enabled the architect to introduce sculptures of higher relief than any hitherto known, and to fix the pieces suspended from the vaultings, without fear of accident, or of their being detached. 3. The great saving of expense between these and castings in bronze. The gilding, also, was effected by the same process, and presented equal advantages. The seven doors of the cathedral will be of bronze and electrotype, the framework being of the former, and the sculptural parts of the latter. Three of these doors are 30 feet high, and 14 feet wide, the four others 17 feet 8 inches wide. They contain 51 bas-reliefs, 63 statues, and 84 alto-relievo busts, of religious subjects and characters. The quantity of metal employed in the dome is as follows: Ducat gold, 247 lbs.; copper, 52½ tons; brass, 321½ tons; wrought iron, 524½ tons; cast iron, 1068 tons. Total, 1966½ tons.—*Builder.* Ibid.

How to Harden Gypsum.

It is known that calcined gypsum, after being moistened with a solution of alum and again burnt, acquires much greater hardness and solidity.—M. Kreating recommends for the same purpose a solution of 1 lb. of borax in 9 lbs. of water, which is poured over the calcined fragments of gypsum. They are then kept at a strong red heat for six hours, ground to a powder and worked. The effect is said to be still better, if a pound of tartar and twice the quantity of water are added to the solution.—*Liebig's Annalen*

Lond. Chem. Gaz., July 1848.

Ultimate Analysis of some varieties of Coal. *By* Fred. Vaux, Esq.

The following analyses of several important species of coal, were undertaken in the laboratory of King's College, for the purpose of ascertaining their ultimate composition, as well as the nature of the ashes obtained from each.

The varieties of coal subjected to examination, with the respective localities from whence they were obtained, are as follows:

1. Newcastle caking coal, as ordinarily used in the laboratory.
2. Wigan cannel coal, specimen obtained from Professor Miller.
3. Coal from St. Helen's, Lancashire, (Rushey Park seam,) specimen also from Professor Miller.
4. Staffordshire coal, sample taken last Christmas from the ten-yard seam of a mine near Wolverhampton.
5. Sample from the bottom of the above-named seam in the same mine.
6. Coal from the top of a bed in the Oregon territory.
7. Anthracite, (Welsh.)
8. Bovey coal, or lignite, from Bovey Heathfield, Chudleigh, near Exeter, Devon.
9. Peat, cut for fuel in 1847, from the neighborhood of the Military Prison, Princetown, near Tavistock, on the Forest of Dartmoor, Devon.

TABLE I.—*Relative Proportions in* 100 *parts of Undried Coal.*

	Newcastle.	Wigan Cannel.	St. Helen's.	Stafford.	Stafford, Bottom of Seam.	Oregon.	Anthracite.	Bovey.	Peat.
Specific Gravity,	1·2760	1·2760	1·2790	1·2785	1·2760	1·5780	1·3925	1·1290	0·8495
Water,	1·3550	0·6060	3·2385	11·2910	8·3910	5·6245	2·0060	34·6600	25·5550
Gaseous matter,	31·9450	38·7310	31·2615	31·4990	33·4090	27·8755	5·9066	34·6310	45·1800
Coke,	66·7000	60·3630	65·5000	57·2100	58·2000	66·5000	92·1000	30·7090	29·3650
Ash,	2·0400	2·6730	5·0000	6·8125	2·7600	33·5000	1·5830	1·4790	7·2450
Sulphur,	0·7368	1·4844	0·6728	0·3450	2·3534	—	0·8967	1·5446	0·4168
Nitrogen,	2·0212	2·1037	1·6342	1·6326	—	—	0·8111	0·9691	1·7123

TABLE II.—*Relative Proportions in a ton of Undried Coal.*

	Newcastle.	Wigan Cannel.	St. Helen's.	Stafford.	Stafford, Bottom of Seam.	Oregon.	Anthracite.	Bovey.	Peat.
	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.
Water,	0 1 24	0 0 20½	0 2 18½	2 1 1	1 2 20	1 0 14	0 1 16¼	6 3 20½	5 0 12¼
Coke,	14 1 10	12 0 8¾	13 0 11¼	11 1 21½	11 2 15½	13 1 5¾	18 1 19	6 0 15¾	5 3 12½
Gaseous matters,	6 1 15¾	7 2 27½	6 1 0¼	6 1 5½	6 2 20½	5 2 8¾	1 0 20½	6 3 20	9 0 3
Sulphate of ammonia,*	20 1 18½	2 1 0½	1 3 27	1 3 0	—	—	0 3 18¾	0 1 16½	1 3 9½
Ash,	0 1 17½	0 2 3¾	1 0 0	0 0 20½	0 2 5¾	6 2 22½	0 1 7½	0 1 5¾	1 1 22¼
Sulphur,	0 0 16½	0 1 5¼	0 0 19½	0 0 7¾	0 1 24¼	—	0 0 20	0 1 6½	0 0 9¼

* Calculated on the supposition that the whole of the nitrogen is converted into ammonia, which, in practice, is not the case.

TABLE III.—*Relative Proportions in* 100 *parts of Dried Coal.*

	Newcastle.	Wigan Cannel.	St. Helen's.	Stafford.	Stafford, Bottom of Seam.	Oregon.	Anthracite.	Bovey.	Peat.
Carbon,	81·4110	86·0685	75·8050	78·5670	—	—	90·3905	66·3140	54·0235
Hydrogen,	5·6275	5·6265	5·2170	5·2910	—	—	3·2450	5·0270	5·2120
Oxygen,	7·9975	8·0670	11·9225	12·6845	—	—	2·9668	22·2610	28·1710
Nitrogen,	2·0490	2·1250	1·9265	1·8405	—	—	0·8277	0·5550	2·3005
Ash,	2·0680	2·6970	5·1670	1·0280	3·0110	35·4960	1·6150	2·2690	9·7330
Sulphur,	0·7470	1·4980	0·9020	0·3890	2·5690	—	0·9150	2·3640	0·5600

TABLE IV.—*Relative Proportions in* 100 *parts of Coal, free from water and ash.*

	Newcastle.	Wigan Cannel.	St. Helen's.	Stafford.	Stafford, Bottom of Seam.	Oregon.	Anthracite.	Bovey.	Peat.
Carbon,	83·1301	82·2878	79·9352	79·3830	—	—	91·8742	67·8535	59·7377
Hydrogen,	5·9505	5·6796	5·5012	5·3459	—	—	3·3368	5·7576	5·7739
Oxygen,	8·0647	8·3113	11·5811	13·0185	—	—	3·0178	23·3920	31·3196
Nitrogen,	2·0920	2·1818	2·0314	1·8596	—	—	0·8412	0·5781	2·5485
Sulphur,	0·7627	1·5395	0·9511	0·3930	2·6487	—	0·9300	2·4188	0·6203

The following table gives the calculated results on the annexed approximative empirical formulæ for each of the preceding varieties of coal, at the same time exhibiting their agreement with the quantities of carbon, hydrogen, and oxygen, found by analysis in Table IV.

	Newcastle. $C_{27}H_{11}O_2$		Wigan Cannel. $C_{26}H_{10}O_2$		St. Helen's. $C_{28}H_{11}O_3$		Stafford. $C_{26}H_{10}O_3$	
Formula.	Calc'd.	Found.	Calc'd.	Found.	Calc'd.	Found.	Calc'd.	Found.
Carbon, . . .	83·260	83·1301	82·520	82·2878	80·280	79·9350	80·250	79·3830
Hydrogen, . .	5·654	5·9505	5·289	5·6796	5·256	5·5012	5·144	5·3459
Oxygen, . .	8·223	8·0647	8·463	8·3113	11·470	11·5811	12·348	13·0180

	Anthracite. $C_{40}H_8O$		Bovey. $C_{27}H_{14}O_7$		Peat. $C_{20}H_{11}O_8$	
Formula.	Calc'd.	Found.	Calc'd.	Found.	Calc'd.	Found.
Carbon, ...	92·080	91·8740	67·730	67·8535	59·580	59·7377
Hydrogen, ...	3·069	3·3368	5·853	5·7576	5·462	5·7739
Oxygen, ...	3·069	3·0178	23·412	23·3920	31·780	31·3196

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On the Analyses of some Specimens of Hot and Cold Blast Iron. *By* F. C. WRIGHTSON, ESQ.

The specimens of iron of which the following are analyses, were kindly furnished by Richard Smith, Esq., agent to Lord Ward, from the Coneygre iron furnaces, near Dudley. The object of the analyses was to show how far the quality agrees with what might be predicated from the composition, and also the difference produced in the composition of the iron