APPENDIX.

WEIGHTS AND MEASURES.

ENGLISH.

APOTHECARIES WEIGHT, L.

Pound.		*Ounces.*		*Drams.*		*Scruples.*		*Grains.*		*Grammes.*
℔ 1	=	12	=	96	=	288	=	5760	=	372.96
		℥ 1	=	8	=	24	=	480	=	31.08
				ʒ 1	=	3	=	60	=	3.885
						℈ 1	=	20	=	1.295
								gr. 1	=	0.06475

Table for converting Ounces, Drams, and Grains Troy into Decimals of the Troy Pound.

Grain.	*lbs. Troy.*	*Dram.*	*lbs. Troy.*	*Oz.*	*lbs. Troy.*
1 =	.000173611	1 =	.0104166	1 =	.0833
2 =	.000347222	2 =	.0208333	2 =	.1666
3 =	.000520833	3 =	.0312500	3 =	.2500
4 =	.000694444	4 =	.0416666	4 =	.3333
5 =	.000868055	5 =	.0520833	5 =	.4166
6 =	.001041666	6 =	.0625000	6 =	.5000
7 =	.001215277	7 =	.0729166	7 =	.5833
8 =	.001388888			8 =	.6666
9 =	.001562500			9 =	.7500
				10 =	.8333
				11 =	.9166

Table for converting Decimals of the Troy Pound into Troy Ounces, Drams, and Grains.

lb.	oz.	dr.	grs.	lb.	oz.	dr.	grs.	lbs.	grains.
.1 =	1 :	1 :	36	.01 =	0 :	0 :	57.6	.001 =	5.76
.2 =	2 :	3 :	12	.02 =	0 :	1 :	55.2	.002 =	11.52
.3 =	3 :	4 :	48	.03 =	0 :	2 :	52.8	.003 =	17.28
.4 =	4 :	6 :	24	.04 =	0 :	3 :	50.4	.004 =	23.04
.5 =	6 :	0 :	0	.05 =	0 :	4 :	48.0	.005 =	28.80
.6 =	7 :	1 :	36	.06 =	0 :	5 :	45.6	.006 =	34.56
.7 =	8 :	3 :	12	.07 =	0 :	6 :	43.2	.007 =	40.32
.8 =	9 :	4 :	48	.08 =	0 :	7 :	40.8	.008 =	46.08
.9 =	10 :	6 :	24	.09 =	0 :	8 :	38.4	.009 =	51.84

AVOIRDUPOIS WEIGHT.

Pounds.		*Ounces.*		*Drams.*		*Troy Grains.*		*Grammes.*
1	=	16	=	256	=	7000	=	453.25
		1	=	16	=	437.5	=	28.32
				1	=	27.34375	=	1.81

Table for converting Avoirdupois Ounces into Decimals of the Avoirdupois Pound.

oz. Av.	lbs. Av.	oz. Av.	lbs. Av.
.25 =	.015625	8 00 =	.5000
.50 =	.03125	9.00 =	.5625
1.00 =	.0625	10.00 =	.6250
2.00 =	.1250	11.00 =	.6875
3.00 =	.1875	12.00 =	.7500
4 00 =	.2500	13 00 =	.8125
5.00 =	.3125	14.00 =	.8750
6.00 =	.3750	15 00 =	.9375
7.00 =	.4375		

Table for converting Decimals of the Avoirdupois Pound into Avoirdupois Ounces and Decimals.

lbs. Av.	oz. Av.	lbs. Av.	oz. Av.
.1 =	1.6	.01 =	.16
.2 =	3.2	.02 =	.32
.3 =	4.8	.03 =	.48
.4 =	6.4	.04 =	.64
.5 =	8.0	.05 =	80
.6 =	9 6	.06 =	.96
.7 =	11.2	.07 =	1 12
.8 =	12.8	.08 =	1.28
.9 =	14.44	.09 =	1.44

Table for converting Troy Pounds into their equivalent Avoirdupois Pounds.

lbs. Troy.		lbs Avoirdup.	lbs. Troy.		lbs. Avoirdup.
1	=	0.82285714	6	=	4.93714285
2	=	1.64571428	7	=	5.76000000
3	=	2.46857142	8	=	6.58285714
4	=	3.29142857	9	=	7.40571428
5	=	4.11428571			

Table expressing the relative Weight in Avoirdupois of various Weights Troy.

TROY. dr.		AVOIRDUPOIS. dr.	gr.	TROY. dr.		AVOIRDUPOIS. dr.	gr.
1	=	2 :	5.3125	5	=	10 :	26.5625
2	=	4 :	10.625	6	=	13 :	4.53125
3	=	6 :	15.9375	7	=	15	9.84375
4	=	8 :	21.25	8	=	17 :	15.15625

TROY. oz.		AVOIRDUPOIS. oz.	gr.	TROY. oz.		AVOIRDUPOIS. oz.	gr.
1	=	1 :	42.5	7	=	7 :	297.5
2	=	2 :	85.	8	=	8 :	340.
3	=	3 :	127.5	9	=	9 :	382.5
4	=	4 :	170.	10	=	10 :	425.
5	=	5 :	212.5	11	=	12 :	30.
6	=	6 :	255.	12	=	13 :	72.5

TROY. lb.		AVOIRDUPOIS. lb.	oz.	gr.	TROY. lb.		AVOIRDUPOIS. lb.	oz.	gr.
1	=	0	13	72.5	17	=	13	15	359.5
2	=	1	10	145	18	=	14	12	430
3	=	2	7	217.5	19	=	15	10	65
4	=	3	4	290	20	=	16	7	137.5
5	=	4	1	362.5	30	=	24	10	425
6	=	4	14	435	40	=	32	14	275
7	=	5	12	70	50	=	41	2	125
8	=	6	9	142.5	60	=	49	5	412.5
9	=	7	6	215	70	=	57	9	262.5
10	=	8	3	287.5	80	=	65	13	112.5
11	=	8	0	360	90	=	74	0	400
12	=	9	13	432.5	100	=	82	4	250
13	=	10	11	67.5	200	=	164	9	62.5
14	=	11	8	140	300	=	246	13	312.5
15	=	12	5	212.5	400	=	293	2	125
16	=	13	2	285	500	=	411	6	375

Table for converting Avoirdupois Pounds into their equivalent Troy Pounds.

lbs. Avoird.	*lbs. Troy.*	*lbs. Avoird.*	*lbs. Troy.*
1	1.215277	6	7.291666
2	2.430555	7	8.506944
3	3.645833	8	9.722222
4	4.861111	9	10.937500
5	6.076388		

Table expressing the relative value in Troy Weight of various Weights Avoirdupois.

AVOIRDUPOIS. *dr.*	TROY. *dr.*	TROY. *gr.*
1	0	27.34375
2	0	54.68750
3	1	22.03125
4	1	49.37500
5	2	16.71875
6	2	44.06250
7	3	11.40625
8	3	38.75000
9	4	6.09375
10	4	33.43750
11	5	00.78125
12	5	28.13500
13	5	55.46875
14	6	22.81250
15	6	50.15625
16	7	17.50000

AVOIRDUPOIS. *oz.*	TROY. *oz.*	*dr.*	*gr.*
1	0	7	17.5
2	1	6	35
3	2	5	52.5
4	3	5	10
5	4	4	27.5
6	5	3	55
7	6	3	2.5
8	7	2	20
9	8	1	37.5
10	9	0	55
11	10	0	22.5
12	10	7	50
13	11	6	57.5
14	12	6	5
15	13	5	22.5
16	14	4	40

AVOIRDUPOIS. *lb.*	TROY. *lb.*	*oz.*	*dr.*	*gr.*
1	1	2	4	40
2	2	5	1	20
3	3	7	6	00
4	4	10	2	40
5	6	0	7	20
6	7	3	4	00
7	8	6	0	40
8	9	8	5	20
9	10	11	2	00
10	12	1	6	40
11	13	4	3	20
12	14	7	0	00
13	15	9	4	40
14	17	0	1	20
15	18	2	6	00
16	19	5	2	40
17	20	7	7	20
18	21	10	4	00
19	23	1	0	40
20	24	3	5	20
30	36	5	4	00
40	48	7	2	40
50	60	9	1	20
60	72	11	0	00
70	85	0	6	40
80	97	2	5	20
90	109	4	4	00
100	121	6	2	40
200	243	0	5	20
300	364	7	0	00
400	486	1	2	40
500	607	7	5	20

MEASURE, LONDON PHARMACOPŒIA.

Gal.	*Pints.*	*Fluidoun.*	*Fluidr.*	*Minims.*	*Troy Gr.*	*Cub. Inch.*	*Litres.*
1 =	8 =	128 =	1024 =	61440 =	58443 =	231 =	3.78515
	O 1 =	16 =	128 =	7680 =	7305 =	28.875 =	0.47398
		f℥ 1 =	8 =	480 =	456.5 =	1.8047 =	0.02957
			fʒ 1 =	60 =	57 =	9.2256 =	0.00396
				♏ 1 =	0.9 =	0.0374 =	0.00066

ENGLISH WINE MEASURE.

Ton.	*Pipe or Butt.*	*Punch.*	*Hogsh.*	*Tierce.*	*Gallon.*	*Cub. Inch.*
1 =	2 =	3 =	4 =	6 =	252 =	58212
	1 =	1½ =	2 =	3 =	126 =	29106
		1 =	1⅓ =	2 =	84 =	19404
			1 =	1½ =	63 =	14553
				1 =	42 =	9902
					1 =	231

ENGLISH ALE MEASURE.

Hogsh.	*Barrel.*	*Kilderk.*	*Firkin.*	*Gallon.*	*Quart.*	*Pint.*	*Cub. Inch.*
1 =	1½ =	3 =	6 =	51 =	204 =	408 =	14382
	1 =	2 =	4 =	34 =	136 =	272 =	9588
		1 =	2 =	17 =	68 =	136 =	4794
			1 =	8½ =	34 =	68 =	2397
				1 =	4 =	8 =	282
					1 =	2 =	70½
						1 =	35¼

SCOTS LIQUID MEASURE.

Gal.	*Quart.*	*Pint.*	*Choppin.*	*Mutchkin.*	*Gills.*	*Cub. Inch.*
1 =	4 =	8 =	16 =	32 =	128 =	840
	1 =	2 =	4 =	8 =	32 =	210
		1 =	2 =	4 =	16 =	105
			1 =	2 =	8 =	52.5
				1 =	4 =	26.25
					1 =	6.56

• In the preceding Tables, the cubic inch of water is estimated at 253 Troy Grains. In the succeeding Tables calculated by Mr Fletcher, it is estimated at 252.506 Troy Grains 60° Fahr. and 29.5 Bar.

	Cubic Inches.		*Wine Pint.*		*Ale Pint.*
1 lb. Troy,	22.81134	=	0.7900031	=	0.6471302
1 lb. Avoirdupois,	27.72135	=	0.960073	=	0.7864429

		Cubic Inches.		*Troy.*		*lbs. oz. dr.*	*grs.*		*lbs. Avoir.*
1 ale gallon	=	282	=	12.362372	=	12 : 4 : 2 :	48.12672	=	10.172384
1 ale quart	=	70.5	=	3.090568	=	3 : 1 : 0 :	42.03168	=	2.543096
1 ale pint	=	35.25	=	1.545284	=	1 : 6 : 4 :	21.01584	=	1.271543

Table for converting Wine Pints of Water into their equivalent Troy and Avoirdupois Pounds.

Wine Pints.		*lbs. Troy.*		*lbs. Troy.*	*oz.*	*dr.*	*grs.*		*lbs. Avoirdup.*
1	=	1 26581783	=	1 :	3 :	1 :	31.1	=	1.04158725
2	=	2.53163566	=	2 :	6 :	3 :	2.2	=	2.08317450
3	=	3·79745349	=	3 :	9 :	4 :	33.3	=	3·12476175
4	=	5.06327132	=	5 :	0 :	6 :	4.4	=	4.16634900
5	=	6.32908915	=	6 :	3 :	7 :	35.5	=	5.20793625
6	=	7·59490698	=	7 :	7 :	1 :	6.6	=	6.24952350
7	=	8.86072481	=	8 :	10 :	2 :	37.7	=	7.29111075
8	=	10.12654264	=	10 :	1 :	4 :	8.8	=	8.33269800
9	=	11.39236047	=	11 :	4 :	5 :	39.9	=	9.37428525

Table for converting Cubic Inches of Water (at 60° Fahr. and 29.5 Bar.) into their equivalents in Troy Weight.

Cub. Inch of Water.		*Troy grs.*		*oz.*	*dram.*	*grs.*
1	weighs	252.506	=	0 :	4 :	12.506
2		505.012	=	1 :	0 :	25.012
3		757.518	=	1 :	4 :	37.518
4		1010.024	=	2 :	0 :	50.024
5		1262.530	=	2 :	5 :	2.530
6		1515.036	=	3 :	1 :	15.036
7		1767.542	=	3 :	5 :	27.542
8		2020.048	=	4 :	1 :	40.048
9		2272.554	=	4 :	5 :	52.554
1728 (1 cub. foot),		———		909 :	0 :	10.368

Table for converting the Ounce Measure used by Dr Priestley to Cubical Inches.

Ounce Measures.	*French Cubical Inches.*	*English Cubical Inches.*
1	1.567	1.898
2	3.134	3.796
3	4.701	5.694
4	6.268	7.592
5	7.835	9.490
6	9.402	11.388
7	10.969	13.286
8	12.536	15.184
9	14.103	17.082
10	15.670	18.980
20	31.340	37.960
30	47.010	56.940
40	62.680	75.920
50	78.350	94.900
60	94.020	113.880
70	109.690	132.860
80	125.360	151.840
90	141.030	170.820
100	156.700	189.800
1000	1567.000	1898.000

Correspondence between English and Foreign Weights and Measures.

NEW FRENCH.

'To employ, as the fundamental unity of all measures, a type 'taken from nature itself, a type as unchangeable as the globe on 'which we dwell,—to propose a metrical system, of which all the 'parts are intimately connected together, and of which the mul- 'tiples and subdivisions follow a natural progression, which is 'simple, easy to comprehend:—this is most assuredly a beauti- 'ful, great, and sublime idea, worthy of the enlightened age in 'which we live.'

Such were the ideas which influenced the French National Institute, when they chose, as the base of the whole metrical system, the fourth part of the terrestrial meridian, between the equator and the north pole. They adopted the ten millionth part of this arc for the unity of measure, which they denominated *meter*, and applied it both to superficial and solid measures, taking for the unity of the former, *are*, the square of the decuple, and for that of the latter, *litre*, the cube of the tenth part of the metre. They chose for the unity of weight, *gramme*, the quantity of distilled water which the same cube contains when reduced to a constant state presented by nature itself; and, lastly, they decided, that the multiples and submultiples of each kind of measure, whether of weight, capacity, or length, should be always taken in the decimal progression, as being the most simple, the most natural, and the most easy for calculation, according to the system of numeration which all Europe has employed for centuries, and they used the prefixes, *deca*, *hecto*, *kilo*, and *myria*, taken from the Greek numerals, to express the multiplication of the integer by 10, 100, 1000, and 1000 respectively, and *deci*, *centi*, *milli*, taken from the Latin numerals, to express its division.

By a careful measurement of the arc between Dunkirk and Mountjoy, they found the length of the metre to be equal to 443.296 lines of the toise of Peru. The cubic decimetre of distilled water, taken at its maximum of density and weight *in vacuo*, that is, the unity of weight, was found to be 18827.15 grains of the pile of Charlemagne.

The *metre* at 32°	=	39.371	English inches at 62°.
The square metre	=	1550.075641	English square inches.
The square decimetre	=	15.50075	English square inches.

100 *ares* or square decametres = 2 English acres nearly.

Cub. feet cub. inch.
The cubic metre = 61028.028 English cubic inches = 355 48.028.
The cubic decimetre, or *litre* = 61.028 English cubic inches.
Equal to the bulk of a killogramme of water.

Troy gr.
The gramme or weight of a cubic centimetre of water = 15.44402.

MEASURES OF LENGTH:

The Metre being at 32°, and the Foot at 62°.

		English inches.		*Mil.*	*Fur.*	*Yards.*	*Feet.*	*Inch.*
Millimetre	=	.03937						
Centimetre	=	.39371						
Decimetre	=	3.93710						
Metre	=	39.37100						
Decametre	=	393.71000	=	0	0	10	2	9.7
Hecatometre	=	3937.10000	=	0	0	109	1	1
Kilometre	=	39371.00000	=	0	4	213	1	10.2
Myriametre	=	393710.00000	=	6	1	156	0	6

Metre.		*Eng. feet.*		*Inches.*
1	=	3	:	3.371
2	=	6	:	6.742
3	=	9	:	10.113
4	=	13	:	1.484
5	=	16	:	4·855
6	=	19	:	8.226
7	=	22	:	11.597
8	=	26	:	2.968
9	=	29	:	6.339

Decimetre.		*Eng. inches.*
1	=	3.9731
2	=	7.8742
3	=	11.8113
4	=	15.7484
5	=	19.6855
6	=	23.6226
7	=	27.5597
8	=	31.4968
9	=	35.4339

MEASURES OF CAPACITY.

		Cubic inches.		ENGLISH. *Tons.*	*Hogs.*	*Wine gal.*	*Pints.*
Millilitre	=	.06103					
Centilitre	=	.61028					
Decilitre	=	6.10280					
Litre	=	61.02800	=	0	0	0.	2.1133
Decalitre	=	610.28000	=	0	0	2.	5.1352
Hecatolitre	=	6102.80000	=	0	0	26.419	
Kilolitre	=	61028.00000	=	1	0	12.19	
Myrialitre	=	610280.00000	=	10	1	58.9	

Litre.		*Eng. cub. inch.*		*Ale pints.*		*Wine pints.*		*Oz. troy of water.*
1	=	61.028	=	1.7313	=	2.11353	=	31.104
2	=	122.056	=	3.4626	=	4.22706	=	64.208
3	=	183.084	=	5.1939	=	6.34059	=	96.312
4	=	244.112	=	6.9252	=	8.45412	=	128.416
5	=	305.140	=	8·6565	=	10.56765	=	160.520
6	=	366.168	=	10.3878	=	12.68118	=	192.624
7	=	427.196	=	12.1191	=	14.79471	=	224.728
8	=	488.224	=	13.8504	=	16.90824	=	256.832
9	=	549.252	=	15.5817	=	19.02177	=	288.936

MEASURES OF WEIGHT.

		English grains.		AVOIRDUPOIS. *Pounds.*	*Oun.*	*Dram.*
Milligramme	=	.0154				
Centigramme	=	.1544				
Decigramme	=	1.5444				
Gramme	=	15.4440				
Decagramme	=	154.4402	=	0	0	5.65
Hecatogramme	=	1544.4023	=	0	3	8.5
Kilogramme	=	15444.0234	=	2	3	5
Myriagramme	=	154440.2344	=	22	1	2

Gram.	Troy grs.	Deca-gram.	Troy dram.	grs.	Hecto-gram.	Troy oz.	Avoird. oz.
1. =	15.444	1. =	2 :	34.44	1. =	3.2175 =	3.5279
2. =	30.888	2. =	5 :	8.88	2. =	6.4350 =	7.0558
3. =	46.332	3. =	7 :	43.32	3. =	9.6525 =	10.5837
4. =	61.776	4. =	10 :	17.76	4. =	12.8700 =	14.1116
5. =	77.220	5. =	12 ;	52.20	5. =	16.0875 =	17.6395
6. =	92.664	6. =	15 :	26.64	6. =	19.3050 =	21.1674
7. =	108.108	7. =	18 ;	1.08	7. =	22.5295 =	24.6953
8. =	123.552	8. =	20 ;	35.52	8. =	25.7400 =	28.2232
9. =	138.996	9. =	23 :	9.96	9. =	28.9575 =	31.7511

The decimal progression of all the French weights and measures renders it only necessary to change the decimal point in order to convert one into the equivalent of any other of the same species and numerically the same, but of a different denomination. Thus as 9 litres are equal to 15.5817 ale pints, 9 hectolitres will be equal to 1558.17 ale pints; and so of the rest.

Weights and Measures used in France before the Revolution.

DIVISION OF FRENCH WEIGHTS.

	Pound.	Ounces.	Gros.	Deniers.	Grains	Troy Grs.
Poids de Marc	1 =	16 =	128 =	384 =	9216 =	7561
Apothecary	1 =	12 =	96 =	288 =	6912 =	5670.5
Marc	1 =	8 =	84 =	142 =	4808 =	3780.5
		1 =	8 =	24 =	576 =	472.6
			1 =	3 =	72 =	59.1
				1 =	24 =	19.7
					1 =	0.8

Troy grains.

		Troy grains.		
The French pound	=	7561	= 1.31268	lb. troy.
ounce	=	472.5625	= 0.984504	oz. troy.
gros	=	59.0703125	= 0.984504	dram.
grain	=	0.820421		

The English troy pound of 12 ounces	=	7021	Paris grains.
The troy ounce - -	=	585.0833	Paris grains.
The dram of 60 grains -	=	73.1351	Paris grains.
The penny-weight or denier, of 24 grains -		29.2544	Paris grains.
The scruple of 20 grains -	=	4.3784	Paris grains.
The grain - - -	=	1.2189	Paris grains.
The avoirdupois pound of 16 ounces, or 7000 troy grains, -	=	8538.	Paris grains.
The ounce - - -	=	533.6250	Paris grains.

To reduce Paris grains to English grains, divide by English grains to Paris grains, multiply by	1.2189
Paris ounces to English troy ounces, divide by English troy ounces to Paris ounces, multiply by	1.015734
Pound (Poids de Marc) to troy pound, multiply by Troy pound to pound Poids de Marc, divide by	1.31268

Table shewing the Comparison between English and French Weights (Poids de Marc.)

English Grs.		*French Grs.*	*English Grs.*		*French Grs.*
1	=	1.2189	9	=	10.9704
2	=	2.4378	10	=	12.1890
3	=	3.6568	20	=	24.378
4	=	4.8757	30	=	36.568
5	=	6.0947	40	=	48.757
6	=	7.3136	50	=	60.947
7	=	8.5325	60	=	73.136

French Grs.		*Troy Grs.*	*French grs.*		*Troy grs.*
1.	=	0.820421	10.	=	8.20421
2.	=	1.640842	20.	=	16.40842
3.	=	2.461263	30.	=	24.61263
4.	=	3.281684	40.	=	32.81684
5.	=	4.102105	50.	=	41.02105
6.	=	4.922526	60.	=	49.22526
7.	=	5.742947	70.	=	57.42947
8.	=	6.563368	72.	=	59.070312
9.	=	7.383789			

Gros.		*Drams.*	*Grs.*	*Gros.*		*Drams.*	*Grs.*
1	=	0	59.07	5	=	4	55.35
2	=	1	58.14	6	=	5	54.42
3	=	2	57.21	7	=	6	53.49
4	=	3	56.28				

Fr. oz.		*Troy oz.*	*Drs.*	*Grs.*	*Fr. oz.*		*Troy oz.*	*Drs.*	*Grs.*
1.	=	0	7	52.56	9.	=	8	6	53.04
2.	=	1	7	45.12	10.	=	9	6	45.60
3.	=	2	7	37.68	11.	=	10	6	38.16
4.	=	3	7	30.24	12.	=	11	6	30.72
5.	=	4	7	22.80	13.	=	12	6	23.28
6.	=	5	7	15.36	14.	=	13	6	15.84
7.	=	6	7	7.92	15.	=	14	6	8,40
8.	=	7	7	0.48					

Fr. pounds.		*Tr. oz. dr. grs.*	*Fr. pounds.*		*Tr. oz. dr. grs.*
1.	=	15 : 6 : 1	6.	=	94 : 4 : 6
2.	=	31 : 4 : 2	7.	=	110 : 2 : 7
3.	=	47 : 2 : 3	8.	=	126 : 0 : 8
4.	=	63 : 0 : 4	9.	=	141 6 : 9
5.	=	78 : 6 : 5			

LONG MEASURE.

		French Inches. *feet.*	*inches.*	*lines.*		*English Inches.*
The French ell, *Aune,*	=	3	7	10.5	=	46.69
The half toise	=	3			=	38.355

		English Foot,		
The foot	=	1.0654167	=	12.785
The inch			=	1.0654
The line			=	0.0888

		French Foot.		*French Inches.*
The English foot	=	0.9386	=	11.2632
The inch			=	0.9386
The line			=	00.7823

To reduce French feet or inches to English feet or inches, multiply by 1.0654167, or divide by 0.9386.

To reduce English long measure to French, multiply by 0.9386, or divide by 1.0654167.

Tables expressing the value of French feet and inches in English Measure.

French feet.		*English inches.*	*Fr. feet or in.*		*Eng. feet or in.*
1.	=	12.785	1	=	1.0654+
2.	=	25.570	2	=	2.1308
3.	=	38.355	3	=	3.1962
4.	=	51.140	4	=	4.2616
5.	=	63.925	5	=	5.3270
6.	=	76.710	6	=	6.3925
7.	=	89.495	7	=	7.4579
8.	=	102.280	8	=	8.5233
9.	=	115.065	9	=	9.5887
10.	=	127.850	10	=	10.6541
			11	=	11.7195
			12	=	12.7850

SQUARE MEASURE.

The French square foot or inch = 1.13510 English.
The English square foot or inch = .88126 French.

To reduce French square measure to English, multiply by 1.13510, or divide by 0.88126.

To reduce English square measure to French, multiply by 0.88126, or divide by 1.13510.

CUBE MEASURE.

The French cubic foot or inch, = 1.209367 English.
The English cubic foot or inch, = 0.8263784 French.

To reduce French cube measure to English, multiply by 1.209367, or divide by 0.8268784.

To reduce English cube measure to French, multiply by 0.8268784, or divide by 1.209367.

When one French cubic inch weighs 1 grain French, or contains 1 grain of any substance; one English cubic inch weighs or contains 0.67839 English grains.

To reduce the weight or contents of French cube measure in French grains, to the weight or contents of English cube measure in Troy grains, multiply by 0.67839.

French cube foot or inch.		*Eng. cube foot or inch.*	*French cube foot or inch.*		*Eng. cube foot or inch.*
1	=	1.2093+	6	=	7.2562
2	=	2.4187	7	=	8.4655
3	=	3·6181	8	=	9.6749
4	=	4.8374	9	=	10.8842
5	=	6.0468	10	=	12.0936

MEASURES OF CAPACITY FROM BAUME.

	Pint.	*chop.*	*demisetier.*	*poisson.*	*demipoisson.*	*oz.*
Pinte	1 =	2 =	4 =	8 =	16 =	32
Chopine		1 =	2 =	4 =	8 =	16
Demisetier			1 =	2 =	4 =	8
Poisson				1 =	2 =	4
Demipoisson					1 =	2
Once					=	1

The legal pint in common use in Paris seems to have been different from that now taken from Baumé, which perhaps is peculiar to apothecaries. Their relations are the following:

	Fr. cub. in.		*Eng. cub. in.*		*Eng. wine pint.*		*Tr. pound.*		*Litres.*
Common pinte	= 48	=	58.05	=	2.01	=	2.54	=	0.95
Baumé's pinte	= 49.52	=	59.89	=	2.07	=	2.62	=	0.98

Table shewing the relative value of the old and new French weights and measures in round numbers. (*Parmentier.*)

Kilogramme	=	2 livres, Poid de Marc
Demikilogramme	=	1 livre
Gramme	=	18 grains
Demigramme	=	9 grains
2 Grammes	=	½ gros
4 Grammes	=	1 gros
8 Grammes	=	2 gros
32 Grammes	=	1 once
Decigramme	=	2 grains
Demidecigramme	=	1 grain
3 Decigramme	=	6 grains
12 Decigramme	=	24 grains
1 Litre	=	1 pinte
Demilitre	=	1 chopine
Quart de Litre	=	demisetier

GERMAN.

COLOGNE WEIGHT.

Marc.	*Oz.*	*Loth.*	*Drs.*	*Pwts.*	*Hellers.*	*As.*	*Eschen.*	*Grs.*	*St. parts.*
1 =	8 =	16 =	64 =	256 =	512 =	1792 =	4352 =	6144 =	65536
	1 =	2 =	8 =	32 =	64 =	224 =	544 =	768 =	8192
		1 =	4 =	16 =	32 =	112 =	272 =	384 =	4096
			1 =	4 =	8 =	28 =	68 =	96 =	1024
				1 =	2 =	7 =	17 =	24 =	256

NUREMBERG, OR APOTHECARIES WEIGHT.

Pound.		*Ounces.*		*Drachms.*		*Scruples.*		*Grains.*		*Troy grs.*
1	=	12	=	96	=	288	=	5760	=	5388
		1	=	8	=	24	=	480	=	460.5
				1	=	3	=	60	=	57.5
						1	=	20	=	19.2
								1	=	0.96

Table shewing the Comparison between Grammes and Troy, French, and Nuremberg Apothecary Grains.

Gramme.		*Troy.*		*Poids de Marc.*		*Nuremberg.*
1	=	15.444	=	18.883	=	16.128
2	=	30.888	=	37.766	=	32.256
3	=	46.332	=	56.648	=	48.384
4	=	61.776	=	75.530	=	64.512
5	=	77.220	=	94.413	=	80.641
6	=	92.664	=	113.296	=	96.769
7	=	108.108	=	132.179	=	112.897
8	=	123.552	=	151.062	=	129.026
9	=	138.996	=	169.944	=	145.154
10	=	154.440	=	188.827	=	161.282

Swedish Weights and Measures, used by Bergman and Scheele.

The Swedish pound, which is divided like the English apothecary, or troy pound, weighs 6556 grains troy.

The kanne of pure water, according to Bergman, weighs 42250 Swedish grains, and occupies 100 Swedish cubical inches. Hence the kanne of pure water weighs 48083.719444 English troy grains, or is equal to 189.9413 English cubic inches; and the Swedish longitudinal inch is equal to 1.238435 English longitudinal inches.

From these data, the following rules are deduced:

1. To reduce Swedish longitudinal inches to English, multiply by 1.2384, or divide by 0.80747.
2. To reduce Swedish to English cubical inches, multiply by 1.9, or divide by 0.5265.
3. To reduce the Swedish pound, ounce, drachm, scruple, or grain, to the corresponding English troy denomination, multiply by 1.1382, or divide by .8786.
4. To reduce the Swedish kannes to English wine-pints, multiply by .1520207, or divide by 6.57804.
5. The lod, a weight sometimes used by Bergman, is the 32d part of the Swedish pound; therefore, to reduce it to the English troy pound, multiply by .03557, or divide by 28.1156.

Tables of Specific Gravities.

METALS.

Platinum	21.5
Gold	19.361
Tungsten	17.6
Mercury at —40°	15.612
——— at 47°	13.545
Sulphuret of ditto	10.
Palladium	11.871
Rhodium	11.+
Lead	11.352
Sulphuret of ditto	7.
Silver	10.510
—— sulphuret	7.2
Bismuth	9.822
——— sulphuret	6.131
Uranium	9.
Copper	8.895
Nickel	8.666
Molybdenum	8.600
————— sulphuret	4.73
Arsenic	8.310
Arsenic, sulphuret, red	3.225
————— yellow	5.315
Iron	7.788
—— sulphuret	4.518
—— supersulphuret	4.83
Cobalt	7.700
Tin	7.299
Zinc	6.861
Manganese	6.850
Antimony	6.712
——— sulphuret	4.368
Tellurium	6.115
Sodium	0.935
Potassium	0.85

INFLAMMABLES.

Sulphur, native	2.033
——— melted	1.990
Phosphorus	1.714
Diamond	3.521
Charcoal	2.+

SALINE SUBSTANCES.

Sulphuric acid	2.125	
Nitric	1.504	
Muriatic	1.194	
Acetic	1.0626	
Red vinegar	1.025	
White ditto	1.014	
Distilled	1.010	
Phosphoric	1.5575	
Citric	1.0345	
Arsenious	1.8731	
Potass	1.7085	H
	4.6215	K
—— sulphate	2.298	Wal
	2.636	Wat
	2.4073	H
—— sulphite	1.586	V
—— nitrate	1.933	Wat
	1.900	Wal
	1.9369	H
	2.15	F
—— muriate	1.836	K
—— carbonate	2.012	H
Potass, carbonate	2.749	M
—— supertartrate	1.953	H
	1.8745	M
—— tartrate	1.5567	H
Soda	1.336	H
—— sulphate	2.246	Wal
	1.380	Wat
	1.4457	H
—— muriate	2.125	F
	2.120	K
	2.143	Wat
	2.200	H
—— sub-borate	1.740	K
	1.720	Wal
	1.757	Wat
—— phosphate	1.333	H
—— subcarbonate	1.3591	H
	1.421	K
—— acetate	2.1	H
—— and potash tar.	1.757	Wat
Ammonia, liquid	0.9054	D
——— muriate	1.450	Wat
	1.453	Wal

SALINE SUBSTANCES.

Ammonia, muriate	1.420	K	Magnesia, carbonate	0.2941	H
——— carbonate	0.966	H	Barytes -	4.	K
	1.824	K		2.374	H
	1.5026	M	——— muriate	2.8257	H
	1.450	V	——— carbon. nat.	4.331	
			——— ——— art.	3.763	
Lime - -	2.3908	K	Alumina -	2.000	K
	2.37	M		0.8200	H
	1.5233	H	Alum -	1.7109	H
—— muriate	1.76	H		1.719	Wal
—— carbonate	2.7			1.757	Wat
Magnesia -	2.3298	K		1.738	F
	0.346	H		1.714	N
——— sulphate	1.6603	H		1.726	M

METALLIC SALTS.

Mercury, muriate	5.1398	H	Iron, sulphate of	1.812	Wat
	4.142	Wat	——— ——— calc.	2.636	Wat
——— submuriate	7.1758	H	Lead, sulphate	1.8742	H
——— phosphate	4.9835	H	——— carbonate	7.2357	
——— subsulphate	6.44	Wat	——— acetate	2.345	H
Copper, sulphate of	2.1943	H	Zinc, sulphate	2.3953	M
	2.230	Wat		1.933	Wat
——— acetate	1.779	H		1.912	H
Iron, sulphate of	1.8399	H		1.712	N
	1.880	Wal			

D. Davy. H Hassenfratz. K Kirwan. M Muschenbrock. Wal Wallerius. Wat Watson. F Fahrenheit. V Vauquelin. N. Newton.

EXTRACTS, GUMS, RESINS.

Acacia prunus spinosa	1.5153	Arecha (Catechu ?	1.4573
Aloes hepatic -	1.3586	Arnotto - -	0.5956
—— socotorine	1.3796	Asphaltum, cohesive	{ 1.450
Alouchi - -	1.0604		{ 2.060
Amber yellow transparent - -	1.0780	——— compact	{ 1.070
			{ 1.165
——— ——— opaque	1.0855	Assafœtida -	1.3275
——— red -	1.0834	Baras - -	1.0441
——— green -	1.0829	Bdellium -	1.1377
Ambergris -	{ 0.7800	Benzoin -	1.0924
	{ 0.9263	Bitumen of Judea	1.104
Ammoniac -	1.2071	Cachibou - -	1.0640
Anime, oriental	1.0284	Camphor -	0.9887
——— occidental	1.0426	Caoutchouc -	0.9335
Arabic - -	1.4523	Caragna -	1.1244
Arcanson -	1.0857	Catechu -	1.4573

EXTRACTS, GUMS, RESINS.

Cherry	1.4817	Opium	1.3365
Copal, opaque	1.1398	Opoponax	1.6226
—— transparent	1.0452	Resin of Jalap	1.2185
Cork	0.2400	Rosin	1.0772
Dragon's blood	1.2045	Sandarac	1.0920
Elemi	1.0682	Sagapenum	1.2008
Euphorbium	1.1244	Sarcocol	1.2684
Galbanum	1.2120	Scammony of Aleppo	1.2354
Galipot	1.0819	———— Smyrna	1.2743
Gamboge	1.2216	Inspissated juice of St John's wort	1.5263
Guaiac	1.2289	Storax	1.1098
Lac	1.1390	Sugar, white	1.6060
Honey	1.4500	Tacamahaca	1.0463
Hypociste	1.5263	Tragacanth	1.8161
Liquorice	1.7228	Turpentine	0.991
Indigo	0.7690	Wax, ouarouchi	0.8970
Ivy	1.2948	—— bees	0.9648
Labdanum	1.1862	—— white	0.9686
Mastic	1.0742	—— shoemakers	0.897
Myrrh	1.3600		
Olibanum	1.1732		

OILS.

Volatile.		*Fixed.*	
Cinnamon	1.044	Tallow	0.9419
Cloves	1.036	Fat of beef	0.9232
Lavender	0.894	——— mutton	0.9235
Mint	0.8982	——— veal	0.9342
Sage	0.9016	——— pork	0.9368
Thyme	7.9023	Naphtha	0.8475
Rosemary	9.9057	Butter	0.9423
Calamint	0.9116	Gaiva butter	0.8916
Scurvy-grass	0.9427	Oil of filberts	0.916
Wormwood	0.9073	——— walnut	0.9227
Tansy	0.9949	——— hemp-seed	0.9258
Chamomile	0.8943	——— poppies	0.9238
Savine	0.9294	——— rape-seed	0.9193
Fennel	0.9294	——— lint-seed	0.9403
——— seed	1.0083	——— whale	0.9233
Coriander seed	0.8655	——— ben	0.9119
Caraway seed	0.9049	——— beechmast	9.9176
Dill seed	0.9128	——— cod-fish	0.9233
Anise seed	0.9867	——— olives	0.9153
Juniper	0.8577	——— almonds	0.9170
Turpentine	0.8697	Spermaceti	0.9433
Amber	0.8867		
Orange flower	0.8798		
Hyssop	0.8892		

WOODS, BARKS, &c.

Cinchona - -	0.7840	Mahogany - -	1.0630
Logwood - -	0.9130	Red saunders -	1.1280
Madder - -	0.7650	Sassafras - -	0.4820

ALCOHOL, ETHERS.

Sulphuric - -	0.7396	Acetic - -	0.8664
Nitric - -	0.9088	Alcohol - -	0.8293
Muriatic - -	0.7296	Proof-spirit -	0.916

SPECIFIC GRAVITY OF GASES.

	Weights of 100 cubic inches in Troy grains.	*Specific gravity.*	*Authority.*
Hydrogen, - -	2.23	0.07321	Biot and Arrago.
Phosphuretted hydrogen,	13.265	0.4347	Sir H. Davy.
Ditto, - - -	25.98	0.8518	Dalton and Henry.
Arseniated hydrogen,	16.13	0.529	Tromsdorf.
Carburetted hydrogen,		0.538	Berthollet.
Ditto from stagnant water,	20.66	0.666	Dalton.
Ammonia, - -	18.18	0.596	Allen and Pepys.
Steam, - - -		0.622	Gay Lussac.
Hydrophosphoric, -	26.53	0.870	Sir H. Davy.
Carbonic oxide, -	30.19	0.967	Cruickshank.
Azote, - - -	29.55	0.9691	Biot and Arrago.
Olefiant, - - -	29.72	0.974	Thomson.
Air, - - -	30.50	1.000	Sir G. Schuckburgh.
Percarburetted hydrogen,		1.000	T. Saussure.
Nitrous gas, - -	32.	1.049	Sir H. Davy.
Ditto, - - -	31.684	1.0388	Berard.
Oxygen - -	33.82	1.1088	Allen and Pepys.
Ditto, - - -		1.10359	Biot and Arrago.
Sulphuretted hydrogen,	35 89	1.177	Sir H. Davy.
Ditto, - - -		1.1912	Gay Lussac and Thenard.
Muriatic acid, - -	38.97	1.278	Sir H. Davy and Biot.
Carbonic acid, - -	47.26	1.5495	Allen and Pepys.
Ditto, - - -	46.31	1.518	Saussure.
Nitrous oxide, - -	49.227	1.614	Sir H. Davy.
Vapour of alcohol, -	65.	2.100	Dalton.
Ditto, - - -		1.5	Gay Lussac.
Nitrous acid, - -		2.10999	Gay Lussac.
Sulphurous acid, -	66.89	2.193	Sir H. Davy.
Ditto, - - -		2.2553	Gay Lussac and Thenard.
Muriatic ether, - -		2.219	Thenard.
Vapour of sulphuric ether,	70.	2.250	Dalton.
Ditto, - - -		2.396	Gay Lussac.
Fluoboracic, -	72.31	2.370	John Davy.
Euchlorine - -	74.	2.409	
Hyperoxymuriatic acid,		2.41744	John Davy.
Carburetted sulphur, vapour,		2.670	Gay Lussac.
Nitric acid, - -	76.[illegible]	2.425	Sir H. Davy.
Chlorine, - -	76.50	2.5082	Sir H. Davy.
Silicated fluoric, -	91.19	2.990	John Davy.
Chloride of carbonic oxide,	111.91	3.669	John Davy.
Hydriodic, - -		4.4288	
Iodine in vapour, -	117.71		
Water, - - -	252.506		Fletcher,

SOLUTIONS OF SALTS at 42° FAHRENHEIT. WATSON.

	Saturated.	In 12 waters.
Lime	1.001	
Arsenious acid	1.005	
Sub-borate of soda	1.010	
Muriate of mercury	1.037	
Alum	1.033	
Sulphate of soda	1.052	1.029
——— potass	1.054	
Muriate of soda	1.198	1.059
Arseniate of potass	1.184	
Muriate of ammonia	1.072	1.026
Carbonate of ditto	1.077	
Oxalate of ammonia (Thomson)	1.0186	
Nitrate of potass	1.095	1.050
Tartrate of potass and soda	1.114	
Sulphate of copper	1.150	1.052
——— iron	1.157	1.043
——— magnesia	1.218	
——— zinc	1.386	1.045
Subcarbonate of potass	1.534	

Table of Specific Gravities indicated in the different Pharmacopœias.

	Dublin.	London.	Edinburgh.
Sulphuric ether	765		
Nitrous ether	900		
Spirit of nitrous ether	850		
Alcohol	815	815	
Rectified spirit (alcohol)	840	835	835
Proof spirit	930	930	935
Acetic acid	1070		
Distilled vinegar	1006		
Oxymuriatic acid	1003		
Muriatic acid	1170	1160	1170
——— diluted	1080		
Nitrous acid	1500	1500	1550
——— diluted	1280		
Sulphuric acid	1845	1850	1850
——— diluted	1090		
Solution of potass	1100	1050	
——— ammonia	936	960	
——— carbonate of ammonia	1095		
——— carbonate of soda, saturated	1220		
——— oxymuriate of potass	1087		
——— sulphuret of potass	1120		
Tincture of muriate of iron (red)	1050		

Table for reducing the Degrees of Baumé's Hydrometer to the Common Standard.

BAUMÉ'S HYDROMETER FOR LIQUIDS LIGHTER THAN WATER.

Temperature 55° Fahrenheit, or 10° Reaumur.

Deg.		*Sp. Gr.*	*Deg.*		*Sp. Gr.*	*Deg.*		*Sp. Gr.*	*Deg.*		*Sp. Gr.*
10	-	1.000	18	-	.942	26	-	.892	34	-	.847
11	-	.990	19	-	.935	27	-	.886	35	-	.842
12	-	.982	20	-	.928	28	-	.880	36	-	.837
13	-	.977	21	-	.922	29	-	.874	37	-	.832
14	-	.970	22	-	.915	30	-	.867	38	-	.827
15	-	.963	23	-	.909	31	-	.871	39	-	.822
16	-	.955	24	-	.903	32	-	.856	40	-	.817
17	-	.949	25	-	.897	33	-	.852			

LIQUIDS HEAVIER THAN WATER.

Deg.		*Sp. Gr.*	*Deg.*		*Sp. Gr.*	*Deg.*		*Sp. Gr.*	*Deg.*		*Sp. Gr.*
0	-	1.000	21	-	1.170	42	-	1.414	63	-	1.779
3	-	1.020	24	-	1.200	45	-	1.455	66	-	1.848
6	-	1.040	27	-	1.230	48	-	1.500	69	-	1.920
9	-	1.064	30	-	1.261	51	-	1.547	72	-	2.000
12	-	1.089	33	-	1.295	54	-	1.594			
15	-	1.114	36	-	1.333	57	-	1.659			
18	-	1.140	39	-	1.373	60	-	1.717			

HEAT.

CORRESPONDENCE BETWEEN DIFFERENT THERMOMETERS.

Fahrenheit's thermometer is universally used in this kingdom. In it the range between the freezing and boiling points of water is divided into 180 degrees; and as the greatest possible degree of cold was supposed to be that produced by mixing snow and muriate of soda, it was made the zero; hence the freezing point became 32°, and the boiling point 212°.

The Centigrade thermometer places the zero at the freezing point, and divides the range between it and the boiling point into 100°. This has long been used in Sweden, under the title of Celsius's thermometer.

Reaumur's thermometer, which was formerly used in France, divides the space between the freezing and boiling of water into 80°, and places the zero at the freezing point.

Wedgwood's pyrometer is only intended to measure very high temperatures. According to its author, its zero corresponds with 1077° of Fahrenheit's, and each degree of Wedgwood is equal to 130 of Farenheit. Guyton Morveau has, however, given good reason for believing that the zero is placed too high, and that the measure of the degree of this scale has been much overrated; and he accordingly fixes the zero of Wedgwood at 517.579 Fahrenheit, and reduces the measure of the degree of Wedgwood to 62.5.

De Lisle's thermometer is used in Russia. The graduation begins at the boiling point, and increases towards the freezing point. The boiling point is marked 0, and the freezing point 150.

Therefore $180° F = 100° C = 80° R = \frac{18}{13} W$, or $= \frac{180}{62.5} W$.

Formulae.

1. To reduce centigrade degrees to those of Fahrenheit, multiply by 9, and divide by 5, and to the quotient add 32, that is, $\frac{C \times 9}{5} + 32 = F$.

2. To reduce Fahrenheit's degrees to centigrade, $\frac{F - 32 \times 5}{9} = C$.

3. To reduce Reaumur's to Fahrenheit's, $\frac{R \times 9}{4} + 32 = F$.

4. To convert Fahrenheit to Reaumur, $\frac{F - 32 \times 4}{9} = R$.

5. To reduce Wedgwood's degrees to those of Fahrenheit, $W \times 130 + 1077 = F$; or, according to Guyton Morveau's estimate, $W \times 62.5 + 517.579 = F$.

6. Inversely, to reduce Fahrenheit to Wedgwood, $\frac{F - 1077}{130} = W$;

or according to Guyton Morveau, $\frac{F - 517.579}{62.5} = W$.

Table of the Effects of Heat.

1. FREEZING POINTS OF LIQUIDS.

Reaum.	*Cent.*	*Fahren.*	
		—90	Greatest artificial cold observed
—44	—66	—55	Strongest nitric acid freezes (Cavendish)
—35	—43	—46	Ether and liquid ammonia
—32	—39	—39	Mercury
—30	—37	—36	Sulphuric acid (Thomson)
—23	—30	—22	Acetous acid
—19	—24	—11	2 Alcohol, 1 water
—17	—14	—7	Brandy; Snow 3 parts, with salt 2
—14	—17	+1	Strongest sulphuric acid (Cavendish)
—7	—9	16	Oil of turpentine (Margueron)
—5	—6	20	Strong wines
—4	—5	23	Fluoric acid
			Oils of bergamot and cinnamon
—3	—4	25	Human blood
—2	—2.5	28	Vinegar
—1	--12.5	30	Milk
0	0	32	Water freezes
+2	+2.5	36	Olive oil
6	7	45	Sulphuric acid, specific gravity, 1·78 (Keir)
14	17	64	Oil of aniseeds, 50 (Thomson)

2. MELTING POINTS OF SOLIDS.

Reaum.	*Cent.*	*Fahren.*	
4	5	40	Equal parts sulphur and phosphorus.
22	28	82	Adipocire of muscle
29	36	97	Lard (Nicolson)
30	37	99	Phosphorus (Pelletier)
32	40	104	Resin of bile
34	43	109	Myrtle wax (Cadet)
36	45	112	Spermaceti (Bostock)
42	53	127	Tallow (Nicolson) (92 Thomson)
49	61	142	Bees wax
50	63	145	Ambergris (La Grange)
		150	Potassium
55	79	155	Bleached wax (Nicolson)
75	94	200	Sodium perfectly fluid
80	100	210	Bismuth 5 parts, tin 3, lead 2, 210 (Dalton)
	107		Iodine (Gay Lussac)
89	111	234	Sulphur (Hope)
90	116	235	Adipocire of biliary calculi (Fourcroy)
112	140	283	Tin and bismuth, equal parts
120	150	303	Camphor
134	168	334	Tin 3, lead 2; or tin 2, bismuth 1
182	227	442	Tin (Crichton) (413 Irvine)
190	238	460	Tin 1, lead 4
197	247	476	Bismuth (Irvine)
214	267	512	Tin (Guyton Morveau)

Reaum.	*Cent.*	*Fahren.*		*Wedg.*
258	325	612	Lead (Crichton (594 Irvine) (540 Newton)	
297	371	700	Zinc	
945	432	809	Antimony	
1678	2100	3807	Brass	21
2024	2530	4587	Copper	27
2082	2602	4717	Silver	28
2313	2780	5237	Gold	32
7475	9850	17977	Cobalt, cast iron	130
9131	11414	20577	Nickel	150
9325	11680	21097	Soft nails	154
9602	12801	21637	Iron	158
9708	12136	21877	Manganese	160
10280	12857	23177	Platina, Tungsten, Molybdena, Uranium, Titanium, &c.	170+

3. SOLIDS AND LIQUIDS VOLATILIZED.

Reaum.	*Cent.*	*Fahren.*	
29	36	98	Ether
48	60	140	Liquid ammonia
50	63	145	Camphor (Venturi)
61	77	170	Sulphur (Kirwan)
64	80	176	Alcohol (174 Black)
80	100	212	Water and essential oils
82	104	219	Phosphorus (Pelletier)
83	110	230	Muriate of lime (Dalton)
93	116	242	Nitrous acid
96	120	248	Nitric acid
112	140	283	White oxide of arsenic ?
226	282	540	Arsenic ?
232	290	554	Phosphorus in close vessels
239	299	570	Sulphur
248	310	590	Sulphuric acid (Dalton) (546 Black)
252	315	600	Linseed oil, Sulphur (Davy)
279	350	660	Mercury (Dalton) (644 Secondat) (600 Black)

4. MISCELLANEOUS EFFECTS OF HEAT.

Reaum.	*Cent.*	*Fahren.*	
—54	—68	—90	Greatest cold produced by Mr Walker
—36	—44	—50	Natural cold observed at Hudson's Bay
—24	—30	—23	Observed on the surface of the snow at Glasgow, 1780
—20	—25	—14	At Glasgow 1780
—14	—18	0	Equal parts, snow and salt
+5	+6	+43	Phosphorus burns slowly
12	15	59	Vinous fermentation begins
15	18	66	to 135, Animal putrefaction
19	24	75	to 80, Summer heat in Britain
20	25	77	Vinous fermentation rapid, acetous begins
21	26	80	Phosphorus burns in oxygen, (104 Gottling)

Reaum.	Cent.	Fahren.		Wedg.
25	31	88	Acetification ceases, phosphorus ductile	
28	35	96	to 100 Animal temperature	
33	41	107	Feverish heat	
40	50	122	Phosphorus burns vividly (Fourcroy) (148 Thomson)	
44	54	130	Ammonia disengaged from water	
59	74	165	Albumen coagulates (156 Black)	
120	150	303	Sulphur burns slowly	
		600	Boracium burns	
269	335	635	Lowest ignition of iron in the dark	
315	384	750	Iron bright in the dark	
341	427	800	Hydrogen burns, (1000 Thomson)	
342	428	802	Charcoal burns (Thomson)	
380	475	884	Iron red in twilight	
448	560	1050	Iron red hot in a common fire	
462	577	1077	Iron red in daylight	1
564	705	1300	Azotic gas burns	+2
737	986	1807	Enamel colours burned	6
1451	1814	2897	Diamond burns (Mackenzie) (5000 Morveau)	14
2313	2780	5237	Settling heat of plate glass	29
2880	3580	6507	Delft ware fired	40
3750	4680	8480	Working heat of plate glass	57
4450	5610	10177	Flint glass furnace	70
5370	6770	12257	Cream-coloured ware fired	86
5800	7330	13297	Worcester china vitrified	94
6270	7850	14337	Stone ware fired	102
6520	8150	14727	Chelsea china fired	105
6925	8650	15637	Derby china fired	112
7025	8770	15897	Flint glass furnace, greatest heat	114
7100	8880	16007	Bow china vitrified	121
7460	9320	16807	Plate glass greatest heat	124
7650	9600	17327	Smith's forge	125
9131	11414	20577	Hessian crucible fused	150
11106	13900	25127	Greatest heat observed	185
			Extremity of Wedgwood	240

Table of High Degrees of Heat, according to the correction of Wedgwood's scale by Guyton Morveau.

Reaum.	Cent.	Fahr.	Wedg.	
215.9	269 9	517.76	0	Red heat in day light
252.4	315.6	599.6		Linseed oil boils
257.8	322.2	612.		Lead melts
271.4	339.3	642.75	2	Mercury boils
299.2	374.	705.25	3	Zinc melts
382.6	478.2	892.74	6	Enamels melt
410.2	512.9	955.23	7	Antimony melts
438.1	547.6	1017.73	8	Copper 1 and tin 3 melt
465.8	582.3	1080.23	9	Silver 1 and tin 1 melt
521.8	651.8	1205.22	11	Copper and tin, equal parts, melt
632.6	790.7	1455.21	15	Copper 3 and tin 1 melt

Reaum.	*Cent.*	*Fahren.*	*Wedg.*	
799.2	998.9	1836.17	21	Brass melts
827.	1033.7	1892.67	22	Silver melts
965.9	1207.3	2205.15	27	Copper melts
1104.8	1380.9	2517.63	32	Gold melts
2715.8	3394.7	6196.40	90	Iron, sweating heat
2854.7	3568.3	6508.88	95	Iron, welding heat
3549.1	4486.3	8071.28	120	Porcelain of China softens
3688.	4609.9	8383.76	125	Smith's forge
3826.9	4783.5	8696.24	130	Cast iron melts
4243.6	5651.5	9633.68	155	Porcelain melts
4382.4	5825.1	10517.12	160	Manganese melts
4821.3	5998.7	10829.60	165	Heat of Macquer's furnace
4938.0	6172.3	11142.08	170	Furnace with three blasts
5076.9	6345.9	11454.56	175	Soft iron melts
*	*	*	*	Nickel melts
				Platinum melts

TABLES,

Frigorific Mixtures, selected from Mr Walker's Publication, 1808, *communicated by the Author.*

Frigorific Mixtures, *without Ice.*

Mixtures.		Thermometer sinks.	Degr. of cold produced.
Muriate of ammonia Nitrate of potash Water - -	5 parts 5 16	From + 50° to + 10°	40
Sulphate of soda Diluted nitric acid	3 parts 2	From + 50 to − 3	53
Sulphate of soda Nitrate of ammonia Diluted nitric acid	6 parts 5 4	From + 50 to — 14	64
Phosphate of soda Nitrate of ammonia Diluted nitric acid	9 parts 6 4	From + 50 to — 21	71

N. B. If the materials are mixed at a *warmer* temperature than that expressed in the table, the effect will be proportionally *greater*; thus, if the most powerful of these mixtures be made when the air is + 85°, it will sink the thermometer to + 2°.

Frigorific Mixtures, *with Ice.*

Mixtures.	Thermometer sinks.	Degr. of cold produced.
Snow, or pounded ice, 2 parts Muriate of soda, - 1	*From any Temperature.* to — 5°	*
Snow, or pounded ice, 12 parts Muriate of soda 5 Nitrate of ammonia 5	*From any Temperature.* to — 25	*
Snow - 3 Diluted sulphuric acid 2	From + 32 to — 23	55
Snow - 2 parts Cryst. muriate of lime 3	From + 32 to — 50	82

N. B. The reason for the *omissions* in the last column of this table is, the thermometer sinking in these mixtures to the degree mentioned in the preceding column, *and never lower,* whatever may be the temperature of the materials at mixing.

Combinations of Frigorific Mixtures.

Mixtures.	Thermometer sinks.	Degr. of cold produced.
Snow - - 3 parts Diluted nitric acid 2	From 0 to —46	46
Snow - - 8 parts Diluted sulphuric acid 3 Diluted nitric acid 3	From —10 to —56	46
Snow - - 2 parts Muriate of lime - 3	From —15 to —68	53
Snow - - 8 parts Diluted sulphuric acid 10	From —68 to —91	23

N. B. The materials in the first column are to be cooled, previously to mixing, to the temperature required, by mixtures taken from either of the preceding tables.

TABLES OF SIMPLE AFFINITY.

OXYGEN.
Carbon,
Manganese,
Zinc,
Iron,
Tin,
Antimony,
Hydrogen,
Phosphorus,
Sulphur,
Arsenic,
Nitrogen,
Nickel,
Cobalt,
Copper,
Bismuth,
Caloric?
Mercury,
Silver,
Arsenious acid,
Nitric oxide,
Gold,
Platinum,
Carbonic oxide,
Muriatic acid,
White oxide of manganese,
White oxide of lead.

OXYGEN *.
Titanium,
Manganese,
Zinc,
Iron,
Tin,
Uranium,
Molybdenum,
Tungsten,
Cobalt,
Antimony,
Nickel,
Arsenic,
Chromum,
Bismuth,
Lead,
Copper,
Tellurium,
Platinum,
Mercury,
Silver,
Gold.

CARBON.
Oxygen,
Iron,
Hydrogen.

NITROGEN.
Oxygen,
Sulphur?
Phosphorus,
Hydrogen.

HYDROGEN.
Chlorine,
Oxygen,
Iodine,
Sulphur,
Carbon,
Phosphorus,
Nitrogen.

SULPHUR. PHOSPHORUS?
Potass,
Soda,
Iron,
Copper,
Tin,
Lead,
Silver,
Bismuth,
Antimony,
Mercury,
Arsenic,
Molybdenum.

POTASS, SODA, AND AMMONIA.
Acids. Sulphuric,
Nitric,
Muriatic,
Phosphoric,
Fluoric,
Oxalic,
Tartaric,
Arsenic,
Succinic,
Citric,
Lactic,
Benzoic,
Sulphurous,
Acetic,
Mucic,
Acids. Boracic,
Nitrous,
Carbonic,
Prussic,
Oil,
Water,
Sulphur.

BARYTA.
Acids. Sulphuric,
Oxalic,
Succinic,
Fluoric,
Phosphoric,
Mucic,
Nitric,
Muriatic,
Suberic,
Citric,
Tartaric,
Arsenic,
Lactic,
Benzoic,
Acetic,
Boracic,
Sulphurous,
Nitrous,
Carbonic,
Prussic,
Sulphur,
Phosphorus,
Water,
Fixed oil.

STRONTIA.
Acids. Sulphuric,
Phosphoric,
Oxalic,
Tartaric,
Fluoric,
Nitric,
Muriatic,
Succinic,
Acetic,
Arsenic,
Boracic,
Carbonic.
Water.

LIME.
Acids. Oxalic,
Sulphuric,
Acids. Tartaric,
Succinic,
Phosphoric,
Mucic,
Nitric,
Muriatic,
Suberic,
Fluoric,
Arsenic,
Lactic,
Citric,
Malic,
Benzoic,
Acetic,
Boracic,
Sulphurous,
Nitrous,
Carbonic,
Prussic,
Sulphur,
Phosphorus,
Water,
Fixed oil.

MAGNESIA.
Acids. Oxalic,
Phosphoric,
Sulphuric,
Fluoric,
Arsenic,
Mucic,
Succinic,
Nitric,
Muriatic,
Tartaric,
Citric,
Malic?
Lactic,
Benzoic,
Acetic,
Boracic,
Sulphurous,
Nitrous,
Carbonic,
Prussic,
Sulphur.

ALUMINA.
Acids. Sulphuric,
Nitric,
Muriatic,
Oxalic,

* Vauquelin's table of the affinity of the metals for oxygen, according to the difficulty with which their oxides are decomposed by heat.

Tables of Simple Affinity,—continued.

Acids. Arsenic,
Fluoric,
Tartaric,
Succinic,
Mucic,
Citric,
Phosphoric,
Lactic,
Benzoic,
Acetic,
Boracic,
Sulphurous,
Nitrous,
Carbonic,
Prussic.

SILICA.

Acid. Fluoric,
Potass.

OXIDE OF PLATINUM.
OXIDE OF GOLD*.

Acids. Gallic,
Muriatic,
Nitric,
Sulphuric,
Arsenic,
Fluoric,
Tartaric,
Phosphoric,
Oxalic,
Citric,
Acetic,
Succinic,
Prussic,
Carbonic,
Ammonia.

OXIDE OF SILVER.

Acids. Gallic,
Muriatic,
Oxalic,
Sulphuric,
Mucic,
Phosphoric,
Sulphurous,
Nitric,
Arsenic,
Fluoric,
Tartaric,
Citric,
Lactic,
Succinic,
Acetic,
Prussic,

Acids. Carbonic,
Ammonia.

OXIDE OF MERCURY.

Acids. Gallic,
Muriatic,
Oxalic,
Succinic,
Arsenic,
Phosphoric,
Sulphuric,
Mucic,
Tartaric,
Citric,
Malic,
Sulphurous,
Nitric,
Fluoric,
Acetic,
Benzoic,
Boracic,
Prussic,
Carbonic.

OXIDE OF LEAD.

Acids. Gallic,
Sulphuric,
Mucic,
Oxalic,
Arsenic,
Tartaric,
Phosphoric,
Muriatic,
Sulphurous,
Suberic,
Nitric,
Fluoric,
Citric,
Malic,
Succinic,
Lactic,
Acetic,
Benzoic,
Boracic,
Prussic,
Carbonic,
Fixed oils,
Ammonia.

OXIDE OF COPPER.

Acids. Gallic,
Oxalic,
Tartaric,
Muriatic,
Sulphuric,

Acids. Mucic,
Nitric,
Arsenic,
Phosphoric,
Succinic,
Fluoric,
Citric,
Lactic,
Acetic,
Boracic,
Prussic,
Carbonic,
Fixed alkalies,
Ammonia,
Fixed oils.

OXIDE OF ARSENIC.

Acids. Gallic,
Muriatic,
Oxalic,
Sulphuric,
Nitric,
Tartaric,
Phosphoric,
Fluoric,
Succinic,
Citric,
Acetic,
Prussic,
Fixed alkalies,
Ammonia,
Fixed oils,
Water.

OXIDE OF IRON.

Acids. Gallic,
Oxalic,
Tartaric,
Camphoric,
Sulphuric,
Mucic,
Muriatic,
Nitric,
Phosphoric,
Arsenic,
Fluoric,
Succinic,
Citric,
Lactic,
Acetic,
Boracic,
Prussic,
Carbonic.

OXIDE OF TIN †.

Acids. Gallic,
Muriatic,
Sulphuric,
Oxalic,
Tartaric,
Arsenic,
Phosphoric,
Nitric,
Succinic,
Fluoric,
Mucic,
Citric,
Lactic,
Acetic,
Boracic,
Prussic,
Ammonia.

OXIDE OF ZINC.

Acids. Gallic,
Oxalic,
Sulphuric,
Muriatic,
Mucic,
Nitric,
Tartaric,
Phosphoric,
Citric,
Succinic,
Fluoric,
Arsenic,
Lactic,
Acetic,
Boracic,
Prussic,
Carbonic,
Fixed alkalies,
Ammonia.

OXIDE OF ANTIMONY.

Acids. Gallic,
Muriatic,
Benzoic,
Oxalic,
Sulphuric,
Nitric,
Tartaric,
Mucic,
Phosphoric,
Citric,
Succinic,
Fluoric,
Arsenic,
Lactic,

* Omitting the oxalic, citric, succinic, and carbonic, and adding sulphuretted hydrogen after ammonia.

† Bergman places the tartaric before the muriatic.

Tables of Simple Affinity,—continued.

Acids. Acetic,
Boracic,
Prussic,
Fixed alkalies,
Ammonia.

SULPHURIC ACID.
PRUSSIC *.
Baryta,
Strontia,
Potass,
Soda,
Lime,
Magnesia,
Ammonia,
Glucina,
Gadolina,
Alumina,
Zirconia,
Metallic oxides.

SULPHUROUS ACID.
SUCCINIC †.
Baryta,
Lime,
Potass,
Soda,
Strontia,
Magnesia,
Ammonia,
Glucina,
Alumina,
Zirconia,
Metallic oxides.

PHOSPHORIC ACID.
CARBONIC ‡.
Baryta,
Strontia,
Lime,
Potass,
Soda,
Ammonia,
Magnesia,
Glucina,
Alumina,
Zirconia,
Metallic oxides,
Silica.

PHOSPHOROUS ACID §.
Lime,
Baryta,
Strontia,
Potass,
Soda,
Ammonia,
Glucina,
Alumina,
Zirconia,
Metallic oxides.

NITRIC ACID.
MURIATIC ‖.
Baryta,
Potass,
Soda,
Strontia,
Lime,
Magnesia,
Ammonia,
Glucina,
Alumina,
Zirconia,
Metallic oxides.

FLUORIC ACID.
BORACIC ¶.
ARSENIC **.
TUNGSTIC.
Lime,
Baryta,
Strontia,
Magnesia,
Potass,
Soda,
Ammonia,
Glucina,
Alumina,
Zirconia,
Silica.

ACETIC ACID.
LACTIC. SUBERIC.
Baryta,
Potass,
Soda,
Strontia,
Lime,
Ammonia,
Magnesia,
Metallic oxides,
Glucina,
Alumina,
Zirconia.

OXALIC ACID.
TARTARIC.
CITRIC ††.
Lime,
Baryta,
Strontia,
Magnesia,
Potass,
Soda,
Ammonia,
Alumina,
Metallic oxides,
Water,
Alkohol.

BENZOIC ACID.
White oxide of arsenic,
Potass,
Soda,
Ammonia,
Baryta,
Lime,
Magnesia,
Alumina.

CAMPHORIC ACID.
Lime,
Potass,
Soda,
Baryta,
Ammonia,
Alumina.
Magnesia.

FIXED OILS.
Lime,
Baryta,
Potass,
Soda,
Magnesia,
Oxide of mercury,
Other metallic oxides,
Alumina.

ALKOHOL.
Water,
Ether,
Volatile oil,
Alkaline sulphurets.

SULPHURETTED HYDROGEN.
Baryta,
Potass,
Soda,
Lime,
Ammonia,
Magnesia,
Zirconia.

* With the omission of all after ammonia.

† Ammonia should come before magnesia; and strontia, glucina, and zirconia should be omitted.

‡ Magnesia should stand above ammonia, and alumina and silica should be omitted.

§ Ammonia should stand above magnesia.

‖ Silica should be omitted, and, instead of it, water and alcohol be inserted.

¶ Except silica.

** With the omission of strontia, metallic oxides, glucina, and zirconia.

†† Zirconia after alumina.

Relative Attractions at the lowest temperature of Visible Ignition, by Sir H. Davy.

OXYGEN.	CHLORINE.	SULPHUR.	PHOSPHORUS.
Potassium	Potassium	Potassium	Potassium
Sodium	Sodium	*Sodium*	*Sodium*
Barium	Zinc	Iron	Platinum
Boron	Iron	Copper	Zinc
Carbon	Lead	Palladium	Antimony
Manganesum	Silver	Lead	Sulphur.
Zinc	Antimony	*Silver*	
Iron	Bismuth		
Tin	Phosphorus		
Phosphorus	Copper		
Antimony	Sulphur		
Bismuth	Mercury		
Lead	Platinum		
Sulphur	Gold		
Arsenic			
Tungstenum			
Azote			
Palladium			
Mercury			
Silver			
Gold			
Platinum			

Cases of Mutual Decomposition.

1. FROM SIMPLE AFFINITY.

Sulphate of potass	with	Muriate of baryta
——— soda	—	Nitrate of potass
——— ammonia	—	Muriate of potass
——— magnesia	—	Carbonate of potass
Supersulphate of alumina	—	Muriate of lime
Nitrate of potass	—	——— baryta
——— ammonia	—	Phosphate of soda
Muriate of baryta	—	All the sulphates and nitrates
——— soda	—	Carbonate of potass
——— lime	—	Sub-borate of soda
——— ammonia	—	Carbonate of potass
Phosphate of soda	—	Muriate of ammonia
Sub-borate of soda	—	Carbonate of potass
Nitrate of silver	—	Muriate of soda
Acetate of lead	—	Citrate of potass
Sulphate of mercury	—	Muriate of soda
Soap of potass	—	——— soda
——— soda	—	Sulphate of lime

2. FROM COMPOUND AFFINITY.

Sulphate of baryta -	with	Carbonate of potass
——— baryta -	—	——— soda
——— potass -	—	Muriate of lime
——— soda -	—	Ditto
Muriate of baryta -	—	Phosphate of soda
Ditto - -	—	Sub-borate of soda
Ditto - -	—	Carbonate of potass
Ditto - -	—	——— soda
Ditto - -	—	——— ammonia
Muriate of lime -	—	——— ammonia
Phosphate of soda -	—	——— lime
Acetate of lead -	—	Sulphate of zinc
Ditto - -	—	Nitrate of mercury.

Cases of Disposing Affinity.

The formation of water by the action of the sulphuric acid on the compound oxides.

The oxidation of metals by water, in consequence of the presence of an acid.

Table of Incompatible Salts *.

SALTS	INCOMPATIBLE WITH
1. Fixed alkaline sulphates	Nitrates of lime and magnesia Muriates of lime and magnesia
2. Sulphate of lime	Alkalies Carbonate of magnesia Muriate of barytes
3. Alum	Alkalies Muriate of barytes Nitrate, muriate, carbonate of lime Carbonate of magnesia
4. Sulphate of magnesia	Alkalies Muriate of barytes Nitrate and muriate of lime
5. Sulphate of iron	Alkalies Muriate of barytes Earthy carbonates
6. Muriate of barytes	Sulphates Alkaline carbonates Earthy carbonates

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* That is, salts which cannot exist together in solution, without mutual decomposition.

SALTS	INCOMPATIBLE WITH
7. Muriate of lime	Sulphates, except of lime Alkaline carbonates Carbonate of magnesia
8. Muriate of magnesia	Alkaline carbonates Alkaline sulphates
9. Nitrate of lime	Alkaline carbonates Carbonates of magnesia and alumina Sulphates, except of lime

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Table of the Specific Heats of equal Weights of some Bodies compared with Water.

	Crawford.	*Dalton's hypothesis.*	*De La Roche and Berard.*
Water	1.000	1.000	1.000
Atmospheric air	1.790	1.759	0.2669
Hydrogen gas	21.400	9.382	3.2936
Carbonic acid gas	1.045	0.491	0.2210
Oxygen gas	4.749	1.333	0.2361
Azotic gas	0.793	1.866	0.2754
Nitrous oxide	-	0.549	0.2369
Nitrous gas	-	0.777	
Olefiant gas	-	1.555	0.4207
Carbonic oxide gas	-	0.777	0.2884
Steam	-	1.166	0.8470
Ammoniacal gas	-	1.555	
Carburetted hydrogen	-	1.333	
Nitric acid gas	-	0.491	
Sulphuretted hydrogen	-	0.583	
Muriatic acid gas	-	0.424	
Ether vapour	-	0.848	
Alcohol vapour	-	0.586	

Colour of the Precipitates thrown down from Metallic Solutions by various Re-agents. **Henry.**

Metal.	*Prussiated Alkalies.*	*Tincture of Galls.*	*Water impregnated with Sulphuretted Hydrogen.*	*Hydrosulphurets.*
Gold	Yellowish-white	Solution turned green, precipitate brown of reduced gold	Yellow	Yellow
Platina	No precipitate but an orange one by prussiate of mercury	Dark-green, becoming paler	Precipitated in a metallic state	
Silver	White	Yellowish brown	Black	Black
Mercury	White changing to yellow	Orange yellow	Black	Brownish black
Palladium	Olive * deep orange †		Dark-brown	Dark-brown
Rhodium	No precipitate			No precipitate
Iridium	None; colour discharged	None; colour discharged		
Osmium		Purple changing to vivid blue		
Copper	Bright reddish-brown	Brownish	Black	Black
Iron 1 green salts	White changing to blue	No precipitate	Not precipitated	Black
Iron 2 red salts	Deep blue	Black		
Nickel	Green	Greyish-white	Not precipitated	Black
Tin	White	No precipitate	Brown	Black
Lead	White	White	Black	Black
Zinc	White	No precipitate	Yellow	White
Bismuth	White	Orange	Black	Black
Antimony	White	A white oxide from dilution	Orange	Orange
Tellurium	No precipitate	Yellow		Blackish
Arsenic	White	Little change	Yellow	Yellow
Cobalt	Brownish-yellow	Yellowish white	Not precipitated	Black
Manganese	Yellowish white	No precipitate	Not precipitated	White
Chrome	Green	Brown		Green
Molybdena	Brown	Deep-brown	Brown	
Uranium	Brownish-red	Chocolate		Brownish-yellow
Tungsten				
Titanium	Grass-green with some brown	Reddish-brown	Not precipitated	Grass-green
Columbium	Olive	Orange		Chocolate
Tantalium				
Cerium		Yellowish		Brown, becoming deep-green

* Chenevix † Wollaston

Table of the Solubility of Saline and other Substances, in 100 parts of Water, at the Temperature of 60° *and* 212°

	60°	212°
ACIDS.		
Sulphuric	unlimited	unlimited
Nitric	do	do
Acetic	do	do
Prussic	do	do
Phosphoric, Tartaric, Malic, Lactic, Laccic — very soluble		
Arsenic	150	
Arsenious acid	1.25	6.
Citric	133	200
Oxalic	50	100
Gallic	8.3	66
Boracic	2.8	8
Mucic	0.84	1.25
Succinic	{ 4 / 1.04	50
Suberic	0.69	50
Camphoric	1.04	8.3
Benzoic	0.208	4.17
Molybdic		0.1
Chromic, unknown		
Tungstic, insoluble		
SALIFIABLE BASES.		
Potass	50	more
Soda, somewhat less than potass		
Baryta	5	50
—— crystallized	57	unlimited
Strontia	0.6	
—— crystallized	1.9	50
Lime	0.2	
SALTS.		
Sulphate of potass	6.25	20
Supersulphate of potass	50	100 +
Sulphate of soda	37.4	125
—— of ammonia	50	100
—— magnesia	100	133
—— alumina, very soluble, proportion unknown		
Supersulphate of alumina and potass } alum	5	133
—— —— ammonia } alum		
Nitrate of baryta	8	25
—— potass	14.25	100 +
—— soda	33	100

	Temperatures 60°	212°
Nitrate of strontia - -	100	200
——— lime - - -	400	any quantity
——— ammonia - -	50	200
——— magnesia - -	100	100 +
Muriate of baryta - - -	20	
——— potass - - -	33	
——— soda - - -	35.42	36.16
——— strontia - - -	150	any quantity
——— lime - - -	200	
——— ammonia - - -	33	100
——— magnesia - -	100	
Oxymuriate of potass - -	6	40
Phosphate of potass, very soluble		
——— soda - - -	25	50
——— ammonia - -	25	25+
——— magnesia - -	6.6	
Sub-borate of soda - - -	8.4	50.
Carbonate of potass - - -	25	83.3
——— soda - - -	50	100+
——— magnesia - -	2	
——— ammonia - -	50+	100
Acetate of potass - -	100	
——— soda - -	35	
——— ammonia, very soluble		
——— magnesia, ditto		
——— strontia - - -		40.8
Supertartrate of potass - -	1.67	3.3
Tartrate of potass - - -	25	
——— and soda - -	25	
Oxalate of potass - -	33	
——— ammonia - -	4.5	
Super-oxalate of potass - - -		10
Citrate of potass, very soluble		
Prussiate of potass and iron		
Nitrate of silver, very soluble		
Muriate of mercury (corrosive sublimate)	5	50
Sulphate of copper - -	25	50
Acetate of copper, very soluble		
Sulphate of iron - - -	50	133
Muriate of iron, very soluble		
Tartrate of iron and potass		
Acetate of mercury		
Sulphate of zinc - - -	44	44+
Acetate of zinc, very soluble		
——— of lead (Ed. Pharm.) Bostock	27	
——— as it exists in Goulard's extract, more sol.		
Tartrate of antimony and potass, Duncan	6.6	83
Alkaline soaps, very soluble		
Sugar - - - -	100	any quantity

	Temperatures 60	212°
Gum, very soluble		
Starch	0	very soluble
Jelly	sparingly	abundantly
Gelatine	soluble	more so
Urea, very soluble		
Cinchonin		

Salts not soluble in 100 *times their Weight of Water.*

Sulphates of baryta, strontia, and lime, and subsulphate of mercury.
Phosphates of baryta, strontia, lime, magnesia, and mercury.
Fluate of lime.
Carbonates of baryta, strontia, and lime.
Muriates of lead and silver, and submuriate of mercury (Calomel).
Subacetate of copper.

Solubility of Saline and other Substances in 100 *Parts of Alcohol, at the temperature of* 176°

All the acids, except the sulphuric, nitric, and oxymuriatic, which decompose it, and the phosphoric and metallic acids.
Potass, soda, and ammonia, very soluble.
Red sulphate of iron.

Muriate of iron	100
——— lime	100
Nitrate of ammonia	89.2
Muriate of mercury	88.3
Camphor	75.
Nitrate of silver	41.7
Refined sugar	24.6
Muriate of ammonia	7.1
Arseniate of potass	3.75
Nitrate of potass	2.9
Arseniate of soda	1.7

Muriate of soda (Mr Chenevix). Alkaline soaps. Magnesian do. Extractive. Tannin. Volatile oils. Adipocire. Resins. Urea. Cinchonin.

Substances insoluble in Alcohol.

Earths.
Phosphoric and metallic acids.
Almost all the sulphates and carbonates.
The nitrates of lead and mercury.
The muriates of lead, silver and soda.
The sub-borate of soda.
The tartrate of soda and potass, and the supertartrate of potass.
Fixed oils, wax, and starch.
Gum, caoutchouc, suber, lignin, gelatin, albumen, and fibrin.

Table of the Solubility of Fats in 100 parts of alcohol and sulphuric ether. By P. F. G. Boullay.

	Alcohol, sp. gr. 0.828. 48 Fahr.	74 boiling.	Ether. 48 Fahr.
Hogs lard	1.04	1.74	25
Mutton suet	0.69	1.39	10
Spermaceti	1.39	8.33	20

Table of the Solubility of Fixed Fluid Oils in 100 parts of Alcohol and Acetic Ether at 55° Fahr. By L. A. Planche.

	Alcohol sp. gr. 0.28.	Acetic Ether.
Castor oil	every proportion.	800 and upwards.
Poppy seed oil, a year old	0.8	-
Linseed oil	0.6	50.
Walnut oil	0.6	50.
Poppy seed oil, new	0.4	33.
Beech mast oil	0.4	40.
Olive oil	0.3	20.
Oil of sweet almonds	0.3	25.
Oil of bitter almonds	0.3	-
Nut oil	0.3	14.

Proportion of Oil and Suet in various Fats according to Braconnot.

	Oil.	*Suet.*
Melted butter, summer	60	40
———— winter	35	65
Hogs lard	62	38
Beef marrow	24	76
Mutton marrow	74	26
Goose grease	72	32
Turkey grease	74	26
Olive oil	72	28
Oil of almonds	76	24
——— colsa	54	46

Table of the Absorption of Gases by 100 Parts of Water at 60° F.

	Volume.	
Nitric acid - - -	361000.	
Muriatic acid - - -	51500.	Thomson
Ammonia - - - -	47500.	Davy
——— - - -	78000.	Thomson
Sulphurous acid - -	12109.	Fourcroy
——— - -	3300.	Thomson
——— - -	1440.	Priestley
Carbonic acid - - -	108.	Henry
Sulphuretted hydrogen - -	108.	Henry
Nitrous oxide - - -	86.	Henry
Olefiant gas - - -	12.5	Dalton
Nitric oxide - - -	5.	Henry
Oxygen - - -	3.7	Henry
Phosphuretted hydrogen - -	2.14	Henry
Carbonic oxide - - -	2.01	Henry
Hydrogen - - -	1.61	Henry
Nitrogen - - -	1.53	Henry
Carburetted hydrogen - - -	1.40	Henry

Table of Efflorescent Salts (Cadet de Vaux).

288 grains of	in days		lost grains
Sulphate of soda -	61	-	203
Phosphate of soda -	39	-	91
Carbonate of soda -	51	-	86

Table of Deliquescent Salts (Cadet de Vaux).

288 grains of	in days		absorbed
Acetate of potass -	146	-	700
Muriate of lime - -	124	-	684
——— manganese -	105	-	629
Nitrate of manganese -	89	-	527
——— zinc - -	124	-	495
——— lime - -	147	-	448
Muriate of magnesia -	139	-	441
Nitrate of copper - -	128	-	397
Muriate of antimony	124	-	388
——— alumina -	149	-	342
Nitrate of alumina -	147	-	300
Muriate of zinc -	76	-	294
Nitrate of soda -	137	-	257
——— magnesia -	73	-	207
Acetate of alumina -	104	-	202
Supersulphate of alumina -	121	-	202
Muriate of bismuth -	114	-	174
Superphosphate of lime -	93	-	165
Muriate of copper -	119	-	148

Table of the Weight of the Ultimate Particles or Atoms of Bodies, and of the constitution of compound bodies, according to M. Dalton's theory of definite proportions; drawn up by Dr T. Thomson.

	Weight of an atom.
Oxygen	1·000
Hydrogen	0·132
Carbon	0·751
Azotē	1·803
Phosphorus	2·618
Sulphur	2·000
Boron	0·733
Chlorine	4·498
Iodine	11·160
Potassium	5·000
Sodium	5·882
Barytium	8·731
Strontium	5·900
Calcium	2·620
Magnesium	1·577
Ammonium	1·149
Gold	24·968
Platinum	12·161
Silver	13·714
Mercury	25·000
Palladium	14·204
Copper	8·000
Iron	7·143
Nickel	7·305
Tin	14·705
Lead	12·987
Zinc	4·095
Bismuth	8·994
Antimony	11·249
Tellurium	4·027
Arsenic	6·000
Cobalt	7·326
Manganese	7·115
Uranium	12·000
Molybdenum	6·013
Tungsten	12·121
Cerium	11·487
Chromium	4·720
Titanium	18·010
Rhodium	14·903

	Number of atoms.		Weight of an integrant particle.
Water, composed of	1 *o* +	1 *h*	1·132
Carbonic oxide	1 *o*	1 *c*	1·751
Carbonic acid	2 *o*	1 *c*	2·751
Nitrous oxide	1 *o*	1 *a*	2·803
Nitrous gas	2 *o*	1 *a*	3·803
Nitrous acid	3 *o*	1 *a*	4·803
Nitric acid	5 *o*	1 *a*	6.803
Phosphorous acid	2 *o*	1 *p*	4·618
Phosphoric acid	3 *o*	1 *p*	5·618
Sulphurous acid	2 *o*	1 *s*	4·000
Sulphuric acid	3 *o*	1 *s*	5·000
Oxalic acid	3 *o*	2 *c* + 1 *h*	4·634

	Number of atoms.	Weight of an integrant particle.
Potash	1 *p* + 1 *o*	6·000
Peroxide of potash	1 *p* 3 *o*	8·000
Soda	1 *s* 2 *o*	7·882
Peroxide of soda	1 *s* 3 *o*	8·882
Barytes	1 *b* 1 *o*	9·731
Strontia	1 *st* 1 *o*	6.900
Lime	1 *l* 1 *o*	3.620
Magnesia	1 *m* 1 *o*	2·577
Alumina		2·136
Glucina		3·600
Yttria		8·400
Zirconia		5·656
Silica		4·066
Protoxide of gold	1 *g* + 1 *o*	25·968
Peroxide of gold	1 *g* 3 *o*	27·968
Protoxide of platinum	1 *p* 1 *o*	13·161
Peroxide of platinum	1 *p* 2 *o*	14·161
Oxide of silver	1 *s* 1 *o*	14·714
Protoxide of mercury	1 *m* 1 *o*	26·000
Peroxide of mercury	1 *m* 2 *o*	27·000
Protoxide of palladium	1 *p* 1 *o*	15·204
Peroxide of palladium	1 *p* 2 *o*	16·204
Protoxide of copper	1 *c* 1 *o*	9·000
Peroxide of copper	1 *c* 2 *o*	10·000
Deutoxide of iron	1 *i* 2 *o*	9·143
Peroxide of iron	1 *i* 3 *o*	10·143
Deutoxide of nickel	1 *n* 2 *o*	9·305
Peroxide of nickel	1 *n* 3 *o*	10·305
Deutoxide of tin	1 *t* 2 *o*	16·705
Tritoxide of tin	1 *t* 3 *o*	17·705
Peroxide of tin	1 *t* 4 *o*	18·705
Protoxide of lead	1 *l* 1 *o*	13·987
Red oxide of lead	2 *l* 3 *o*	28·974
Deutoxide of lead	1 *l* 2 *o*	14·987
Oxide of zinc	1 *z* 1 *o*	5·095
Oxide of bismuth	1 *b* 1 *o*	9·994
Tritoxide of antimony	1 *a* 3 *o*	14·249
White oxide of antimony	1 *a* 4 *o*	15·249
Antimonic acid	1 *a* 6 *o*?	17·249
Oxide of tellurium	1 *t* 1 *o*	5·027
Deutoxide of arsenic	1 *a* 2 *o*	8·000
Arsenic acid	1 *a* 3 *o*	9·000
Deutoxide of cobalt	1 *c* 2 *o*	9·326
Peroxide of cobalt	1 *c* 3 *o*	10·326
Protoxide of manganese	1 *m* 1 *o*	8·115
Deutoxide of manganese	1 *m* 2 *o*	9·115
Tritoxide of manganese	1 *m* 3 *o*	10.115
Peroxide of manganese	1 *m* 4 *o*	11·115
Protoxide of uranium	1 *u* 1 *o*	13·000
Peroxide of uranium	1 *u* 3 *o*	15·000
Deutoxide of molybdenum	1 *m* 2 *o*	8·013
Peroxide of molybdenum	1 *m* 3 *o*	9·013
Deutoxide of tungsten	1 *t* 2 *o*	14·121
Peroxide of tungsten	1 *t* 3 *o*	15·121
Deutoxide of cerium	1 *c* 2 *o*	13·487
Peroxide of cerium	1 *c* 3 *o*	14·487
Green oxide of chromium	1 *c* 2 *o*	6·720

	Number of atoms.		Weight of an integrant particle.
Brown oxide of chromium	1 c +	3 o	7·720
Chromic acid	1 c	4 o	8·720
Protoxide of titanium	1 t	1 o	19·010
Peroxide of titanium	1 t	2 o	20·010
Protoxide of rhodium	1 rh	1 o	15·903
Deutoxide of rhodium	1 rh	2 o	16·903
Peroxide of rhodium	1 rh	3 o	17·903
Olefiant gas	1 h	1 c	0·883
Carburetted hydrogen	2 h	1 c	1·015
Ammonia	1 h	1 a	1·935
Hydrophosphorous gas	4 h	1 p	3·146
Phosphuretted hydrogen	3 h	1 p	3·014 ?
Sulphuretted hydrogen	1 h	1 s	2·132
Chloride of oxygen	1 ch	1 o	5·498
Muriatic acid	1 ch	2 h	4·762
Chloride of sulphur	1 ch	1 o	6·498
Prochloride of phosphorus	1 ch	1 p	6·241
Perchloride of phosphorus	2 ch	1 p	10·996
Chloride of azote	4 ch	1 a	19·705
Chloride of potassium	1 ch	1 p	9·498
Chloride of sodium	2 ch	1 s	14·878
Chloride of ammonium	1 ch	1 am	5·647
Chloride of barytium	1 ch	1 b	13·229
Chloride of strontium	1 ch	1 str	10·398
Chloride of calcium	1 ch	1 c	7·118
Chloride of magnesium	1 ch	1 m	6·075
Chloride of silver	1 ch	1 s	18·212
Prochloride of mercury	1 ch	1 m	29·498
Perchloride of mercury	2 ch	1 m	34.996
Prochloride of copper	1 ch	1 c	12·498
Perchloride of copper	2 ch	1 c	16·996
Prochloride of iron	2 ch	1 i	16·139
Perchloride of iron	4 ch	1 i	25·135
Prochloride of tin	2 ch	1 t	23·701
Perchloride of tin	4 ch	1 t	32·697
Chloride of lead	2 ch	1 l	21·983
Chloride of zinc	1 ch	1 z	8·593
Chloride of bismuth	1 ch	1 b	13·493
Chloride of antimony	2 ch	1 a	20·245
Chloride of arsenic	2 ch	1 a	14 996
Chloride of manganese	2 ch	1 m	16·111
Chloride of carbonic oxide	1 ch	1 c. ox	6·249
Sulphuret of carbon	1 c	2 s	2·751
Phosphuret of sulphur	1 p	1 s	4·618
Sulphuret of gold	1 g	3 s	30·968
Sulphuret of platinum	1 p	2 s	16·161
Sulphuret of silver	1 s	1 s	15·714
Prosulphuret of mercury,	1 m	1 s	27·000
Persulphuret of mercury or cinnabar	1 m	2 s	29·000
Sulphuret of copper	1 c	1 s	10·000
Magnetic pyrites	1 i	2 s	11·143
Cubic pyrites	1 i	4 s	15 143
Sulphuret of nickel	1 n	1 s	9·305
Prosulphuret of tin	1 t	1 s	16·705
Persulphuret of tin or mosaic gold	1 t	2 s	18·705

	Number of atoms.		Weight of an integrant particle.
Sulphuret of lead	1 *l* +	1 *s*	14·987
Persulphuret of lead	1 *l*	2 *s*	16·987
Sulphuret of zinc	1 *z*	1 *s*	6·095
Sulphuret of bismuth	1 *b*	1 *s*	10·994
Sulphuret of antimony	1 *a*	2 *s*	15.249
Sulphuret of tellurium	1 *t*	2 *s*	8·027
Sulphuret of arsenic or realgar	1 *a*	1 *s*	8·000
Orpiment	1 *a*	2 *s*	10 000
Sulphuret of cobalt	1 *c*	1 *s*?	9·326 ?
Sulphuret of manganese	1 *m*	1 *s*	9·115
Sulphuret of molybdenum	1 *m*	2 *s*	10·013
Sulphuret of potassium	1 *p*	1 *s*	7·000
Sulphuret of potash	1 *p*	1 *s*	8·000
Sulphuret of sodium	1 *s*	2 *s*	9·882
Carburet of phosphorus	1 *c*	1 *p*	3·369 ?
Hydrate of potash	1 *p*	1 *w*	7·132
Hydrate of soda	1 *s*	1 *w*	9·014
Hydrate of lime	1 *l*	1 *w*	4·752
Hydrate of barytes	1 *b*	1 *w*	10·863
Hydrate of strontian	1 *st*	1 *w*	8·032
Hydrate of magnesia	2 *m*	1 *w*	6·286
Hydrate of alumina	1 *a*	1 *w*	3·268
Hydrate of glucina	1 *g*	1 *w*	4·732
Hydrate of yttria	1 *y*	3 *w*	11·796
Hydrate of zirconia	1 *z*	1 *w*	6·788
Hydrate of silica	1 *si*	1 *w*	5·198
Hydrosulphuric acid, or acid of 1·85	1 *s*	1 *w*	6·132
2d hydrate of sulphuric acid, or acid of 1·780	1 *s*	2 *w*	7·264
3d hydrate of sulphuric acid, or acid of 1·65	1 *s*	3 *w*	8·396
Hydronitric acid, or acid of 1·620	2 *n*	1 *w*	14·738
2d hydrate of nitric acid, or acid of 1·54	1 *n*	1 *w*	7·935
3d hydrate of nitric acid, or acid of 1·42	1 *n*	2 *w*	9·067
4th hydrate of nitric acid, or acid of 1·350	1 *n*	3 *w*	10·199
Hydrophosphorous acid	2 *p*	1 *w*	5·750
Hydrate of boracic acid	1 *b*	3 *w*	9·106
Hydrate of peroxide of copper	1 *c*	1 *w*	11·132
Hydrate of black oxide of iron	1 *i*	1 *w*	10·275
Hydrate of red oxide of iron	1 *i*	1 *w*	11·275
Hydrate of deutoxide of tin	1 *t*	1 *w*	17·837
Hydrate of peroxide of tin	1 *t*	1 *w*	18·969
Hydrate of deutoxide of nickel	1 *n*	2 *w*	11·569
Hydrate of deutoxide of cobalt	1 *c*	1 *w*	10·458
Hydrate of protoxide of manganese	1 *m*	1 *w*	9·245
Hydrate of oxide of arsenic	1 *a*	1 *w*	9·132
Sulphate of potash	1 *s*	1 *p*	11·000
Supersulphate of potash	2 *s*	1 *p*	16·000
Sulphate of soda	1 *s*	2 *so*	20·764
Sulphate of ammonia	1 *s*	2 *a*	8·870
Sulphate of magnesia	1 *s*	1 *m*	7·577
Sulphate of lime	1 *s*	1 *l*	8·620

	Number of atoms.		Weight of an integrant particle.
Sulphate of barytes	1 *s*	1 *b*	14·731
Sulphate of strontian	1 *s*	1 *str*	11·900
Sulphate of alumina	1 *s*	1 *a*	7·136
Subsulphate of alumina	1 *s*	2 *a*	9·272
Sulphate of yttria	1 *s*	2 *y*	13·400
Sulphate of glucina	1 *s*	1 *g*	8·600
Sulphate of zirconia	1 *s*	1 *z*	10·656
Alum	6 *s*	5 *al* + 1 *p*	46·680
Sulphate of potash and ammonia	2 *s*	1 *p* 2 *a*	19·870
Sulphate of potash and magnesia	3 *s*	1 *p* 2 *m*	26·154
Sulphate of soda and ammonia	5 *s*	2 *so* 8 *a*	56·244
Sulphate of soda and magnesia	4 *s*	2 *so* 3 *m*	43·495
Sulph. of magnesia and ammonia	3 *s*	2 *m* 2 *a*	24·024
Supersulphate of copper	2 *s*	1 *c*	20·000
Sulphate of copper	1 *s*	1 *c*	15·000
Subsulphate of copper	1 *s*	2 *c*	25·000
Supersulphate of iron	2 *s*	1 *i*	19·143
Sulphate of iron	1 *s*	1 *i*	14·143
Subsulphate of iron	2 *s*	3 *i*	37·429
Persupersulphate of iron	3 *s*	1 *i*	25·143
Sulphate of lead	1 *s*	1 *l*	18·987
Sulphate of zinc	1 *s*	1 *z*	10·095
Sulphate of mercury	1 *s*	1 *m*	31·000
Persulphate of mercury	1 *s*	1 *m*	32·000
Sulphate of silver	1 *s*	1 *si*	19·714
Sulphate of bismuth	1 *s*	1 *b*	14·994
Sulphate of nickel	1 *s*	1 *n*	14.305
Sulphate of cobalt	2 *s*	1 *c*	19·326
Sulphate of manganese	2 *s*	1 *m*	19·115
Sulphate of uranium	1 *s*	1 *u*	20·000
Persulphate of platinum	2 *s*	1 *p*	24·161
Nitrate of potash	1 *n*	1 *p*	12·803
Nitrate of soda	2 *n*	1 *s*	21·438
Nitrate of ammonia	1 *n*	1 *a*	8·868
Nitrate of magnesia	1 *n*	1 *m*	9·380
Nitrate of lime	1 *n*	1 *l*	10.423
Nitrate of barytes	1 *n*	1 *b*	16·534
Nitrate of strontian	1 *n*	1 *str*	13·703
Nitrate of amm. and magnesia	4 *n*	3 *m* + 1 *a*	35·878
Nitrate of copper	2 *n*	1 *c*	23·606
Subnitrate of copper	1 *n*	2 *c*	26·803
Nitrate of iron	2 *n*	1 *i*	22·749
Pernitrate of iron	3 *n*	1 *i*	30·552
Nitrate of zinc	1 *n*	1 *z*	11·942
Nitrate of lead	1 *n*	1 *l*	20·790
1st Subnitrate of lead	1 *n*	2 *l*	34·777
2d Subnitrate of lead	1 *n*	3 *l*	48·764
3d Subnitrate of lead	1 *n*	6 *l*	90·725
Nitrate of nickel	3 *n*	1 *nick*	29·714
Subnitrate of nickel	1 *n*	7 *nick*	71·938
Nitrate of silver	1 *n*	1 *s*	21·517
Nitrate of mercury	1 *n*	1 *m*	32·803
Pernitrate of mercury	1 *n*	2 *m*	60·805
Subnitrate of platinum	1 *n*	4 *pl*	63·447
Nitrate of bismuth	1 *n*	1 *b*	16·797
Nitrate of uranium	1 *n*	1 *u*	21·803
Bicarbonate of potass	2 *c*	1 *p*	11·502

	Number of atoms.		Weight of an integrant particle.
Carbonate of potash	1 *c*	1 *p*	8·751
Carbonate of soda	3 *c*	1 *s*	16·135
Subcarbonate of soda	2 *c*	1 *s*	13·384
Bicarbonate of ammonia	2 *c*	1 *a*	7·437
Carbonate of ammonia	1 *c*	1 *a*	4·686
Subcarbonate of ammonia	1 *c*	2 *a*	6·621
Carbonate of lime	1 *c*	1 *l*	6·371
Carbonate of barytes	1 *c*	1 *b*	12·482
Carbonate of strontian	1 *c*	1 *str*	9·651
Bicarbonate of magnesia	2 *c*	1 *m*	8·079
Carbonate of magnesia	1 *c*	1 *m*	5·328
Carbonate of yttria	1 *c*	1 *y*	11·151
Carbonate of zirconia	1 *c*	1 *z*	1·407
Carbonate of glucina	1 *c*	1 *gl?*	6·351 ?
Carbonate of silver	1 *c*	1 *s*	16·369
Percarbonate of mercury	1 *c*	2 *m*	56·751
Percarbonate of copper	1 *c*	1 *c*	12·751
Carbonate of iron	2 *c*	1 *i*	14·645
Carbonate of lead	2 *c*	1 *l*	17·489
Carbonate of nickel	2 *c*	1 *n*	14·807
Carbonate of zinc	1 *c*	1 *z*	7·890
Carbonate of manganese	2 *c*	1 *m*	13.617
Carbonate of cerium	2 *c*	1 *ce*	18·996
Percarbonate of cerium	3 *c*	1 *ce*	21·747
Oxalate of potash	1 *ox*	1 *p*	10·634
Binoxalate of potash	2 *ox*	1 *p*	15·268
Quadroxalate of potash	4 *ox*	1 *p*	24·536
Oxalate of soda	2 *ox*	1 *s*	17·150
Superoxalate of soda	3 *ox*	1 *s*	21·784
Oxalate of ammonia	1 *ox*	1 *a*	6·783
Binoxalate of ammonia	2 *ox*	1 *a*	11·417
Oxalate of magnesia	1 *ox*	1 *m*	7·211
Oxalate of lime	1 *ox*	1 *l*	8·254
Binoxalate of lime	2 *ox*	1 *l*	12·888
Oxalate of barytes	1 *ox*	1 *b*	4·365
Oxalate of strontian	1 *ox*	1 *st*	11·534
Oxalate of alumina	1 *ox*	1 *al*	6·770
Oxalate of yttria	1 *ox*	1 *y*	13·034
Oxalate of glucina	1 *oz*	1 *gl*	14·467
Oxalate of zirconia	1 *ox*	1 *z*	10·290
Oxalate of copper	2 *ox*	1 *c*	19·268
Oxalate of potash and copper	2 *ox*	1 *p* + 1 *c*	29·902
Oxalate of soda and copper	3 *ox*	1 *s* 1 *c*.	32·410
Oxalate of amm. and copper	2 *ox*	1 *a* 1 *c*	26·051
Oxalate of iron	2 *ox*	1 *i*	18·383
Peroxalate of iron	3 *ox*	1 *i*	23·017
Oxalate of nickel	2 *ox*	1 *n*	18·573
Oxalate of cobalt	2 *ox*	1 *c*	18·594
Oxalate of lead	2 *ox*	1 *l*	37·242
Oxalate of zinc	1 *ox*	1 *z*	9·661
Oxalate of mercury	1 *ox*	1 *m*	30·634
Oxalate of silver	1 *ox*	1 *s*	19·348
Oxalate of bismuth	1 *ox*	1 *b*	14.628
Oxalate of manganese	2 *ox*	1 *m*	17·101
Oxalate of uranium	1 *ox*	1 *u*	19·634
Oxalate of cerium	2 *ox*	1 *c*	23·115
Oxalate of platinum	1 *ox*	1 *p*	17·795

Table of Chemical Equivalents by Dr Wollaston.

Hydrogen -	1.32				
Carbon -	7.54				
Oxygen -	10				
Water	11.32 =	10 *ox.*	+	1.32	*hyd.*
Phosphorus -	17.40				
Azote -	17.54				
Sulphur -	20.				
Ammonia -	21.5 =	17.54 *az.*	+	3.96	*hyd.*
Magnesia -	24.6 =	10 *ox.*	+	14.6	*mag.*
Calcium -	25.46				
Carbonic acid -	27.54 =	20 *ox.*	+	7.54	*carb.*
Sodium -	29.1				
Muriatic acid, (dry)	34.1				
Iron, -	34.5				
Lime -	35.46 =	10 *ox.*	+	25.46	*calc.*
Phosphoric acid	37.4 =	20 *ox.*	+	17.4	*phos.*
Nitrous gas -	37.54 =	20 *ox.*	+	17.54	*az.*
Soda -	39.1 =	10 *ox.*	+	29.1	*sod.*
Copper -	40.				
Zinc - -	41.				
Chlorine -	44.1 =	10 *ox.*	+	34.1	*mur. acid.*
Green oxide of iron	44.5 =	10 *ox.*	+	34.5	*ir.*
Muriatic gas -	45.42 =	44.1 *chl.*	+	1.32	*hyd.*
Oxalic acid -	47.0				
Subcarbonate of ammonia -	49.0 =	27.5 *acid*	+	21.5	*am.*
Potassium -	49.1				
Red oxide of iron,	49.5 =	15 *ox.*	+	34.5	*iron*
Sulphuric acid (dry)	50. =	30 *ox.*	+	20	*sulph.*
Black oxide of copper	50. =	10 *ox.*	+	40	*copper*
Oxide of zinc -	51 =	10 *ox.*	+	41	*zinc*
Potash -	59.1 =	10 *ox.*	+	49.1	*pot.*
Sulphuric acid sp. gr. 1.85; -	61.32 =	50 *sul. ac.*	+	11.32	*wat.*
Carbonate of lime	63 =	27.54 *carb. ac.*	+	35.46	*lime*
Subcarbonate of soda	66.6 =	27.5 *carb. ac.*	+	39.1	*soda*
Muriate of ammonia	66.9 =	34.1 *acid* + 21.5 *am.*	+	11.32	*wat.*
Nitric acid (dry)	67.54 =	50 *ox.*	+	17.54	*az.*
Strontia -	69				
Muriate of lime	69.6 =	34.1 *acid*	+	35·5	*lime*
Muriate of soda	73.2 =	34.1 *acid*	+	39.1	*soda*
Sulphate of magnesia	74.6 =	50. *acid*	+	24.6	*magn.*
Bicarbonate of ammonia -	76.5 =	27.5 *carb. ac.*	+	49.	*subcarb.*
Sulphate of lime	85.5 =	50 *acid*	+	35.5	*lime*
Subcarbonate of potash -	86 =	27.5 *acid*	+	59.1	*potash*

Sulphate of soda	89.1	= 50	*acid*	+ 39.1	*soda*
Liquid nitric acid sp. gr. 1.50;	90.2	= 67.54	*nit. ac.*	+ 22.64	*wat.*
Muriate of potash	93.2	= 34.1	*acid*	+ 59.1	*potash*
Barytes -	97				
Nitrate of lime -	103	= 67.5	*acid*	+ 35.5	*lime*
Bicarbonate of soda	105.5	= 27.5 *ac.* + 66.6 *car. soda* + 11.3 *wat.*			
Nitrate of soda -	106.6	= 67.5	*acid*	+ 39.1	*soda*
Selenite -	108.1	= 85.5	*s. of lime*	+ 22.4	*water*
Sulphate of potash	109.1	= 50	*acid*	+ 59.1	*potash*
Sulphate of strontia	119.0	= 50	*acid*	+ 69	*stront.*
Carbonate of barytes	124.5	= 27.5	*acid*	+ 97	*barytes*
Bicarbonate of potash -	125.5	= 27.5 *acid* + 86. *sub. pot.* + 11.3 *wat.*			
Mercury -	125.5				
Nitrate of potash	126.6	= 67.54	*acid*	+ 59.1	*potash*
Lead -	129.5				
Muriate of barytes	131	= 34	*acid*	+ 97.	*barytes*
Silver -	135				
Red oxide of mercury -	135.5	= 10	*ox.*	+ 125.5	*merc.*
Litharge -	139.5	= 10	*ox.*	+ 129.5	*lead*
Oxide of silver	145	= 10	*ox.*	+ 135	*silver*
Sulphate of barytes	147.	= 50	*acid*	+ 97	*barytes*
Binoxalate of potash	153.0	= 94	*acid*	+ 59	*potash*
Hyperoxymuriate of potash -	153.2	= 93.2	*mur. pot.*	+ 60	*ox.*
Cryst. muriate of barytes	153.6	= 131	*mur. bar.*	+ 22.6	*wat.*
Sulphate of magnesia -	153.9	= 74.6	*sul. mag.*	+ 79.3	*water*
Sulphate of copper	156.6	= 50 *acid* + 50 *cop.* + 56.6 *water*			
Nitrate of barytes	164.5	= 67.5	*acid*	+ 97	*barytes*
Carbonate of lead	167.	= 27.5	*acid*	+ 139.5	*lead*
Corrosive sublimate	170.1	= 34.1 *acid* + 10 *ox.* + 125.5 *merc.*			
Muriate of lead	173.6	= 34.1	*acid*	+ 139.5	*lead*
Sulphate of iron	173.8	= 50 *acid* + 34.5 *iron* + 79.3 *water*			
Phosphate of lead	176.9	= 37.4	*acid*	+ 139.5	*lead*
Muriate of silver	179.1	= 34.1	*acid*	+ 145	*silver*
Sulphate of zinc	180.2	= 50 *acid* + 51 *zinc* + 79.3 *water*			
Oxalate of lead	186.5	= 47	*acid*	+ 139.5	*lead*
Sulphate of lead	189.5	= 50	*acid*	+ 139.5	*lead*
Sulphate of soda	202.3	= 50 *acid* + 39.1 *soda* + 113.2 *water*			
Nitrate of lead	207.0	= 67.5	*acid*	139.5	*lead*
Protoxide of mercury -	261.	= 10	*ox.*	+ 251.	*merc.*
Calomel -	296.1	= 34.1. *acid* + 10 *ox.* + 251 *merc.*			

Composition of some Organic Bodies, according to Berzelius.

	Oxyg.		*Hydr.*		*Carb.*	*Oxyg.*	*Hydr.*	*Carb.*	*Capacity of saturation.*
Benzoic acid	1 *o*	+	3 *h*	+	5 *c*	20.02	5.27	74.71	6.69
Gallic acid	1 *o*		2 *h*		2 *c*	38.02	5.02	56.96	12.34
Tannin from galls	2 *o*		3 *h*		3 *c*	45.00	4.45	50:55	3.718
Succinic acid	3 *o*		4 *h*		4 *c*	47.923	4.218	47.859	15.9743
Acetic acid	3 *o*		6 *h*		4 *c*	46.934	6.195	46.871	15.63
Sugar of milk	4 *o*		8 *h*		5 *c*	48.348	6.385	45.267	
Sugar	10 *o*		21 *h*		12 *c*	49.083	6.802	44.115	9.98
Potatoe starch	6 *o*		13 *h*		7 *c*	49.583	7.090	43.327	
Gum Arabic	12 *o*		24 *h*		13 *c*	51.456	6.792	41.752	
Citric acid	1 *o*		1 *h*		1 *c*	55.096	3.634	41.270	13.585
Tartaric acid	5 *o*		5 *h*		4 *c*	59.200	3.912	36.888	11.976
Saclactic acid	4 *o*		5 *h*		3 *c*	60.818	5.018	34.164	7.66
Oxalic acid *	6 *o*		1 *h*		4 *c*	66.534	0.244	33.222	22.

* Oxalic acid 3 *o* + 1 *h* + 2 *c* 64.739 2.848 32.413 Dr Thomson.

Composition of some Organic Bodies, according to Gay Lussac and Thenard.

	Carbon.	*Oxygen.*	*Hydrogen.*	*Nitrogen.*
Wax	81.79	5.54	12.67	
Olive oil	77.21	9.43	13.36	
Copal	76.81	10.61	12.58	
Rosin	75.94	13.34	10.72	
Oak wood	52.53	41.78	5.69	
Beech wood	51.45	42.73	5.82	
Fecula	43.55	49.68	6.77	
Sugar	42.47	50.63	6.90	
Gum Arabic	44.23	50.84	6.93	
Sugar of milk	38.825	53.834	7.341	
Acetic acid	50.22	44.15	5.63	
Citric acid	33.81	59.86	6.33	
Tartaric acid	24 05	69.32	6.53	
Mucous acid	33.69	62.67	3.62	
Oxalic acid	26.57	70.69	2.74	
Gelatin	47.881	27.207	7.914	16.998
Albumen	52.883	23.872	7.540	15.705
Fibrin	53.360	19.865	7.021	19.934
Cheese	59.781	11.409	7.429	21.381

Pharmaceutical Calendar for the Climate of Weimar, by Goëtling, shewing the Principal Objects which the Apothecary has to attend to in each Month of the Year.

JANUARY.—The concentration of vinegar by freezing,
Muriate of antimony,
Ethers, dulcified spirits,
Dippel's animal oil to be prepared;
Some gum resins, as assafœtida, galbanum, ammoniac, &c. to be powdered.

FEBRUARY—As in January.

MARCH.—Mezereon bark,
Misletoe of the oak to be gathered;
Conserve of scurvy-grass to be prepared.

APRIL.—Spirit of scurvy-grass,
Syrup of violets to be prepared.

MAY.—Sloe flower water,
Conserve of sorrel;
Plaster of henbane,
Extract of succory, henbane, grass, dandelion, &c.
Oil of beetles (Meloë majalis et proscarabæus),
Spirit of ants, earthworms, &c.

JUNE.—Distilled water of lily of the valley,
Various distilled spiritous waters,
Conserves of various herbs and flowers, as conserve of roses, &c.
Hemlock plaster,
Extracts of hemlock, fumatory, wild lettuce, aconite, &c.

JULY.—Vinegar of roses.
Rose water,
Marjoram butter,
Preserved Cherries, walnuts, currants, &c.
Extract of elaterium,
Honey of roses,
Boiled oil of Hypericum, &c.
Distilled oil of rosemary, mint, parsley, pennyroyal, wild thyme, &c.
Syrup of cherries, raspberries, &c.
Spirit of rosemary.

AUGUST.—Cherry water,
Extract of blessed thistle, thorn apple, &c.
Boiled oil of wormwood, chamomile, &c.
Distilled oil of wormwood, chamomile, peppermint, millefoil, rue, &c.
Rob and syrup of mulberries,

SEPTEMBER.—Quince cinnamon water,
Oxymel of meadow saffron,
Quince cakes,
Syrup of barberries, quince, buckthorn,
Tincture of steel, with quince juice.

OCTOBER.—Tincture of steel, with apple juice.

NOVEMBER and DECEMBER.—As in January.

EXPLANATION OF THE PLATES.

Plate I.

Fig. 1, 2, 3, Mortars of metal, marble, and earthen ware, with their respective pestles.

Fig. 4. a levigating stone and muller.

a, The table of polished porphyry or other siliceous stone.

b, The muller of the same substance.

Fig. 5, A compound sieve.

a, The lid.

c, The body containing the sieve.

b, The receiver.

Fig. 6. A funnel.

Fig. 7. A hooked glass rod. Several of which may be hung round the edge of the funnel, to prevent the filtering substances from adhering too closely to its sides.

Fig. 8, A compound syphon.

a, *b*, *c*, The syphon.

f, *g*, The mouth-piece.

d, *e*, A board for supporting it.

When we insert the upper orifice *a* into any liquid, and close the lower orifice *c* with the finger; by sucking through *f*, the fluid rises from *a* to *b*, and proceeds by *g* towards *f*; as soon as it has passed *g*, the finger is to be removed, and the fluid immediately flows through *c*, and continues flowing as long as any remains above the orifice *a*. It is absolutely necessary that the point *g*, where the mouth-piece joins the syphon, be lower than *a*.

Fig. 9, A board perforated with holes for supporting funnels.

Fig. 10, A separatory. The fluids to be separated are introduced through the orifice A, which is then closed with a stopper. The one neck is then to be shut with the finger, and the phial is to be inclined to the other side. As soon as the fluids have separated by means of their specific gravity, the finger is to be removed, and the whole of the heavier fluid will run through the lower neck, before any of the lighter escapes.

Plate II.

Fig. 11 and 12, Graduated glass measures. 11, A cylindrical one for large quantities.—12, A conical one for small quantities.

Fig. 13, A phial of a particular shape for keeping laudanum.

Fig. 14, External view of Dr Black's furnace.

a, The body.

b, The ash-pit.

c, The chimney.

d, The circular hole for the sand-pot.

e, A door about the centre of the body, to be opened when the furnace is used as a reverberatory. In Dr Black's original furnace, there is no aperture in the side, and, indeed, as its peculiar excellence consists in the power which it gives the

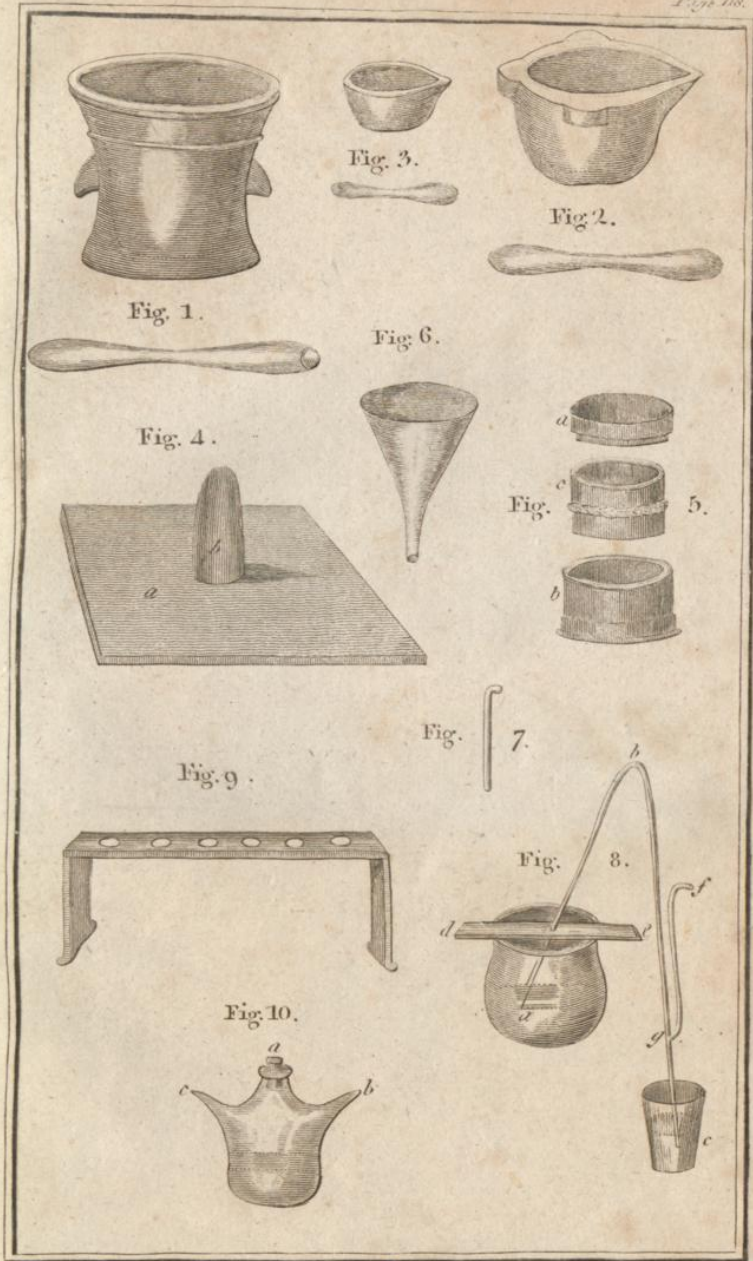
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
a
b
Fig. 5.
a
c
b
Fig. 6.
Fig. 7.
Fig. 8.
a
b
c
d
e
f
g
Fig. 9.
Fig. 10.
a
b
c

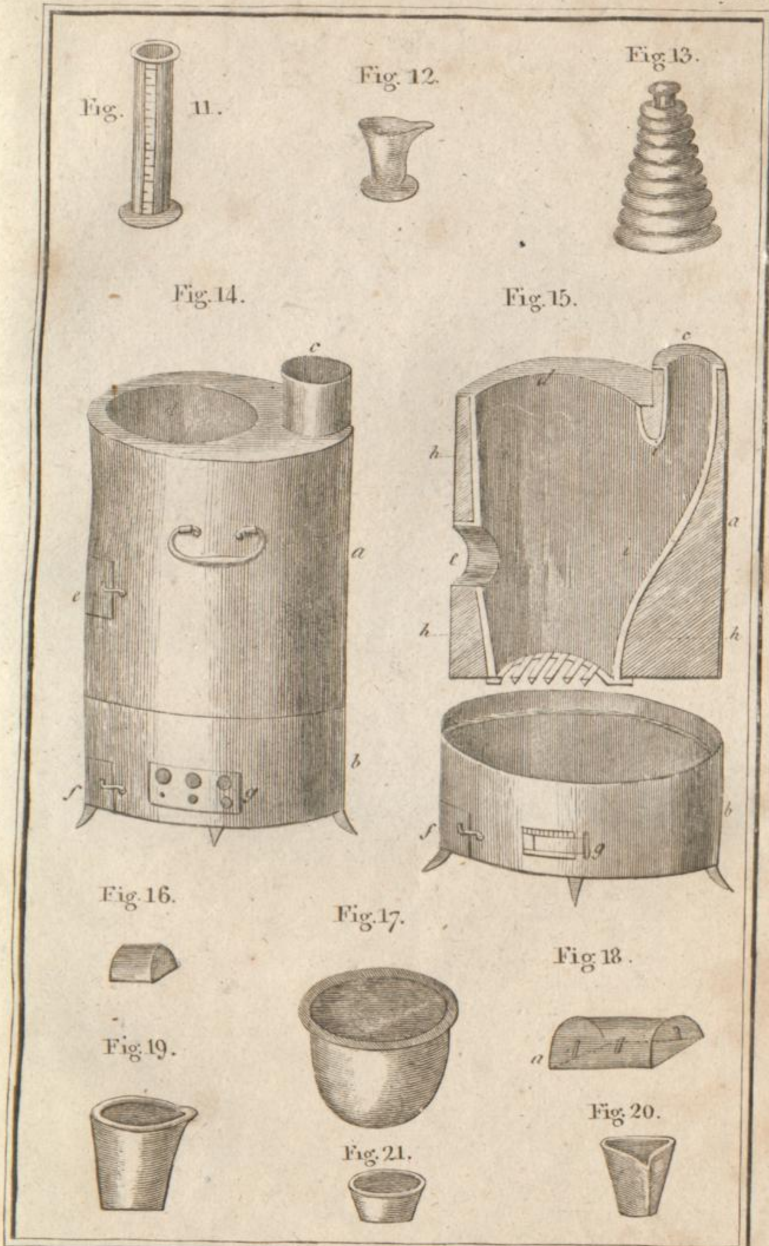
Fig. 11.
Fig. 12.
Fig. 13.
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Fig. 17.
Fig. 18.
Fig. 19.
Fig. 20.
Fig. 21.


Fig. 22.
Fig 23
Fig 24.
Fig 25.
Fig 26.
Fig 27.
Fig 28.
Fig 29.
Fig 30.
Fig. 31.
Fig 32.
Fig. 33.
Fig. 34.
Fig 35.
Fig 36.
Fig 37.

operator of regulating the quantity of air admitted to the fuel, and by that means of regulating the intensity of the fire; every aperture is rather to be considered as an injury than as an improvement. At all times when these apertures are not employed, they must be accurately closed and luted up.

f, The door of the ash-pit.

g, The damping plate for regulating the admission of air, having six holes, fitted with stoppers, increasing in size in a geometrical proportion.

Fig. 15, A vertical section of the body of the same furnace, to shew the manner of luting, and the form and position of the grate.

a——*g*, As in the former figure, except the damping plate which is here closed by a sliding door with a graduated scale.

h, The form which is given to the lute of clay and charcoal which is applied next to the iron.

i, The form given to the lute of sand and clay, with which the former is lined.

e, Is a semicircular aperture left unluted, to serve as a door when necessary. On other occasions, it is filled up with a semi-cylindrical piece of fire-brick, Fig. 16, accurately luted in.

k, The grate fastened on the outside of the body.

Fig. 16, A semi-cylindrical piece of fire-brick, for closing the door *e* of the furnace.

Fig. 17, The sand-pot, which is suspended in the aperture *d* of the furnace, by means of the projecting ring *a b*.

Fig. 18. A muffle, *a a* apertures in its sides for the admission of the heated air.

Fig. 19, A large black lead crucible.

Fig. 20. A small Hessian crucible.

PLATE III.

Fig, 21, 22, Tests.

Fig. 23, A small support of clay, to raise the crucible above the grate.

Fig. 24, A pair of crucible tongs.

Fig. 25, A support for raising the muffle, as high as the door *e* of the furnace.

Fig. 26, A ring for suspending a retort within the furnace, when we wish to expose it to the immediate action of the fire. The ring itself, *a*, *b*, is suspended within the aperture *d* of the furnace, by means of the three hooked branches, *c*, *c*, *c*.

Fig. 27, Semicircular rings of plate-iron, for applying round the neck of a retort when suspended within the furnace, in order to close as much as possible the aperture *d*, Fig. 1. The largest pair *a* are first made to rest upon the edge of the aperture *d*, the next pair *b* upon them, and so on until they come in contact with the neck of the retort. The whole are then to be covered with ashes or sand, to prevent the loss of heat, and the escape of vapours, from the burning fuel.

Fig. 28, Circular rings, *a b*, to be applied in the same manner when we wish to evaporate with the naked fire. We must always take care that the fluid rises higher than the portion of the evaporating vessel introduced within the aperture of the ring; *c*, a circular piece of iron, which, when applied with the rings *a b*, completely closes the aperture *d* of the furnace.

Fig. 29, 30, 31, 32, Evaporating vessels of different shapes.

Fig. 33, A long necked matrass.

Fig. 34, A jar.

Fig. 35, A phial or receiver.

Fig. 36, A cucurbit.

Fig. 37, A cucurbit with its capital.

Plate IV.

Fig. 38, The arrangement of the apparatus for distilling *per descensum*. The substance to be distilled is laid on the metallic plate *a*, which is perforated with holes. The burning fuel is laid upon the upper plate *b*, also of metal, but not perforated. On the application of heat, the vapour descends into the cavity *a*, *c*, where it is condensed.

Fig. 39, A retort and receiver; *a*, the retort; *b*, the receiver.

Fig. 40, A retort funnel.

Fig. 41, A metallic still.

c, *d*, *e*, *f*, The body.

a, *b*, *e*, *f*, The lower portion of the body, which hangs within the aperture *d* of the furnace, by the projecting part *a b*.

d, *g*, *c*, The head of the still.

d, *c*, A gutter which goes round the bottom of the head, for conveying any vapours which may be condensed there into the spout *h*, which conveys away the vapour and the fluid condensed in the head into the refrigeratory.

Fig. 42, A refrigeratory.

a, *b*, *c*, *d*, A cylindrical vessel filled with cold water.

e, *f*, A spiral metallic pipe which passes through it. The spout *h* of the still is inserted within the upper orifice *e*; therefore the vapours which escape from the head of the still enter it, and are condensed in their passage towards *f*, the lower termination of the pipe from which the distilled fluid runs, and is received into proper vessels. As the water in the vessel *a*, *b*, *c*, *d*, continually abstracts caloric from the vapour, it is apt to become too warm to condense it. As soon, therefore, as any steam escapes by the spout *f*, the water must be drawn off by the cock *g*, and its place supplied by cold water.

Fig. 43, A vessel for boiling inflammable fluids.

a, *b*, *c*, *d*, The body of the kettle.

PLATE IV.

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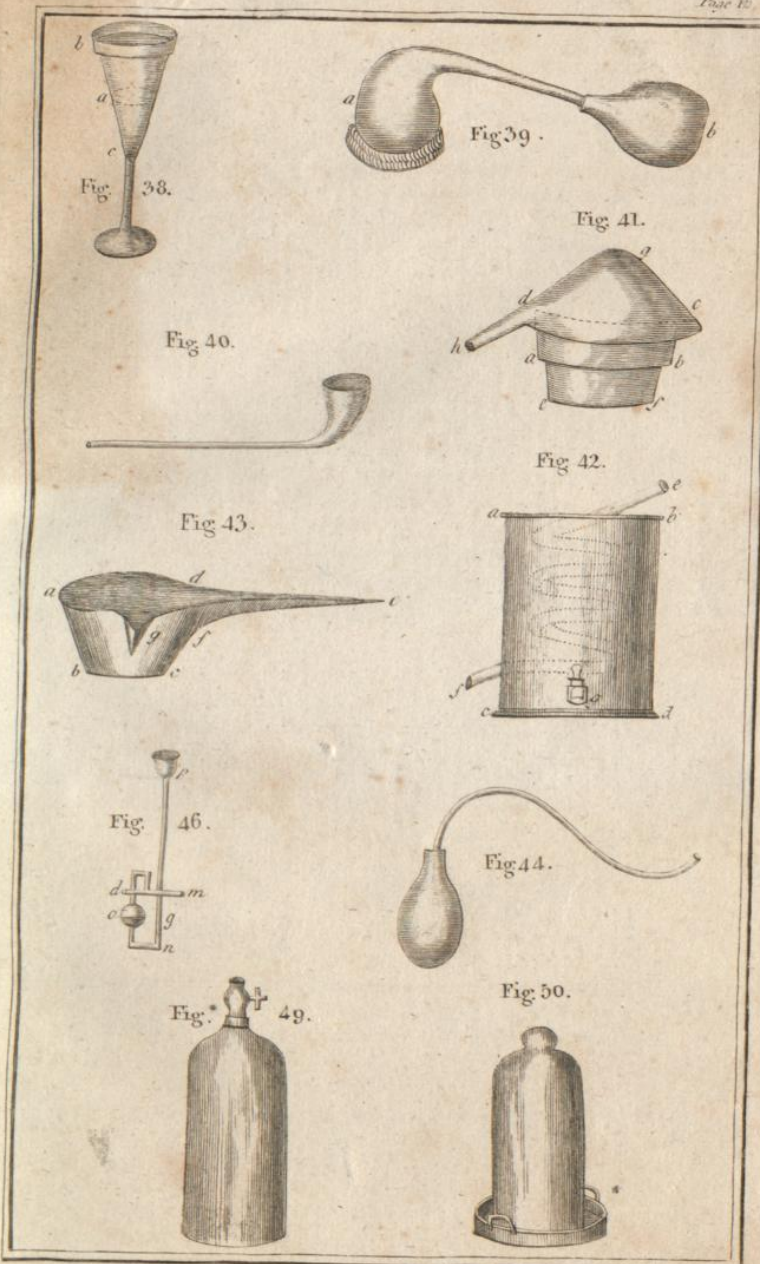


d, e, f, A long spout proceeding from it, for preventing any risk of boiling over.

g, A short spout for pouring out. The vessel should not be filled above *h, f;* and the long spout, *d, e, f,* should be placed so as to be as little heated as possible. When the fluid begins to swell and boil up, both from the great increase of surface, and from part of it running up the cooler spout, *d, e, f,* the ebullition will be checked, and all danger of running over prevented.

Fig. 44, A body with a bent tube.

a, b, The body.

b, c, A sigmoid tube accurately ground to it. When any permanently elastic fluid is generated within the body *a, b,* it escapes by the extremity of the tube, and may be collected by introducing it under a jar filled with water or mercury in the pneumatic cistern. This simple apparatus can only be used conveniently when the production of the gas is slow, or requires the application of heat.

Fig. 45, A Woulfe's apparatus.

a, b, c, d, e, A tubulated retort and receiver.

f,' f,' f," Three three-necked bottles. The first *f,* is commonly filled with water, and the two others with various solutions.

d, g, d,' g,' d," g," d,"' g."' Bent tubes connecting the different parts of the apparatus, so that when any vapour escapes from the receiver *c, d, e,* it passes along the tube *d, g,* and rises through the fluid contained in the bottle *f,* where it remains in contact with the surface, and under considerable pressure, until the expansion of the vapour, not condensable in *f,* overcomes the column of fluid *h, g,'* in the bottle *f,'* and escapes into the upper part of *f'.* In the same manner the uncondensed vapours proceed to *f,"* and at last to the pneumatic apparatus.

But, as in processes of this kind, diminution of temperature and other causes frequently produce sudden condensations of the gases contained in the different parts of the apparatus, especially in the retort and receiver, any such occurrence would cause the fluids to move through the connecting tubes in a retrograde direction. This accident is prevented, by inserting through the third neck of each bottle a small tube *k, l,* having its lower extremity *l* immersed in the fluid contained in the bottle. By this contrivance no fluid can possibly pass from one bottle into another, because the columns *g, m,* &c. which resist the absorption, are much higher than the columns *h, l,* which oppose the admission of external air; while, on the contrary, no gas can escape through these tubes, because the columns *h, k,* which oppose their escape, are higher than the columns *g, h,* which resist its progress to the next bottle. From their use, these tubes have got the name of tubes of safety.

Another contrivance for the same purpose, the invention of C.

Welter, seems now to be much used in France. It is fixed to the connecting tubes, as at *n*.

Fig. 46. To explain it more fully, we have given a separate view, taken in an oblique direction. When the apparatus is adjusted, a small quantity of water is poured through the funnel *p*, until it rises to about the centre of the ball *o*. Now, on any absorption taking place, the fluid rises in the ball *o*, until the column *g n* be annihilated, when a quantity of air will immediately rush in through *p g n o*, &c. and the water will regain its former equilibrium. On the other hand, no gas can escape by this tube, because the whole fluid contained in the ball and tube must previously enter the portion of the tube *n p*, where it would form a column of such a height that its pressure could not be overcome.

Fig. 47. A vertical section of a pneumatic cistern.

a, b, c, d, The whole cavity of the cistern.

e, f, A shelf for holding the jars.

e, b, c, The well for filling the jars.

g, h, The surface of the fluid contained in the cistern, which must always be higher than the surface of the shelf.

Fig. 48, 49, 50, 51, Pneumatic jars of different shapes.

Fig. 48, A jar in the situation in which it is filled with gas.

Fig. 49, A jar fitted with a stop-cock.

Fig. 50, A jar placed upon a tray for removing it from the pneumatic cistern.

PLATE V.

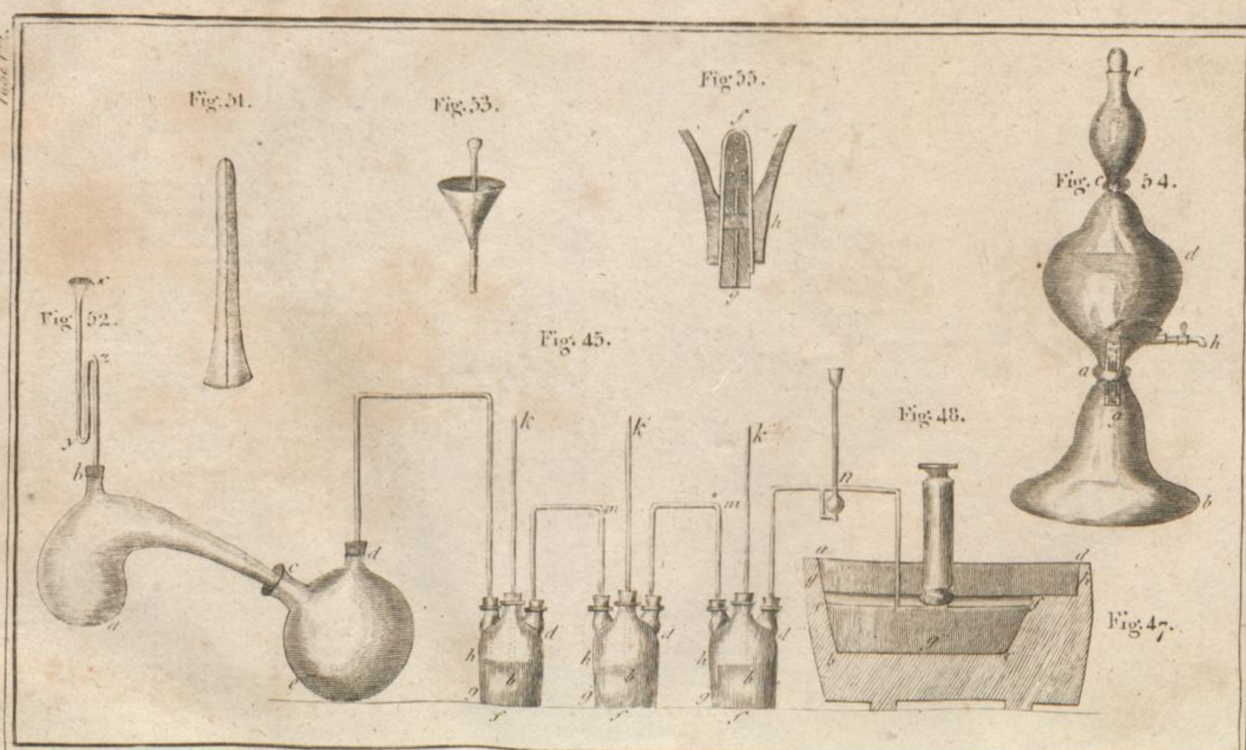
Fig. 51. A graduated jar, commonly called an Eudiometer.

Fig. 52, A hydrostatic funnel, for pouring fluids gradually into air-tight vessels, especially when attended with the formation of gas. It is evident, that any portion of fluid, poured into the funnel *x*, more than sufficient to fill the two first parts of the bent tube up to the level *z*, will escape by the lower extremity *b*. At the same time, no gas can return through this funnel, unless its pressure be able to overcome the resistance of a column of fluid of the height of *x y*.

Fig. 53, Another contrivance for the same purpose. It consists of a common funnel, in the throat of which is inserted a rod with a conical point, which regulates the passage of the fluid through the funnel, according to the firmness with which it is screwed in.

Fig. 54. Nooth's apparatus for promoting the absorption of gaseous fluids by liquids. It consists of three principal pieces; a lower piece *a b*, a middle piece *a c*, and an upper piece *d c e*; all of which are accurately ground to each other. The substances from which the gas is to be extricated are put into the lower piece. The middle piece is filled with the fluid with which the gas is to be combined, and the upper piece is left empty. As soon as a sufficient quantity of gas is formed to overcome the pressure, it passes through the valve *f g*, and rises through the fluid to the upper part of the middle piece. At the same time it forces a quantity of fluid into the upper piece through its lower aperture *d*. As soon as so much of the fluid has been for-

PLATE V.



ced from the middle piece as to bring its surface down to the level of the lower aperture of the upper piece, a portion of gas escapes into the upper piece, and the fluid rises a little in the middle piece. The upper piece is clothed with a conical stopper *e*, which yields, and permits the escape of a portion of gas, as soon as its pressure in the upper piece becomes considerable. *h* is a glass cock for drawing off the fluid.

Fig. 55. The valve of Nooth's apparatus. It consists of an internal tube *g*, of small caliber, but pretty stout in substance, and ground into an external tube *f*, closed at the upper end, but perforated with small holes, to allow the gas to pass. After the internal tube is fitted to the external, a portion of it is cut out, as at *h*, sufficient to receive a small hemisphere of glass, and to allow the hemisphere to rise a little in its chamber, but not to turn over in it. The upper piece of the internal tube is then thrust home into the place where it is to remain, and the glass hemisphere introduced with its plane recumbent on the upper end of the lower piece of the tube, which is ground perfectly flat, as is also the plane of the hemisphere. From this construction it is evident, that by the upward pressure of any gas, the glass hemisphere may be raised so as to allow it to pass, while nothing can pass downwards, for the stronger the pressure from above, the closer does the valve become. We have been more particular in our description of this valve, because it has been very ingeniously applied to distilling apparatuses by Mr Pepys *junior* and Mr Burkit.

PART II.