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SOCIETY OF PUBLIC ANALYSTS.

THE ANNUAL MEETING of the Society will be held at Burlington House on Wednesday, the 19th inst. The Annual Dinner will take place the same evening. The customary circular, with particulars, will be sent to Members as usual.

NOTE ON THE METHOD OF CALCULATING THE QUANTITY OF ADDED WATER IN DILUTED SPIRITS.

By A. ASHBY, M.B., F.R.C.S.

THE excellent alcohol tables compiled by Mr. Hehner, and by Dr. Stevenson, give us a ready way of calculating the exact quantity of water which must be added to spirit of any known strength in order to reduce it to any other, found or wished for, by using, in conjunction with them, the formulæ I am about to propose. The analyst can thus readily state the amount of water which has been added to spirit of the lowest strength allowed by the Sale of Food and Drugs' Act Amendment Act in any adulterated sample which may come under his notice, whilst the spirit merchant can as easily calculate how much water he must mix with a spirit of any known strength in order to reduce it to any other he may desire.

Let us presume that we have an adulterated sample of gin 45 under proof, and that we want to state how much water has been added to gin of the limited strength of 35 u.p. On referring to the tables it is seen that spirit of the latter strength contains 37·14 per cent. by volume of alcohol; consequently it has 62·86 per cent. of water by volume.

Now let us add an unknown quantity of water to this spirit, which may be represented by X. The volume of the diluted spirit will be $100 + X$; and the percentage of alcohol by volume in it will be— $(100 + X) : 100 :: \text{alcohol by vol. per cent. at 35 u.p.} : \text{alcohol by vol. per cent. in diluted spirit.}$

The latter is the strength of the spirit found by analysis, which in gin 45 u.p. is 31·4. Then—

$(100 + X) \times \text{alcohol by vol. per cent. found} = \text{alcohol by vol. per cent. at 35 u.p.} \times 100;$

$$\text{and } X = \frac{\text{Alcohol by vol. per cent. at 35 u.p.} \times 100}{\text{Alcohol by vol. per cent. found}} - 100;$$

and in the example taken—

$$X = \frac{37 \cdot 14 \times 100}{31 \cdot 4} - 100 = 18 \cdot 28.$$

So that in the adulterated sample 18·28 parts by measure of water have been added to 100 parts by measure of gin of the lowest strength allowed by law.

In the case of brandy, whiskey, or rum, it will be necessary to use the following formula—

$$X = \frac{\text{Alcohol by vol. per cent. at 25 u.p.} \times 100}{\text{Alcohol by vol. per cent. found}} - 100,$$

since 25 under proof is the limit of reduction assigned by the Act to those spirits.

Similarly, by the use of the following formulæ, and the alcohol tables already alluded to, the spirit merchant can ascertain how to reduce a spirit from any known strength to any other he may desire. Thus:—

$$X = \frac{\text{Alcohol by vol. per cent. at present strength} \times 100}{\text{Alcohol by vol. per cent. at desired strength}} - 100.$$

Suppose, for example, that it is desired to reduce brandy from 1 o.p. to 12 u.p.; then on referring to the tables, and using the above formulæ, we shall have—

$$X = \frac{57.64 \times 100}{50.21} - 100 = 14.79.$$

So that to 100 parts of brandy at 1 o.p. 14.79 parts of water must be added in order to reduce it to 12 u.p.

By substituting the percentage of alcohol by weight for that by volume in the formulæ, the relative proportions by weight of spirit and water can be ascertained if desired.

I am not aware whether these formulæ have been proposed before, but, at any rate, the use of them will demonstrate one of the numerous advantages to be derived from the complete alcohol tables by spirit merchants as well as by chemists.