

The number of Cc. of this solution required to completely reduce 25 Cc. of Benedict's solution gave the factor.

RESEARCH AND ANALYTICAL LABORATORIES
OF THE
LOUIS K. LIGGETT COMPANY.

A STANDARD DOSAGE MEASURE.*

BY GEORGE M. BERINGER.

Accuracy in the compounding of medicines is a first principle instilled into the mind of a pharmacist and so he realizes fully the importance of correct weights and measures. This is a matter that is now also receiving official attention in some of the States, where the scales, weights and measures of the pharmacists, the same as those of other merchants, are periodically inspected by a representative of the State or Municipal Department of Weights and Measures.

While in the past the apothecary may have used graduated measures of variable shapes and with indifferent and inaccurate markings, today he is supplied by the manufacturers with "standard graduates," the shapes and graduation of which have been standardized with the coöperation of the United States Bureau of Standards, and the use of which is already compulsory by statutes in some of the states.

Accuracy in the administration of medicines is equally as important as accuracy in their preparation. The physician calculates the amount of active medicament that he intends shall be given his patient in each dose of the prescription that he directs. To the trained physician the word dose has a well defined meaning, namely, the right amount to obtain the desired effect, no more and no less. So it is evident that if too much be given untoward effects or undesirable reactions may result and that if too little be given there may be expected a failure to produce such effect. In either case, the intent of the physician may be nullified with detriment to his patient. It is the height of inconsistency to invalidate the judgment, the professional knowledge and skill of the physician and the pharmacist and to make these useless by the careless or inaccurate administration of the medicines.

The inaccuracy of the ordinary dose measures has been so frequently decried that the variability and uncertainty of these should be common knowledge. The almost universal custom is for the physician to direct as a dose of a liquid medicine, either a teaspoonful, a dessertspoonful, a tablespoonful, or possibly so many drops. Spoons of all sizes and shapes are marketed by the various manufacturers without any attempt to standardize the content of those bearing the same designation. In the same household one teaspoon may hold 55 minims and another as much as 80 minims and as great a range of variation may be shown by the dessertspoons and the tablespoons. Another source of error in measuring with the ordinary metal spoons is what may be termed the personal equation. One person does not hold the spoon level, another gauges the spoon as full when it is not en-

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tirely filled. Even more uncertain and unreliable is the measurement of the fractions of the teaspoonful that are not infrequently prescribed for children. Although it is very generally conceded that the metal spoon of the household use is too uncertain and unreliable for the administration of medicines it, nevertheless, even at the present time, is the most commonly employed measure for this purpose.

To overcome the unreliability of the spoon, the glass manufacturers have placed upon the market medicine tumblers and medicine goblets, of various shapes and sizes, marked for the measurement of teaspoonfuls, dessertspoonfuls, table-spoonfuls, etc. Unfortunately, the shapes selected have not been such as would permit of accurate measurement and in some cases the graduation has been very careless and inaccurate and the common medicine glass shows very little if any advantage in accuracy over the variable spoon. It is apparent that 60 minims of a liquid, distributed over the bottom of a broad tumbler or goblet shaped vessel, will make so little showing that it will be difficult to gauge and to properly graduate this, and it will be impracticable to indicate lesser amounts.

The commonly employed medicine dropper for measuring medicines directed to be given in doses of so many minims or drops is likewise far from accurate. This can be readily demonstrated by measuring accurately the same number of drops of the same liquid as dropped by a number of these.

The physician has in mind a definite amount of liquid as the equivalent of the dosage term he uses. It is almost an invariable rule, that to him a drop is one minim, a teaspoonful is one fluidrachm, a dessertspoonful is two fluidrachms, a tablespoonful is four fluidrachms or a half fluidounce. Upon these equivalents he bases his calculations for the intended doses of the medicaments in his prescriptions. Practically all of the formulas in use by physicians and published in the works on medicine and the treatment of diseases are based upon these commonly accepted equivalents, and these have also been generally employed in the "ready made medicines" so frequently dispensed.

The United States Pharmacopoeia IX recognized the seriousness of the prevailing inaccuracy in the administration of liquid medicines, and while not adopting the suggestion that a standard form for a dosage measure should be defined, the Committee of Revision compromised by making in the "Introductory Notices" the following statement on Page LI:

"Approximate Measures.

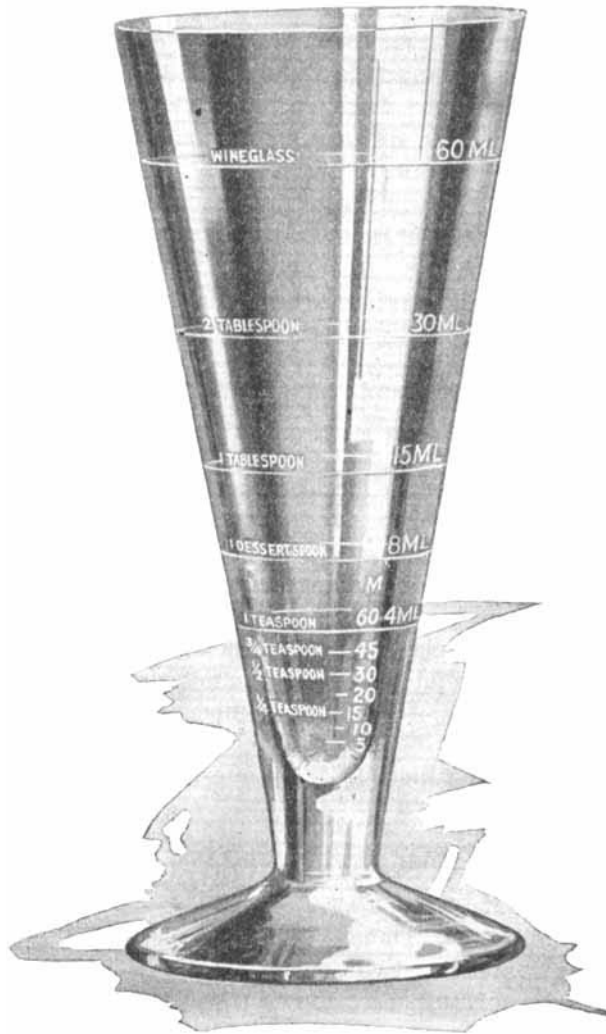
Physicians have hitherto very commonly prescribed liquid medicines in teaspoonful, dessertspoonful or tablespoonful doses. Inasmuch as spoons vary greatly in capacity, and from their form are unfit for use in the dosage of medicine, it is desirable that the more scientific practice should be always adopted, of prescribing doses in mils, fluidrachms or minims, to be measured with a suitable medicine measure. The following are the values conventionally attached to the several approximate measures above mentioned:

	METRIC.
A teaspoonful	= 4 mils
A dessertspoonful	= 8 mils
A tablespoonful	= 15 mils

APOTHECARIES SYSTEM.

A teaspoonful	= 1 fluidrachm
A dessertspoonful	= 2 fluidrachms
A tablespoonful	= 1/2 fluidounce"

The use of these equivalents as stated in the Pharmacopoeia has given entire satisfaction and their general acceptance indicates such a firm establishment that they should be permanently continued.



Measuring Glass.

Doubtless if the Pharmacopoeia had gone one step further and described "a suitable medicine measure," the manufacturers of such wares would have adopted this as a standard and the uncertainty of the dosage of liquid medicines and the use of the unreliable spoon and medicine glasses, before this time, would have been largely curtailed.

The necessity for standardizing the measure as well as the equivalents of the doses, in order that the uncertainty of the dosage of medicines may be terminated, is thus presented. It is not creditable to the medical profession and to the intelligence of this generation that the inaccuracy of the administration of liquid medicines has existed for so long a time and still less so that it be permitted to continue. The purpose of this communication is to present a study of this necessity that has led the writer to design a Standard Dosage Measure.

What are the essentials for such a measure? The *doses* that are commonly prescribed and which must necessarily be shown on the measure claim first consideration. Experience advises that there are certain numbers of standard drops or minims, such as 5, 10, 15, 20, 30; the teaspoonful and at times fractions thereof, such as one-fourth, one-half; the dessertspoonful; the tablespoonful, and occasionally the wineglassful. These with their metric equivalents it was concluded should be indicated upon the measure.

The *shape* must be such as will permit of the smallest of these named doses, 5 minims, occupying an appreciable space in the measure and also such that each of the doses named as necessary may be accurately measured and graduated. It must also be slightly and convenient to drink and to pour from. The inverted cone is the only shape that possesses all of these qualifications and so this form was adopted.

The *graduation* must be clear and accurate and indicate by distinct lines and lettering each denomination.

Stability is another essential so that the measure will not be easily upset. A relatively broad, flat, round base was decided upon with a short heavy stem just above and the weight of glass at this point adds materially to this important feature.

The glass designed, as a result of this study, as the standard dosage measure, is shown in actual size in the accompanying illustration and a sample is exhibited. It will be noted that it contains distinct graduations for 5, 10, 15, 20, 30, 45, 60 minims; the teaspoonful, and the one-quarter, one-half and three-quarter fractions thereof; the dessertspoonful; the tablespoonful; and the wineglassful along with their equivalents in mils. The denominations are arranged in three distinct columns under proper classifications. Each graduation is distinct and each dose, even down to the smallest indicated, 5 minims, can be accurately measured.

LABORATORY NOTES.

BY THOMAS D. McELHENIE.

In a paper presented by Mr. Thomas D. McElhenie, in the form of notes, he recommends the use of interleaved editions of the United States Pharmacopoeia and National Formulary. Notations made on these sheets are always accessible when preparations are to be made and for which improved manipulation has been discovered. He dates the notations.

The author has found that Acetic Turpentine Liniment can be prepared by shaking, in a bottle. A thorough shaking after the addition of each ingredient in the order named insures a perfect emulsion.

The addition of 8 grammes of citric acid is recommended as an improvement of the formula for Compound Elixir of Glycerophosphates. For Elixir Iron,