of sulphuric acid per gallon. This adulterant not only made the whisky highly unpalatable, but probably accounted for the complaints of illness which had been made to the local authorities by those who had used it. In another case, a sample of butter, also from Scotland, was reported by the local analyst to contain 54 per cent. of foreign fat. Two scientific witnesses, who had examined the sample, gave evidence for the defence to the effect that when the butter was examined by the old mode of analysis the results were consistent with a genuine butter. They also stated that in their opinion there were no well-established means of distinguishing butter fat from other animal fats, and that the new method of analysis relied upon by the prosecution had not been sufficiently tested to establish its reliability, but they



admitted that if the new processes were trustworthy, then the sample was adulterated. The sample was referred to us by desire of the prosecution, with a request from the sheriff-substitute of Lanarkshire, who had heard the case, that an opinion should be given as to the trustworthiness of the processes adopted by the analyst for the prosecution. A report was made expressing confidence in the method of analysis—which had in fact been partly devised by ourselves—adopted by the prosecution, and stating that the sample consisted almost entirely of foreign fat, which appeared to have been worked up with a little milk. Within a day or two after the case had been disposed of, one of the local papers gave an account of an artificial butter manufactory, which existed in the town, from which the sample had been sent. Details of the apparatus were given, and by the process of manufacture described, which consisted primarily in churning purified melted fat with milk, an article would be produced which would exactly correspond with the terms of our report on the sample. The existence of the manufactory, and the manufacture of “butterine” by the process described, were placed beyond a doubt by subsequent proceedings in a court of justice.

“A sample of preserved peas, in the examination of which we practically confirmed the result arrived at by the local analyst, was found adulterated with copper to an extent which the magistrate held to be injurious to health.

“We have continued our investigations into the composition of certain articles of food, especially of milk and butter, to determine the variation in the composition of genuine samples, and also to observe the changes effected by keeping under various conditions, at different seasons of the year. These enquiries are slow and tedious, and involve a considerable expenditure of time and labour. We find the information thus obtained of the greatest value in dealing with samples referred to us for analysis,\* and in arriving at a decision in any case it is our invariable practice to take the whole of the constituents, and not one or two only, into consideration, as we consider that by such means only can we arrive at a sound conclusion.”

---

### HOUSE OF COMMONS.

12th February, 1878.

#### SALE OF FOOD AND DRUGS' ACT.

Mr. ANDERSON asked the President of the Local Government Board whether his attention had been called to a recent decision of the High Court of Justiciary, Scotland, concerning the Sale of Food and Drugs' Act, 1875, by which five Judges had decided that no offence could be proved on evidence taken from any article specially bought for analysis, the buyer in such case not having been prejudiced in the purpose for which he bought it; and, further, that two of the Judges—Lords Moncrieff and Young—expressed the opinion that the sixth section did not prevent tampering with an article to the deterioration of its quality, if without the addition of extraneous matter; and whether he purposed taking any steps to prevent the Act in question becoming a dead letter.

Mr. SCLATER-BOTH.—My attention has been called to the decision by the High Court of Justiciary in Scotland to which the hon. gentleman refers, and I regret that I have not had an opportunity of conferring with the Lord-Advocate on the subject. It seems that previous to the Scottish case alluded to no question had been raised in England as to the validity of a prosecution under the Sale of Food and Drugs' Act by a person who purchases only with a view to analysis, and in the cases which have occurred since the magistrates have decided against the objection when raised. I concur in that

---

\* This is the information which was asked for by the resolution of the Society of Public Analysts, and which, as will be seen by the correspondence, was refused by the Inland Revenue Chemists.—EDITORS ANALYST.

view, which, be it observed, is also the view of some of the Scottish Judges, and I cannot believe that the High Court of Justice, if appealed to, will come to any other decision. I am, therefore, not prepared, as at present advised, to introduce an amending Bill, though, if my anticipations were disappointed, such a step might be necessary.

*Times.*

#### ANALYSIS OF WINE.

WE note that in Paris one of the clauses of our Sale of Food Act has been put in operation, thus showing that our Gallic neighbours are not above following our example when they consider it expedient to do so. The alleged adulteration of wine by means of fuchsine, and the dangers which it may cause to public health, have given rise in Paris to new measures of repression. Formerly, the examination was made on the premises of the wine merchant, and was conducted without any serious control or exactitude. Now, however, a special Commission is sent to the vendor's premises. If a wine is suspected of sophistication, the Commissioner takes two samples, which are sealed. One of the samples is left with the merchant, who must present it intact on application. The other sample is sent to chemists, officially appointed—public analysts in fact—who are not permitted to know the name of the vendor. The analysis is thus prepared with all sincerity, and without consideration for individuals. If the presence of fuchsine or other dangerous matter is detected, the wine merchant is called upon to produce the sample left with him; it is compared with the wine officially analysed, and identity being proved, the merchant is punished. He is not able to tamper with the sample left with him, and consequently, he cannot say that he did not sell the wine as analysed. It is thought that much good will be done, in the way of repressing adulteration, by the adoption of this new system. The method of dealing with suspected samples is somewhat similar to that established by our own Sale of Food and Drugs Act.

#### AN EXTRAORDINARY MINERAL SPRING.

The *Boston Journal of Chemistry* publishes the following:—"A mineral spring extensively advertised in the States has recently attracted our notice, and from the circular of the owners, which is before us, we learn of its nature, as the published analysis of Dr. A. A. Hayes, State Assayer of Massachusetts, is presented, along with other recommendatory matter. Here is the statement of analysis:—In a standard gallon the following salts are present, considered as dry:—

	Parts
Silicate of potash ... ..	1·110
Sulphate of soda ... ..	0·490
Chloride of sodium ... ..	0·100
Crenate of iron ... ..	0·310
	2·010

This is extraordinary natural water, surely, but the comments of the distinguished chemist which accompany the analysis are still more remarkable. He follows with this statement to the owners, as found in the circular.

"I think much of the effect of this water in cases of *diseased digestion* is due to a remarkable cleansing action it exerts, being in fact a very weak solution of a kind of soap of natural origin. We have to many cured cases to allow us to doubt that the use of this water freely relieves complaints having their origin in the kidneys.

(Signed)

A. A. HAYES."

THE SOCIETY OF PUBLIC ANALYSTS AND THE SOMERSET HOUSE  
ANALYSTS.

IN accordance with the resolution passed at the Anniversary Meeting of the Society of Public Analysts, on the 16th January last, the Secretaries addressed the following letter to Mr. Bell, the Principal of the Somerset House Laboratory, and we give below his reply and the further correspondence which has since taken place:—

SOCIETY OF PUBLIC ANALYSTS,  
79, GREAT TOWER STREET, LONDON, E.C.,

22nd January, 1878.

DEAR SIR,—By a resolution unanimously passed at the Anniversary Meeting of this Society, held at Burlington House, on the 16th instant, we were instructed to write and ask you to read a paper at an early Meeting of the Society, upon the standards you have adopted in your Laboratory for the analysis of butter, milk, and other adulterated articles coming to you under the Sale of Food and Drugs' Act, together if you so desire, with reference to the methods you use for the analysis of those samples. The Society decided to request you to favour them by reading this paper because they considered that it is undesirable that public analysts and yourselves, both acting under the authority of an Act of Parliament, should differ either in the interpretation of the Act or in the interpretation of the results obtained in analyses made under the Act.

We are directed to say that if you assent to this proposition we will place the entire evening on the 20th February at your disposal, and give you and those of your assistants whom you may choose to call every opportunity for reply, or if you prefer it we will call a Special Meeting upon any date that may be convenient to you, and that does not clash with the Meetings of other Societies.

It seems hardly necessary for us to add that personally we hope you will assent, and so enable a fair discussion to take place on those specially disputed subjects—Milk and Butter.

We are, dear Sir, yours truly,

(Signed) CHAS. HEISCH, } *Honorary*  
G. W. WIGNER, } *Secretaries.*

J. BELL, Esq.,  
Principal,  
Laboratory, Somerset House.

79, GREAT TOWER STREET, LONDON, E.C.,

28th January, 1878.

MY DEAR SIR,—I shall be glad if you can let me have an answer by return to our letter of 20th, in reference to the Society of Public Analysts, as I want to announce the business for next meeting in the forthcoming *Analyst*.—Yours truly,

(Signed) G. W. WIGNER,

J. BELL, Esq.,  
Laboratory, Somerset House.

LABORATORY, SOMERSET HOUSE, LONDON, W.C.,

30th January, 1878.

DEAR SIR,—I duly received your note of the 29th inst., and also that of yourself and Mr. Heisch of the 20th inst., inviting me on behalf of the Society of Public Analysts to read a paper on Milk and Butter before that Society, and to discuss certain standards of purity as adopted by its members and by ourselves.

After careful consideration it appears to me that the object you have in view would not be likely to be attained by the course proposed, but I shall be pleased to see you and Mr. Heisch at any time to talk over the matter.

I may add that you are doubtless aware that in dealing with such samples as Milk and Butter, we have been guided by the results of our own investigations into the variations in their composition, and that these results have at all times been open to the inspection of any Public Analyst who has chosen to call upon me; and I may further say that I shall be glad to see any member of your Society who may feel disposed to favor me with a visit.

I am, dear Sir, yours truly,

G. W. WIGNER, Esq.

(Signed,) J. BELL.

SOCIETY OF PUBLIC ANALYSTS,

79, GREAT TOWER STREET, LONDON,

12th February, 1878.

DEAR SIR,—We are obliged by your letter of the 30th January, replying to ours of the 20th January, but, as you will have seen from our letter, that it was written by direction of this Society, and your reply will, consequently, have to be submitted to them and published, we think it only courteous to write to you again on the matter, because we fear that, to some extent, you must have misunderstood the wish of this Society. On referring to our letter, and also to the copy of the resolution passed by the Society, which we enclose, you will see that our object is to ascertain the standards which you and your assistants have adopted, in dealing with disputed cases under the adulteration Act—having special reference to butter and milk. Now, as at present, we, as a Society, as well as individually as analysts, are completely ignorant of the standards, and of the allowances you make for decomposition, we think you will admit that there is scarcely any more suitable mode of our acquiring the information which we need, than to ask you to favour us with a paper, stating what your standards are. There are, no doubt, differences between us, but we have no means of judging, either the amount of those differences, or what the reason for them is, and we really think that such a discussion as we propose would afford the opportunity of settling the point.

Probably the question resolves itself in the matter into this—Were the cows which you have accepted as standards healthy and thoroughly milked, and does your method of analysis differ from that adopted by this Society?

Can you not see your way clear to give us the paper yet?

Yours truly,

(Signed,) CHAS. HEISCH,  
G. W. WIGNER,

*Honorary Secretaries.*

P.S.—Your reply by the 19th instant will be in time for our Council Meeting.

J. BELL, Esq.,

Principal,

Laboratory, Somerset House.

INLAND REVENUE, SOMERSET HOUSE, LONDON, W.C.

18th February, 1878.

SIR,—Mr. Bell having laid your letters of 22nd ultimo and subsequent dates before the Board, without whose leave he would not feel justified in attending the proposed meeting of the Society of Public Analysts, I am instructed to acquaint you that the Board do not think it expedient that Mr. Bell should attend the meeting in question.

I am Sir, your obedient Servant,

(Signed) ADAM YOUNG,

*Secretary.*

CHAS. HEISCH, Esq.

SOCIETY OF PUBLIC ANALYSTS,

79, GREAT TOWER STREET, LONDON,

21st February, 1878.

SIR,—We are directed by the Council of this Society to acknowledge the receipt of your communication of the 18th inst.

Your obedient Servants,

(Signed) CHAS. HEISCH,  
G. W. WIGNER,

*Honorary Secretaries.*

ADAM YOUNG, Esq.,

Secretary,

Inland Revenue Department, Somerset House.

Mr. A. Wynter Blyth has obtained from the Royal Society a Government Grant of £20 for continuation of research with reference to the poison of the Cobra de Capello, and we hope shortly to be able to publish another paper by him on the subject supplementary to that which appeared in our first vol.

## CORRESPONDENCE.

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

TO THE EDITOR OF "THE ANALYST."

SIR,—In reply to your statement in the last issue of THE ANALYST, "That it would be interesting to know what Mr. Cleaver's figures were, and what standard he adopted," I beg to give you copies of my analyses of the Milk which were stated by me to have been adulterated.

No. 34.				No. 40.			
Solids	...	...	11.10	Solids	...	...	11.80
Fat	...	...	3.20	Fat	...	...	3.40
Solids not Fat	...	...	7.90	Solids not Fat	...	...	8.40

My certificates were to the effect that No. 34 was adulterated with 15 per cent. of water, and No. 40 with 8 per cent., so that it will be at once seen that the standard I adopted did not press at all severely on the vender. In addition to my own analyses, I also annex a copy of the reports and analyses, dated 22nd January, 1878, made on the duplicate samples at Somerset House, and signed by Messrs. J. Bell, R. Bannister, and C. Lewin.

"The sample of milk referred to in the enclosed letter, and marked No. 34, was received here on the 10th inst. The bottle was securely sealed. We hereby certify that we have analysed the Milk, and declare the results of our analyses to be as follows:—

"Solids not Fat	...	...	...	...	...	7.69	per cent.
Fat	...	...	...	...	...	3.22	
Water	...	...	...	...	...	89.09	
						100.00	
Ash	...	...	...	...	...	0.68	

"The amount of Fat is equal to that found in genuine Milk of good quality. After making allowance for the natural loss arising from decomposition through the keeping, the proportion of Solids not Fat is lower than is found in genuine Milk of low quality. From a consideration of these results we are of opinion that the Milk contains not less than seven per cent. of added water."

"The sample of Milk referred to in the enclosed letter, and marked No. 40, was received here on the 10th inst. The bottle was securely sealed. We hereby certify that we have analysed the Milk, and declare the results of our analysis to be as follows:—

"Solid not Fat	...	...	...	...	...	7.95	
Fat	...	...	...	...	...	3.43	
Water	...	...	...	...	...	88.62	
						100.00	
Ash	...	...	...	...	...	.73	

"The amount of Fat is equal to that found in genuine Milk of good quality. After making allowance for the natural loss arising from the decomposition of this Milk through keeping, the amount of Solids not Fat is low. From a consideration of these results we are of opinion that the Milk contains not less than four per cent. of added water."

These analyses were made about one month after my own, and so granting the analyses in both cases, and on both sides, to have been correctly made, the amount of natural loss is, in No. 34, .21 per cent., and in No. 40, .45 per cent., which would mean that the loss was equal to that which would be obtained by adding respectively about 3 and 6 per cent. of water to pure Milk.

This lost amount is, I consider, more loss than usually takes place in winter time, but as I do not know what method of analysis is followed by the Somerset House chemists, it is impossible to say if there is anything to account for it. The certificate does not state the amount of loss allowed for, but it is evident from these reports that the authorities (?) have some standard to guide them, and they ought, therefore, in fairness to the analyst, to make this standard (and also any others) public.

The analyses of the Somerset House chemists point to their standards of Solids not Fat being somewhere about 8.5 per cent., if 3 per cent. is allowed for natural loss, or to 8.2 per cent. if no such allowance be made.

Now Mr. Bell has once stated in evidence\* that he has found a Milk giving as low as 8.2 per cent. Solids not Fat, and that he could not therefore certify to any Milk giving such a result being adulterated, but if he takes 8.2 as his standard he cannot have allowed any margin for natural loss, and as he states that there has been a natural loss he must evidently take a higher standard, so that in point of fact he has somehow altered his opinion since the Birmingham case.

\* ANALYST, Vol. 1., page 40.

Granted Mr. Bell's analysis of his milk with 8.2 solid not fat being correct, the question arises, ought he to take that milk as a standard, knowing, as he must do, that it is of extremely rare occurrence? In fact, I believe Mr. Bell is the only analyst who has ever met with such a case.

According to the exact terms of the Act, the chemical officers at Somerset House are only empowered to give a certificate of the *results* of their analyses, and are not asked for any expression of opinion, and hence I consider the gentlemen referred to are exceeding their duty in furnishing such reports as above.

I beg also to draw attention to the absurdity of the clause as to the amount of fat, when contrasted with the after opinion that the milk is adulterated, and it is time that the attention of the Government should be drawn to the manner in which the Act is rendered inoperative by their officials, both by their peculiar views on the subject of Analyses, and by the issue of certificates framed in such an ambiguous manner that a magistrate, after reading them, feels bound to dismiss a summons, even though the Milk is expressly stated to have been adulterated.

318, King's Road,  
Chelsea, S.W.

I am, Sir, yours &c.,

E. L. CLEAVER,  
*Public Analyst to the Parish of St. Mary Abbott, Kensington.*

---

TO THE EDITOR OF "THE ANALYST."

SIR,—I shall be glad if you can inform me where I can find a reprint of the Lecture delivered by Mr. James Bell, of the Somerset House Laboratory, some years ago, before the Chemical Society, on the Adulteration of Food.

Yours &c.,

A PUBLIC ANALYST.

Feb. 22, 1878.

[We suppose the Lecture referred to was the one stated in the *Journal of the Chemical Society*, Vol. 11, new Series, page 1197, to have been delivered on the 19th February, 1874, but we cannot succeed in finding any reprint or abstract of it.—EDITORS ANALYST.]

---

LAW REPORTS.

**TO THE PREJUDICE OF THE PURCHASER.**—A remarkable prosecution, under the provisions of the Sale of Food Act, has been decided at Southampton. Mr. W. Gibbons, of Netley, was summoned for selling adulterated rum, to the prejudice of the purchaser. A police constable named Palmer said he bought a pint and a quarter of the rum. Examined by the counsel for the defendant, he said he bought the rum for himself, but did not taste it, nor had he done so since. For the defendant it was urged that the information was wrong, inasmuch as it alleged distinctly that the witness was prejudiced by the sale, whereas according to his own admission he could not be prejudiced because he had never tasted the rum at all. Being asked, the witness said he did not know how he was "prejudiced" by purchasing the rum. He knew, however, that the rum was not good. Mr. Stannard proved the forwarding of a sample of spirits to Mr. Angell, the county analyst, who had since forwarded him a certificate showing that whilst genuine rum was sold from proof to 12 per cent. under, the rum in question had been reduced by the addition of water to 19.5 under proof. For the defendant it was submitted that he had been summoned under the wrong clause in the Act, viz., section 6, which applied to a private purchaser, instead of section 13, which applied to the purchase by an inspector in his official capacity. Clearly the actual purchaser in this case had not been, in the words of the summons, prejudiced, and it was submitted, therefore, that there was no case. The Bench said they believed the water had been added to the rum according to the custom prevalent, at any rate in that neighbourhood, and to accommodate the purchaser by selling the spirit at a reduced price. They could not come to the conclusion that any fraud had been committed against the purchaser, and therefore dismissed the case.—*Grocer*.

**ADULTERATION OF BEER AT PECKHAM.**—At Lambeth Police-court, on Friday, 1st. ult., Owen Haster beer-house retailer, late of the George, St. George's road, Peckham, was summoned by the Vestry of Camberwell for selling beer which was not of the nature, substance, and quality of the article demanded. Mr. Marsden, the vestry clerk prosecuted, and Mr. Lilley defended. Mr. Marsden said the case was one of considerable public importance, and he proposed to call Dr. Bernays, Professor of Chemistry, who had given a certificate that the beer in question was adulterated to the extent of 96 grains per gallon. Mr. Lilley denied that any salt had been put into the porter. The defendant had been obliged to leave the house, and had lost £140 by the place. What he had done was to use liquorice and sugar, in order to satisfy the taste of his customers. Dr. Bernays, in his evidence, said there was salt in sugar, which might now account for the statement made by Mr. Lilley, and the more common the sugar the more the salt. The beer in this and other cases promoted instead of quenching thirst. Mr. Ellison said the case had been much altered by the evidence of Dr. Bernays that sugar contained salt, or he should have inflicted the highest penalty. He imposed a fine of 20s. and 12s. 6d. costs.

**HEAVY PENALTIES FOR MILK ADULTERATION.**—At Southport, William Wright, a farmer, of Crossens, was fined £10 and costs for having sold milk adulterated to the extent of 9.5 per cent. John Rimmer, farmer, of Marshside, was assessed in the like penalty for a similar offence, the dilution being certified by the analyst to amount in this instance to 11.5 per cent. George Aylesbury, proprietor of the Royal Hotel, and contractor for the sale of refreshments at the Botanic Gardens, Churchtown, for having the milk he was vending at the latter place, slightly adulterated with water, and almost without cream, was fined £5 and costs.

At Macclesfield, Jane Sharpley was fined £3 and costs, or two months' imprisonment with hard labour, for selling flour adulterated with 58 grains of alum to the 1lb. loaf. It was described as the worst case brought in any Court under the Food and Drugs Adulteration Act.

At Greenwich, Joseph Samuel Doust, of the British Queen, Bilingsgate Street, Greenwich, appeared to a summons, at the instance of the Greenwich District Board of Works, charging him with selling adulterated gin. The evidence showed that on the 13th of November, Mr. Corden, an Inspector in the service of the Board, purchased a half-pint of gin, retailed at 5d. per quartern, at the defendant's house. The certificate of the Analyst, Mr. G. W. Wigner, set forth that the gin was nearly 40 per cent. under proof. The gin had been adulterated with water, not with anything deleterious. Mr. W. Andrews of the Henry VIII., Foreign Cattle Market, Deptford, was called, and said he had been in business as a licensed victualler 30 years. He said that gin was generally supplied to the trade at 17 to 22 per cent. under proof, and that the 17 per cent. was diluted with sugar to 22 per cent., which was then what was termed "Old Tom," and sold at 6d. per quartern, the 22 per cent. under proof having water added and being sold at 6d. per quartern. The 4d. gin he sold was as near as possible that which had been analysed. The price of gin was generally from 12s. to 12s. 6d. per gallon in the market. The defendant was fined 20s. and costs.—*Times*.

In another case at Greenwich, a summons for selling gin at 4d. per quartern, 38 under proof, was dismissed on the ground that it was proved by evidence that this was the usual strength of 4d. gin in that district. Mr. Poulter, in opening the case for the defence, raised a preliminary objection that the charge was for selling gin "to the prejudice of the purchaser," and contended that the inspector, having acted officially, was not prejudiced by his purchase. Mr. Balguy, the magistrate—Then you would make the officer useless altogether, unless set in motion by the purchaser. I cannot allow the objection.

Mrs. Maria Tuck, wife of a farmer residing at South Tawton, was fined 20s. and costs by the Exeter magistrates on Thursday for selling adulterated butter. According to the certificate of the city analyst, the article contained at least 20 per cent. of fatty matter, which might have been either dripping or lard. As we stated a week or two since, short-weighted butter is frequently found in Exeter Market by the inspector, but if the farmers' wives are going to adulterate as well as to curtail the legal weight of their butter, Exeter provision dealers will do well to be very cautious in purchasing country supplies of this article.—*Grocer*.

At Bromsgrove Public Office, before Sir R. Harington and Mr. R. Smallwood, was decided a case which has excited a large amount of attention in the district. On the 11th ultimo charges under the Sale of Food and Drugs' Act, preferred by Superintendent Tyler, were heard at the same place, by the same magistrates, against several milk sellers. One was convicted and fined £2 and costs; three cases were withdrawn, the result of the analysis by Dr. Swete, of Worcester, showing the amount of fat in each to be very near the standard. In the other case, against Thomas Fisher, Dr. Swete's analysis showed the milk to contain 11.22 per cent. of solids not fat, and only 1.76 of fat. The defendant was ably defended by Mr. Buller, of Birmingham, who called Mr. Alfred Bostock Hill, of Birmingham, who stated that he had analysed a sample of milk (sworn to be the portion of defendant's milk handed back to him at the time of purchase by Superintendent Tyler, in accordance with the Act), and he found it to contain 9.22 per cent. of solids not fat and 3.47 of fat. In this conflict of scientific evidence, it was decided to send the third portion of the milk sample in the possession of the police to Somerset House, for analysis by the Government analyst, and the case was adjourned till yesterday, for the result to be ascertained. Yesterday Sir R. Harington stated that the analysis showed as follows:—Solids not fat, 9.00 per cent.; fat, 3.55; water, 87.45, and the analysts (Messrs. J. Bell, R. Bannister, and G. Lewin) gave it as their opinion, from the consideration of the result of the analysis, that the milk was genuine. Sir R. Harington said the analysis showed that there must have been a mistake somewhere, as practically it showed the milk to be genuine, and they must, therefore, dismiss the case; but as they thought it rather hard on defendant to bear all the expenses of the mistake, they had decided to allow one guinea costs. Defendant afterwards applied for other costs, but this was not granted. Defendant said he should not accept the costs allowed before taking a legal opinion.—*Birmingham Daily Post*, February 14th, 1878.

---

Mr. J. W. Thomas, Public Analyst for the Borough of Cardiff, has been appointed Public Analyst for the Borough of Newport, Mon.

A new and simple method is reported from Berlin of testing the purity of water by electricity. The more the water is charged with foreign matter, the more does it resist the passage of the electric current, and *vice versa*. Could not our native chemists devise a version or versions of this aqueous experiment that would admit of application to all the liquid merchandise of refreshment rooms?—*Western Daily Press*.

FURTHER NOTES FOR BEER DRINKERS.—Professor Galloway, of the Irish College of Science, writes to the Dublin papers, to say that his attention has been directed to an advertisement which appeared in one of the journals devoted to the brewing trade, of a bitter as a substitute for hops. He procured a sample of this bitter, but there was great difficulty in obtaining it, as the vendors were careful to whom they supplied it. It was found to be picric acid, mixed with a little colouring matter.—*Medical Examiner*.

GLYCERINE IN BEER.—It appears that beer is adulterated to a great extent with glycerine in Germany. An easy and exact method of its determination in this connection is wanting, and a prize of 3,000 marks has been offered by the *Verein für deutschen Gewerbfleiss* for the best solution of this problem.—*County Brewers' Gazette*.

FAVERSHAM.—The Town Council having received another letter from the Local Government Board, asking their reason for not appointing a Public Analyst, have, after due discussion and deliberation, decided to send a reply to the effect that, "the Council do not consider it necessary to do so." The Board have lately exhibited commendable activity in endeavouring to induce the appointment of Public Analysts throughout the kingdom, and there appears a strong indication of their intention to put the law in operation against all defaulting authorities.—*Lancet*, Feb. 2nd, 1878.

FAVERSHAM, AT LAST!—At a meeting of the Faversham Town Council, a third letter was read from the Local Government Board on the subject of appointing a public analyst for the borough under the Sale of Food and Drugs Act. It stated that the Board had considered the representations made by the Council, but saw no reason why the benefits of the Act should not be extended to Faversham, and therefore the Council was again urged to appoint an analyst. It was decided by seven votes against three to rescind the former resolution, and to make the appointment.—*Times*, Feb. 26th, 1878.

RUSSIAN ATROCITY.—The Russians are a remarkable people. If there be any truth in the following statement, the Russian soldier must certainly be credited with powers of digestion not enjoyed by the armies of other nations. An Austrian Military paper, the *Vedette*, asserts that some bread of the same kind as that issued to the Russian troops in Bulgaria was recently obtained and examined by the Military Intendance in Vienna. A careful analysis showed that the bread contained 19 per cent. of sawdust and 14 per cent. of sand! We should like to know what the other ingredients were.—*Grocer*.

### RECENT CHEMICAL PATENTS.

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

1877. No.	Name of Patentee.	Title of Patent.	Price.
2288	J. Holden and S. Turton ... ..	Receptacles for Acids ... ..	2d.
e420	A. Colson ... ..	Manufacture of Gas ... ..	6d.
2476	R. W. Wallace and C. F. Claus ... ..	Purification of Gas ... ..	4d.
2488	F. D. Marshall ... ..	Manufacture of Gas ... ..	6d.
2579	P. & F. M. Spence ... ..	Manufacture of Alum, &c. ... ..	6d.
2612	Ditto ... ..	Ditto ... ..	2d.
2594	H. McDrummond & J. A. W. Donald ... ..	Manufacture of Chromates ... ..	2d.
2635	F. B. Doering ... ..	Medicated Wools ... ..	2d.
2663	M. Welton ... ..	Preserving Meat ... ..	2d.
2687	E. Solvay ... ..	Treatment of Bicarbonate of Soda ... ..	6d.
2708	H. Gardner ... ..	Pyrometer or Thermometrical Indicator ... ..	6d.
2720	G. Lund ... ..	Apparatus for Synchronizing Clocks ... ..	6d.
2736	G. W. Von Nawrocki ... ..	Treating Fœcal Matters for Production of Manure ... ..	4d.
2753	F. W. Haddan ... ..	Apparatus for Burning Hydrocarbons ... ..	2d.
4443	W. E. Nickerson ... ..	Sour Tannin Solutions for Plumping Hides ... ..	2d.

The Index to Vol. 2 will be published with our next number. Price to non-subscribers, 3d.; to subscribers, free.

### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Medical Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Country Brewers' Gazette.