V. *Table of the successive Strengths of Pyroxylic Spirit, corresponding to its successive Specific Gravities, with some Introductory Observations. By* Andrew Ure, *M.D., F.R.S., &c.*

Read June 1, 1841.

HAVING been professionally employed by an eminent manufacturing chemist, about eighteen months ago, in experimental researches upon the above spirit, the *holzgeist* of the Germans, I found it necessary to construct the following table, in order to ascertain the commercial value of the article at various densities. The principal use of wood-spirit, as extracted by distillation from pyrolignous acid, or from liquid pyrolignite of lime, is for dissolving shell-lac and sandarac into a varnish for stiffening the bodies of hats, and rendering them impervious to water. Hats imbued with this varnish exhale in the hot apartments where the process is conducted the vapours of the wood-spirit very copiously, and thereby occasion a painful irritation to the eyes of the workmen. Some kinds of the spirit are much more injurious to the eyes and the health than others, even when they have all been rectified to apparently the same pitch of purity and strength by the same operations. One purpose of my researches was to discover

the causes of these variations, which affect the comfort of the operatives, and another was to discover the causes of the variations in the solvent qualities of wood-spirit of the same strength by the hydrometer. Having hitherto but partially succeeded in the attainment of these two objects, I shall not occupy the time of the Society at present with an account of the experiments made with that view, but shall reserve them for a future communication.

The researches of Berzelius, Gmelin, Weidmann, Schweitzer, Kane, Liebig, Dumas, and Peligot, concur to prove that the ordinary wood-spirit of commerce, even in its most highly rectified state, is not like spirit of wine, merely an alcoholic liquor more or less diluted with water, but that it consists of different compounds mingled together, and very difficultly separable from each other. Wood-spirit, xylite, and mesite, are three of these liquid compounds usually associated in pyroxylic spirit. When the common wood naphtha of the druggist is distilled three or four times from pulverized unslaked quicklime, by the heat of a water-bath, the oily impurities and water are got rid of, and an anhydrous fluid is obtained which is not liable to become brown on exposure to light, like the ordinary wood naphtha, and which does not become turbid or milky when mixed with water. This purified spirit, however, still acts as painfully almost as the original cruder article, upon the eyes of the hatters, as I ascertained by trial. One mode of separating *wood-spirit* from xylite and mesite, is founded upon the property possessed by wood-spirit, of forming a compound with chloride of calcium not decomposable at the heat of boiling water, while similar compounds with xylite and mesite are decomposable at that temperature. I did not find that pyroxylic spirit was essentially improved as to its employment in the arts, by being rectified by distillation from its combination with chloride of calcium.

Methol is the name which has been given to the oil formed by the action of sulphuric acid upon wood-spirit, xylite, and mesite; and I believe the same oil is generated by the simple combustion of pyroxylic spirit; for I have observed that when the pyroxylic spirit, which has been treated with both quicklime and chloride of calcium, is burned in a platinum capsule till fully one-half be consumed, the residuum becomes oily and opalescent.

The spirit used for the construction of the following table was purified by distillation from pulverized quicklime, and was drawn over with the heat of a water-bath, at such a temperature that its specific gravity at 60° was 0·8136. When

the specific gravity becomes 0·847 by the dissipation of the lighter spirit, the boiling point is 145° Fahr. I believe that a useful criterion of the nature of pyroxylic spirit would be obtained by comparing its boiling temperatures at different degrees of density. To this point I shall also direct my further investigations.

The temperature of the pyroxylic spirit when the specific gravities were taken, was exactly 60° Fahr.

Spec. Grav.	Spirit per cent.	Over proof of Excise scale.	Spec. Grav.	Spirit per cent.	Over proof of Excise scale.
0·8136	100·00				
0·8216	98·00	64·10	0·9032	68·50	13·1
0·8256	96·11	61·10	0·9060	67·56	11·4
0·8320	94·34	58·00	0·9070 ?	66·66	9·3
0·8384	92·22	55·50	0·9116 x	65·00	7·10
0·8418	90·90	52·50	0·9154	63·30	4·20
0·8470	89·30	49·70	0·9184	61·73	2·10
0·8514	87·72	47·40			Under proof.
0·8564	86·20	44·60	0·9218	60·24	0·6
0·8596	84·75	42·20	0·9242	58·82	2·5
0·8642	83·33	39·90	0·9266	57·73	4·0
0·8674	82·00	37·10	0·9296	56·18	7·00
0·8712	80·64	35·00	0·9344	53·70	11·00
0·8742	79·36	32·70	0·9386	51·54	15·30
0·8784	78·13	30·00	0·9414	50·00	17·80
0·8820	77·00	27·90	0·9448	47·62	20·80
0·8842	75·76	26·00	0·9484	46·00	25·10
0·8876	74·63	24·30	0·9518	43·48	28·80
0·8918	73·53	22·20	0·9540	41·66	31·90
0·8930	72·46	20·60	0·9564	40·00	34·20
0·8950	71·43	18·30	0·9584	38·46	35·60
0·8984	70·42	16·60	0·9600	37·11	38·1
0·9008	69·44	15·3	0·9620	55·71	40·6