WEIGHTS AND MEASURES SHOULD BE GUARANTEED U. S. P. STANDARD.

JOSEPH W. ENGLAND.

There is probably no more important need in the pharmaceutical world than the necessity of having accurate and uniform weights and measures, especially measures of volume.

It is simply idle to standardize the more potent remedies of the Pharmacopoeia, with the greatest possible degree of accuracy, and then measure them with measures that are not accurately graduated.

As an illustration, three dozen 8-ounce graduates were purchased by Whitall, Tatum & Co., in widely separated localities and compared with the standards used in their factory. The results were startling. They were as follows:

Not *one* of the 36 graduated measures were accurately graduated.

Some were better than others, but all were bad.

On one graduate, the 6-ounce mark was correct, but all the remaining ones were wrong.

In one lot of twelve graduates, 6 fluid drachms of liquid were required to reach the graduation marked ½ fluidounce, a variation of 50 per cent.

All graduates should be required to be graduated by manufacturers, and marked, "Guaranteed U. S. P. Standard by ————," and pharmacists, for self-protection, should buy no other. *It is fully as important that weights and measures be guaranteed to be of U. S. P. Standard as it is of drugs.*

A standard graduate should be made of good flint glass properly annealed and properly graduated, the usual types being conical, narrow cylindrical and broad cylindrical. The best forms are of blown glass, not pressed glass. The annealing of the glass is done in lehrs or tempering ovens 75 to 100 feet long. The graduates go in at one end red hot, and in twelve hours comes out at the other end cold, properly annealed. It has been alleged that graduates may be annealed by placing them in cold water, bringing the water to the boiling point and cooling. But glass workers claim that such a method is of no practical value, as the temperature of the boiling water is not high enough to permit any great readjustment of the relative positions of the molecules of the glass.

The standard followed by Whitall, Tatum & Co. is 1 fluidounce=29.5161 grams of water when weighed in dry air at a temperature of 15° C., barometric pressure of 760 mm., the coefficient of expansion of the glass being assumed to be 0.000025 and the density of the brass weights 8.3. These figures are derived from the original data in use at the National Bureau of Standards of the United States, Washington, D. C., and the calculations are carried to any number of decimals necessary in the case of each instrument. The best method of graduation is that in which the graduates *deliver* the quantities indicated, every line in each graduate being determined by actual measurement. Where mechanical division is employed, the graduates will vary in delivery.

*Read before Pennsylvania Pharmaceutical Association, June, 1912.

There should be no variation in the delivery of graduates, other than that caused by the personal factor. In measuring liquids, the lower meniscus should be, of course, always observed; if the graduate is not held in a perfectly level position, more or less of the liquid will be measured, according as the graduate is tilted backward or forward.

Personal accuracy in the reading of graduates depends somewhat upon the diameter of the graduate at the point where the reading is taken. It is for this reason that the narrow cylinder is apt to be more accurate than the cone, and is preferred in analytical work; the cone is sufficiently accurate, however, for galencial work, and is more easily cleaned out.

The weights and measures recognized by the United States Pharmacopoeia are derived from or based upon those of the metric system as the United States Prototype Standards of the Meter and Kilogram in the custody of the National Bureau of Standards at Washington, D. C., and the system of Apothecaries Weights and Fluid Measures as used in England prior to 1825, the weights being originally derived from the old English Troy Weight, and the Fluid Measures from the Wine Measure. As is well known, the metric weights and measures are used in all pharmacopoeial work, while the Apothecaries' Weights and Fluid Measures are used by the physicians of this country in prescribing and the pharmacists in dispensing; the use of the metric weights and measures is exceedingly limited, but it is growing.

According to the U. S. P. (VIII), p. LIII, the standard temperature for the solubility of substances in liquids, for taking specific gravity and the volumetric operations in the Pharmacopoeia is 25° C. (77° F.); in the former revision it was 15° C. (59° F.) This change was made on account of its greater convenience and because it suited the greatest number of laboratory experts and pharmacists in the United States. In the case of alcohol and wine, however, the temperature of 60° F. (15.667° C.) was recognized for the present, since all the laws and regulations of the United States, referring to alcohol and alcoholic liquids in general, are still based on this degree of temperature.

The standard temperature used by the glass manufacturer for graduating measures is still 15° C., although the standard temperature was changed in the eighth revision of the Pharmacopoeia from 15° C. to 25° C., which it will be probably in the ninth revision; but this error will be doubtless corrected by the manufacturer as soon as the temperature for the ninth revision has been decided upon.

The standard fluidounce of water used by the manufacturer in graduating his measures is: 1 fluidounce=29.5161 grams at 15° C. The standard of the U. S. P. (VIII) is 1 fluidounce=29.5737 grams at the maximum density of water (4° C.) in vacuo. This is a very small difference, when the expansion of the water from 4° C. to 15° C. is considered; and proper adjustments will doubtless be made as soon as the standards of the ninth revision become official.

The use of graduated prescription bottles should be discouraged. They vary greatly in accuracy, and their use is a delusion and a snare. They are blown in moulds, and vary in content according to distribution of the glass in the mould. Sometimes this is more uniform and sometimes less, and hence, the quantities

marked on such containers must be inaccurate. There is no substitute in prescription work for an accurately graduated measure.

In conclusion, it should be added that the American-made glass graduates, in accuracy and appearance, are superior to the foreign makes, and much more likely to be in accord with U. S. P. standard.

CUDBEAR AS A PHARMACEUTICAL COLORING.*

GEORGE M. BERINGER.

Since 1874, when Hans Wilder[1] directed attention to the advantages of cudbear over cochineal and carmine as a coloring agent for pharmaceutical preparations, it has become very popular and is now extensively used. As a vegetable dye miscible with either slightly acid or alkaline solutions, with the production of acceptable shades of red, it has been used by many almost as a universal coloring where red colored liquids are wanted. Despite its extensive use and desirable tinctorial properties, one has but to note the criticisms in the phramaceutical press to learn that it has not proved entirely satisfactory.

The principal complaint has been the lack of uniformity in the color of preparations as made by formulas in which the tincture of cudbear was directed. This tincture as found in the drug stores is exceedingly variable, due in part to the variability of commercial cudbear and in a large measure to the imperfect extraction of cudbear by the official N. F. formula.

This tincture is directed in a number of the National Formulary recipes, and in the revision now in progress it has again been decided to retain cudbear as a coloring agent. The desirability of adopting a method of standardizing the tincture is obvious and a sub-committee on color standards have been giving earnest consideration to this vexing problem.

A few of the suggestions offered for this purpose may be here mentioned. One of the earlier thoughts was the publication of a color chart with the shades designated by numbers and to indicate in the formula for a preparation the number of the shade that the product should match. A similar suggestion was to color silk thread or woolen yarn to the desired shades, and chart and number these as guides. Tinted glass, especially that known as "ruby flash glass," was recommended for comparing acid solutions of cudbear. Tintometers were recommended, but these are beyond the reach of the average pharmacist and so not practicable. A novel proposition along this line was offered by Harvey I. Leith,[2] namely, that standard glass rods be prepared of definite diameter and length and colored in their manufacture according to standards established by the Committee on National Formulary. Each rod to have a groove at the top bearing a tag with a number indicating the color. A rod of the standard tint dipped into a preparation would not be discerned if the coloring matched; if the rod showed it

*Presented at the meeting of the New Jersey Pharmaceutical Association, Atlantic City, N. J., June 5, 1912.

[1]American Journal of Pharmacy, 1874—299.

[2]American Druggist, 1910—175.