

two parts: (1) the interval during which the string is not displaced while the hammer felt undergoes compression till at the end of this interval; the second (2) regime begins and the string is displaced from the equilibrium position when Kaufmann's assumption holds good. It may be mentioned that this mode of considering the phenomenon first pointed by the authors in 1930 (*Phil. Mag.*, 9, 1175, 1930) has also been accepted by Messrs. Ghosh and Kar of Calcutta, (*Phil. Mag.*, 17, 521, 1931). Now Kaufmann's assumption is

$$\dot{Y} = \dot{Y}_0 \frac{x}{a} \quad \dots \quad (1)$$

initially at the beginning of second regime without any displacement, and at any subsequent instant the displacement is given by

$$Y = Y_0 \frac{x}{a} \quad \dots \quad (2)$$

where  $\dot{Y}_0$  and  $Y_0$  are velocity and displacement of the striking point abscissa  $x = a$  measured from the nearer end.

A distribution of velocity in the position  $a$  given by (1) and without any displacement has been shown by Sir C. V. Raman, N.L., to be due to discontinuous velocity waves (Fig. 1); one set travelling positively, and

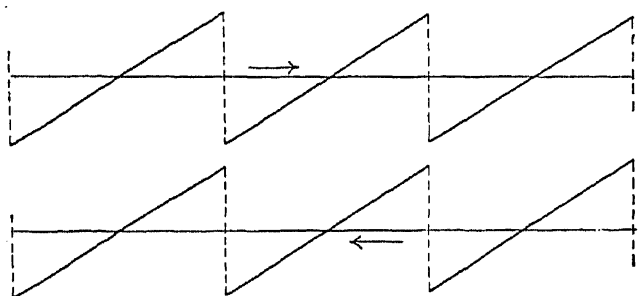


Fig. 1.

Discontinuous Velocity Diagram.

the other negatively. These produce displacements similar to that of bowed string, which appear as small kinks (Fig. 2) in the

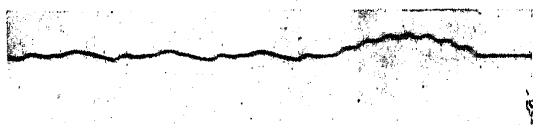


Fig. 2.



Fig. 3.

time displacement diagrams of any point of the string between the nearer end and the striking point, obtained during the time the hammer is in contact with the string. In

fact Kaufmann's theory with slight modifications is sufficient to explain the presence of these kinks in the shorter portion, their absence at the striking point and on the longer side of the string. It is also adequate to explain the appearance of large kinks when  $a$  is increased and the length of the other portion is decreased. Fig. 3 shows a large kink,  $a = 30.7$  cms.;  $\beta =$  the point of observation 106 cms.;  $\frac{T}{\phi} = \frac{\text{Period of vibration of the string}}{\text{Duration of contact}} = .7$ ; while Fig. 4 shows the same drawn theoretically. Details will appear elsewhere.

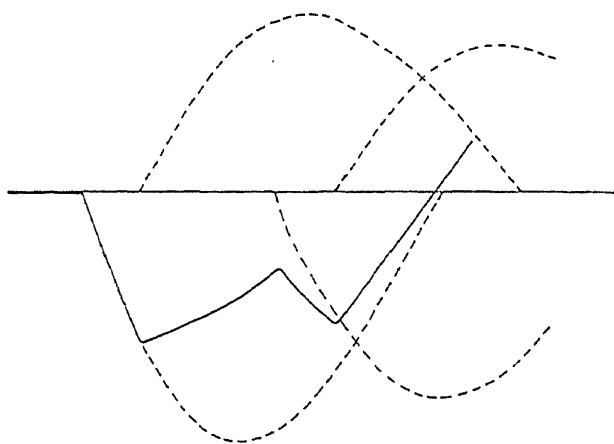


Fig. 4.

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#### Molecular Weight of Lignin.

THE highest yield of formaldehyde recorded by Freudenberg and co-workers<sup>1</sup> from pine-wood lignin is 1.2 per cent. Depending mainly on this result they advanced a structural formula for lignin<sup>2</sup> corresponding to a molecular weight of 2140 (in unpolymerised form). But as the molecular weights of various lignin derivatives lie between 800 and 1000,<sup>3</sup> it is difficult to reconcile Freudenberg's figure with these. The di-oxy-methylene group has been found to be very unstable towards acids and by treating jute with 42 per cent. HCl at 20° for 24 hours a lignin has been obtained with a pale rose colour which after repeated washings with

<sup>1</sup> *Ber.*, 1933, 66, 262.

<sup>2</sup> *Cellulose Chemie.*, 1931, 12, 269.

<sup>3</sup> Fuchs, *Chemie des Lignins*, 1926, 178.

dilute NaOH, gives 2.78 per cent. of formaldehyde (estimated by the Dimedone method).

Unlike aliphatic compounds, aromatic bodies with O-CH<sub>2</sub>-O groups do not give formaldehyde quantitatively by acid hydrolysis—the phenolic groups combine with the HCHO liberated to give resins; the temperature and concentration of acid employed for the estimation of HCHO being the same as those suitable for resin formation.<sup>4</sup> In the case of piperonylic acid 77.6 per cent. HCHO was obtained—also when HCHO and excess of protocatechuic acid were distilled with 28 per cent. H<sub>2</sub>SO<sub>4</sub> very nearly the same percentage was obtainable.

Assuming as Freudenberg does, that only one O-CH<sub>2</sub>-O group is present in lignin and also that 2.78 per cent. HCHO represents 77.6 per cent. of theory, the molecular weight comes to 830. Rassow and Wagner<sup>5</sup> determined the molecular weight of glycol-lignin by Barger-Rast method and gave the figure as 840. Freudenberg's formula therefore needs modification.

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#### Equisetum in Gujerat.

THE occurrence of *Equisetum* at Poona is perhaps the only record of its existence in the Presidency of Bombay.

The writer came across a dwarf (about six inches) but fertile specimen of *Equisetum* in October 1931 at Malsar in the Baroda State. The plant was isolated in a cleft formed by hardened clay in the bed of the river Narbada. It was supposed to be an accidental exotic in a district where ferns are rare or none.

This year at the end of May, I happened to visit a place called Balaram fifteen miles N.-E. of Palanpur. It is one of the outlying hills of the Aravalli range on the river Banas. Here, I found the shady slope of the hill covered all over by *Equisetum*. The fine green plants about twenty-four inches in height on hard limy soil apparently enjoyed the hot weather (115° temp.). They had stout dark rhizomes and a few branches but no cones.

<sup>4</sup> Bary and others, *Natural and Synthetic Resins*, 118.

<sup>5</sup> *Wochenblatt f. fabrikation*, 1932, 63, 103.

This find of *Equisetum* at two different places about hundred miles apart in Gujerat and that too, one from a place supposed to be arid and sandy is worth noting.

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#### Fluorescence in Wood under Ultra-Violet Light.

WHILE we were engaged on the study of the fluorescence in wood, under ultra-violet light, a short paper by Dalton on 'Woods that shine in the dark', appeared in the *Canadian Woodworker and Furniture Manufacturer*, 1934, p. 9. In this note certain observations have been made which are not in accordance with our findings and we, therefore, take this opportunity to record the results of our preliminary examination, a detailed account of which will appear elsewhere. Dalton remarks that "with the new Argon ultra-violet glow lamps and suitable light suppressing filters a large number of wood specimens were found to possess very definite fluorescent features. In practically all instances, the fluorescence was of a yellowish green colour."

We have examined over a hundred specimens in wood blocks, and in powder form, as well as their extracts in some common organic solvents, under a 'Hanovia' Quartz Mercury Vapour Lamp fitted with Wood's filter. We find that most of the woods fluoresce, the colour of the fluorescence in the block form and in the powder form being practically identical but, in many cases, different from the colour of the fluorescence of their extracts. Furthermore, the colour of the fluorescence in different woods is different, ranging from snuff brown to violet with practically all shades of orange, yellow, green, blue and indigo, between these extremes. The intensity of the fluorescence, however, is not restricted to any particular part of the wood. In some cases, the heartwood fluoresces more brilliantly than the sapwood, and in others the reverse is the case. Then again, in many cases, the colour of the fluorescence in sapwood and heartwood is very different.

In making extracts of the wood powders (100-mesh) we have employed absolute alcohol, acetic acid, ethyl ether, chloroform and xylene. Of these, alcohol and acetic acid extracts showed fluorescence in almost