V.—*Note on a Modification of Traube's "Capillarmeter."*

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HAVING a number of native Indian liquors to analyse, especially with regard to the amount of fusel oil contained in them, I determined to try the capillarmetric method proposed by J. Traube in the *Zeit. für Spirit Ind.*, No. 36 of 1886, this being according to the author both the quickest, least costly, and most accurate method, especially for small proportions of fusel.

Not having the apparatus, and there being no time to obtain it from Germany, I attempted to make one from a broken thermometer having a thin-walled capillary tube, and the scale of which was divided pretty accurately into 1.12 mm., that is, 88.5° equalled 100 mm. On testing this, I found that a 20 per cent. (vol.) solution of pure alcohol rose to a height of 76°, and that 0.1 per cent. of fusel oil depressed the height by very nearly 1°. It was, therefore, possible to read to $\frac{1}{50}$ per cent., as claimed by Traube, but it was, as might be expected, rather difficult, and the scale had to be adjusted to the surface of the liquid with the greatest nicety.

On thinking over the matter, I concluded that if the tube were laid at an angle approaching the horizontal, the height to which the liquid would rise would be correspondingly increased.

I therefore made an apparatus as follows: a broken milk scale thermometer, graduated up to 600° F., furnished the required capillary tube. The divisions on the scale very nearly corresponded with 1 mm., that is, 151° equalled 150 mm. On a stand, A, about 15 inches long, is placed a sloping piece of wood, B, the lower end of which is raised 2 inches above the stand, and slants upwards at an angle of 10°. In the centre of this inclined plane, a piece of wood, D, is made to slide easily between two other strips, CC, and to this is attached the scale and capillary tube, the end of the latter being slightly bent downwards. The slide can be adjusted by a screw, E, so as to bring the lower end of the scale in exact contact with the surface of the liquid. On the stand, near the lower end of the inclined plane, is placed a piece of glass tube, G, bent to a convenient angle, and ground off level, this being filled with the spirit to be tested. This tube is fixed moderately firmly between two small cork blocks, HH. The scale must be adjusted accurately to the same point each time, and this is effected by bringing the lower end of the scale itself, or a point attached to it, into exact contact with the surface of the liquid. This may be done with the greatest nicety by placing a polished

metal or glass reflector, I, under the bent portion of the glass tube when the exact moment of contact can be easily observed; without

F, India-rubber tube for sucking up liquid.

the reflector it is difficult to adjust it properly. The stand should be set exactly level by means of a spirit-level, K, and an adjusting screw.

By attaching an india-rubber tube, F, to the upper end of the capillary tube, it is easy to suck the liquid up the tube, or force it

back, and it is also used for cleaning the apparatus with pure spirit, and for sending dry air through afterwards.

I find that the most accurate readings can be obtained by drawing the liquid up the tube five or six times, and finally to a fixed point some 10° or 20° above the point reached by pure spirit.

In Traube's instrument the rise of a pure 20 per cent. vol. spirit is said to be 50 mm. In the modification here proposed a pure spirit rises 173 mm., and with 1 per cent. of fusel oil the meniscus is lowered 25 mm. against 7 mm. in the former apparatus. The instrument described is therefore more than three times as sensitive as Traube's.

From my experience with this apparatus, I find that it is necessary to distil the spirit under examination with soda or potash in order to eliminate the ethers, which have a very considerable influence on the capillary rise. One drawback is the amount of dilution required by, say, a proof spirit. If, for instance, the original liquid was proof, and contained 0.1 per cent. of fusel oil, it would require approximately one and a half times its volume of water, and the percentage of fusel oil in the mixture would be correspondingly lowered.

It is quite possible that a stronger spirit may answer the purpose, but I have not as yet had time to try it.

It seems to me that the experiments I have already made fully bear out Dr. Traube's recommendation, and the use of the capillarimetric method will tend to greater accuracy in the estimation of fusel oil than has hitherto been possible.