



LXXIII. Observations on the resin of the Xanthorœa hastilis, or yellow gum-resin of New Holland

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conveying the combustion to a great distance through the mine, while its continuity would be broken by such mixing, and an explosion, when it occurred, be confined within narrower limits.

Secondly, no effective means exist for succouring the miners after the occurrence of an explosion, although a large proportion of the deaths is not occasioned by fire, or injuries from the force of the explosion, but from suffocation by the after-damp, or carbonic acid gas, which diffuses itself afterwards through all parts of the mine. It is suggested that a cast-iron pipe, from eight to twelve inches in diameter, be permanently fixed in every shaft, with blowing apparatus, above, by which air could be thrown down, and the shaft itself immediately ventilated after the occurrence of an explosion. It is also desirable that, by means of fixed or flexible tubes, this auxiliary circulation should be further extended, and carried as far as practicable into the workings.

LXXIII. *Observations on the Resin of the Xanthorœa hastilis, or Yellow Gum-resin of New Holland.* By JOHN STENHOUSE, Esq., Ph.D.*

THIS remarkable resin, which is known in commerce as the yellow gum or acaroid resin of Botany Bay, exudes from the *Xanthorœa hastilis*, a tree which grows abundantly in New Holland, especially in the neighbourhood of Sidney. This resin was first described in Governor Phillips's Voyage to New South Wales in 1788. Mr. Phillips states that it was employed by the natives and first settlers as a medicine in cases of diarrhœa. The resin as it occurs in commerce sometimes forms masses of considerable size, but as it is very brittle, although tolerably hard, it usually arrives in the state of a coarse powder. Its colour is a deep yellow, with a slightly reddish shade, considerably resembling gamboge, but darker and less pleasing. The colour of its powder is greenish yellow. When chewed it does not dissolve or stick to the teeth, but tastes slightly astringent and aromatic like storax or benzoin. Its smell is very agreeable and balsamic. When gently heated it melts, and when strongly heated it burns with a strong smoky flame, and emits a fragrant odour resembling balsam of Tolu. The resin contains a trace of an essential oil, to which much of its agreeable smell is probably owing. This oil passes into the receiver when the resin is

* Communicated by the Chemical Society; having been read November 17, 1845.

distilled with a mixture of carbonate of soda and water, but its quantity is so small that I was unable to examine it more closely. The resin is insoluble in water, but dissolves readily both in alcohol and in æther, especially in the former. Its solution in alcohol has a brownish yellow colour; the addition of water precipitates it as a dark yellow mass, but it does not crystallize out of its alcoholic solution when left to spontaneous evaporation, but remains as a varnish. When digested with strong alkaline lyes, it readily dissolves and forms a brownish red solution; and when the alkali is neutralized with muriatic acid, the resin is precipitated considerably altered as a dark brownish brittle mass. On concentrating the solution out of which the resin has been precipitated, and allowing it to cool, a quantity of impure reddish crystals resembling benzoic acid are gradually deposited. It requires repeated and long-continued digestions with the strongest alkaline lyes to remove the whole of this crystalline acid from the resin, which retains it with very great tenacity. The quantity of the acid is by no means great. It is not easily purified, as its crystals are apt to retain a trace of a reddish colouring matter, from which it is very difficult to free them. The easiest way of getting rid of it, is by dissolving the impure crystals in a small quantity of alcohol and then adding water; the greater portion of the colouring matter is retained in solution, while the crystals are precipitated tolerably white. When purified by repeated crystallizations, they become quite colourless. In appearance, taste, and smell they closely resemble benzoic acid. When dried at 212° F. and subjected to analysis,—

I. 0.2284 grm. of substance gave 0.6005 CO_2 and 0.113 HO.

II. 0.2955 grm. of substance prepared on a different occasion gave 0.790 CO_2 and 0.1505 HO.

		Found.		Cinnamic acid.	Benzoic acid.
	I.	II.			
C	71.74	72.91	73.35	68.85	
H	5.49	5.65	5.32	4.91	
O	22.77	21.44	21.33	26.24	
	100.00	100.00	100.00	100.00	

It is evident from these analyses that the crystalline acid contains nearly the same amount of carbon and hydrogen as cinnamic acid, with some deficiency however in the carbon. I was led therefore to suspect that it consisted essentially of cinnamic acid, with probably a small admixture of benzoic acid, a suspicion which subsequent experiments tended fully to confirm; for on heating a quantity of the crystals with some peroxide

of manganese and sulphuric acid, oil of bitter almonds was immediately evolved, and on boiling a second portion with hypochlorite of lime, the very peculiar chlorinated oil described in a former paper was also abundantly produced, thus clearly indicating the presence of cinnamic acid. A third portion of the crystals was dissolved in alcohol and left to spontaneous evaporation; it yielded after some time the fine rhombic prisms so characteristic of cinnamic acid when it is crystallized out of alcohol, mixed however with some long acicular crystals, having all the appearance of benzoic acid. I think myself warranted to conclude therefore that Botany Bay resin contains cinnamic acid mixed with a very little benzoic, in which respect it resembles balsam of Tolu, which contains both cinnamic and benzoic acids, though fortunately in much greater abundance.

Action of Nitric Acid on the Resin.

When the resin is treated with moderately strong nitric acid in the cold, a violent action ensues with the evolution of nitrous fumes. The resin is completely dissolved if the quantity of the nitric acid is considerable. The colour of the solution is dark red, but by boiling it becomes of a bright yellow colour. The liquid should be evaporated to dryness on the water-bath, to get rid of the great excess of nitric acid. The residue forms a mass of fine yellow crystals, consisting chiefly of carbazotic acid, but mixed with some oxalic and a little nitrobenzoic acids. The nitrobenzoic acid is evidently derived from the cinnamic acid in the resin. The carbazotic acid is easily separated from these other acids by converting it into carbazotate of potash, which is easily purified by one or two crystallizations, and then by decomposing the salt with muriatic acid, pure carbazotic acid may be obtained.

0·3823 grm. of the acid, dried at 212° F., gave 0·442 CO₂ and 0·049 HO.

	Found.	Calculated numbers.
Carbon . . .	31·53	31·37
Hydrogen . .	1·42	1·30
Oxygen . . .	67·05	67·33
	<hr/> 100·00	<hr/> 100·00

0·3975 grm. of the potash salt, decomposed by sulphuric acid and then ignited with carbonate of ammonia, left 0·1300 of sulphate of potash = 17·68 per cent. of potash; calculated quantity 17·60.

The silver salt was also formed by boiling the acid with carbonate of silver. It is a very soluble salt, which crystallizes in fine red-coloured needles. 0·8975 grm. of the salt gave 0·372

Cl Ag = 31.22 Ag, or 33.53 per cent. oxide. The calculated numbers are 31.27 per cent. of silver = 33.59 oxide.

The quantity of carbazotic acid which Botany Bay resin yields when treated with nitric acid is so great, and it is so easily purified, that this resin seems likely to prove the best source of that substance. When the resin is subjected to destructive distillation in an iron or copper retort, it yields a very large quantity of a heavy acid oil mixed with a very small quantity of a neutral oil, which is lighter than water. If however the resin has been previously digested with alkaline lyes, so as to remove all the cinnamic and benzoic acids it contains, the heavy oil is obtained as before, but none of the light essential oil. The acid oil is readily soluble in potash and soda lyes; in its smell and properties it resembles creosote; when it is digested with nitric acid, it is wholly converted into carbazotic acid, and when a slip of fir-wood is dipt in it, and then moistened with either muriatic or nitric acid, the deep blue colour passing quickly into brown, so characteristic of hydrate of phenyle, is immediately produced, with which substance the oil appears completely identical. The light oil above mentioned, the quantity of which is extremely small, is separated from the hydrate of phenyle by saturating it with an alkali and distilling the mixture in a glass retort with a gentle heat. In smell and properties it resembles benzine, and is most probably a mixture of benzine and cinnamene; unfortunately the quantity obtained was so small, that I was unable to subject it to more particular examination.

LXXIV. *On the Constitution of Matter.*

By H. SLOGGETT, Esq.

To Richard Taylor, Esq.

SIR,

HAVING observed in your Journal for December 1845 some remarks on Prof. Faraday's speculation on the constitution of matter by Mr. Laming, wherein he attempts to show, that by a peculiar way of considering the theory of atoms the conducting and insulating powers of bodies appear more intelligible than on any other doctrine, I have been induced to send you a few ideas of mine on the subject, with a hope that you may not consider them unworthy of insertion.

The test of the truth of any hypothesis, is its accordance with all known facts; and any discrepancy, even a single one, between a theory and experiment, is, if not cleared up, fatal to its validity. The one-fluid theory, in electricity though pre-