I think it can fairly be said as a result of my observation of the administration of the Act in this district that the greater care exercised by physicians and druggists, as required by the terms of the Act, has been a distinct public benefit, and this, without regard to other benefits which have resulted from the enforcement of the law, would justify its enactment.

During the first registration period under the law, ending June 30, 1915, the total number of persons registered in the First District of Pennsylvania was 7489, whilst the registrations in the four districts which are located in the State of Pennsylvania was 17,771. This number was exceeded only by one State—New York—which had a total registration of 20,036. The registrations in the First District of Pennsylvania for the current year have been somewhat larger.

The enactment of the law is fully justified and the slight amount of trouble and inconvenience caused by its administration should be cheerfully undergone, for the sake of the general welfare, by those to whom the Act applies.

HOW TO USE THE METRIC SYSTEM.*

BY J. W. ENGLAND.

It sounds trite and commonplace to say it, but the way to use the metric system of weights and measures is to *think in terms of the metric system.* Nothing can be more confusing than to use equivalents of the older system of weights and measures, and nothing has done more to handicap the introduction of the metric system than such use. The only right procedure is to *think* in metric units. And when this is done, the system becomes surprisingly simple in operation.

The metric system has come and come to stay in this country and in time it will be the only system used; probably in a much shorter time than many of us realize. The metric system was legalized by Congress in 1866. Its weights are used in our coinage. Metric units are the legal units of electrical measure in the United States. The use of the metric system is obligatory in the medical work of the U. S. Navy and War Departments and U. S. Public Health Service, and in Porto Rico and the Philippine Islands; and it is in universal use by analytical chemists and scientists generally.

The European War is demoralizing the export trade of foreign countries. The system of weights and measures most largely used in such trade is the metric. To-day is America's golden opportunity, commercially. Never before in the history of the world has any country ever had such commercial possibilities as this country has for foreign trade. The Government is fully alive to the situation and is doing everything it can to induce manufacturers to use the metric system in the shipment of goods to foreign countries.

Recently, there has been issued an exceedingly practical Senate Document (No. 241), entitled "Report on the Use of the Metric System in Export Trade," by S. W. Stratton, Director of the Bureau of Standards, Washington, D. C. If the metric system becomes the accepted system of U. S. manufacturers for export trade, it will be but a short time until it will be used for goods that are not to be exported, because manufacturers will not want to use two standards—one for export and another for home trade.

The forthcoming editions of our official legal standards—the U.S.P. IX and

* Read before the annual meeting of the Pennsylvania Pharmaceutical Association, June 22, 1916.

the N.F. IV, both of which will become official as of September 1, 1916—will use *only* the metric system of weights and measures. The U.S.P. VIII uses the metric system only. The N.F. III uses the metric system, but gives *relative* equivalents in the apothecaries system, as do, also, many books of reference and text-books. The use of relative equivalents has led to errors by those who assumed that the equivalents given were proportional and interchangeable with the metric units, and they were not. This procedure has undoubtedly retarded the adoption or even the learning of the metric system by pharmacists in a practical manner, and the Committee on National Formulary has very wisely decided to eliminate this feature in the forthcoming edition of the book.

It would certainly seem that the time has come for the pharmacists of this country to decide to use the metric system in the manufacture of pharmaceutical preparations. There is nothing inherently difficult about this. But there is a right way of doing it and a wrong way. The wrong way is to use equivalents of the older weights and measures, and the right way is to use the metric weights and measures, and it is along this line that the following suggestions are offered:

In the first place, while the use of equivalents is to be unreservedly condemned, it is essential that the users of the metric system shall have an intelligent conception of the *approximate* equivalents of metric weights and measures in apothecaries weights and measures so that they shall clearly understand relative values; however, this is very different from using the equivalents themselves.

The following table will serve for the purpose of comparison:

APPROXIMATE WEIGHTS.	APPROXIMATE VOLUMES.
1 milligramme = 1/65 grain.	1 millilitre or mil (or Cc.) = 15 minims.
1 centigramme = 1/6 grain.	1 litre = 2.1 pints or 34 fluidounces.
1 decigramme = 1½ grains.	
1 gramme = 15 grains.	

The term mil will be used in the U. S. P. IX in place of the Cc. or cubic centimetre of the U. S. P. VIII, the Bureau of Standards of Washington, D. C., having found that there was an error in the original measurement of the Cc. The error is practically negligible,[1] but the Committee on Revision wished to be as exact as is humanly possible, and also wished to follow the example of the British Pharmacopœia in the use of the term. Hence, the adoption of the newer and more euphonious term—mil.

APPROXIMATE LENGTHS.

1 millimetre = 1/25 inch.
1 centimetre = 4/10 inch.
1 decimetre = 4 inches.
1 metre = 40 inches.

The figures given are not exact equivalents, but they are sufficiently exact for understanding relative values. The exact metric equivalents carried out to the ultimate decimal point can be found in Part II of U. S. P. IX.

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[1] According to the Bureau of Standards, U. S. Government (Circular 47, Bureau of Standards, Department of Commerce, page 12), the term "cubic centimetre" as used in chemical work is a misnomer, since the unit actually used is the "millilitre," which has a slightly larger volume. The difference is the 27 millionth (0.000027) of a Cc.

An excellent conception of the relative values of metric weights and volumes in comparison with the apothecaries weights and volumes may be had by studying the doses given in the U. S. P. IX and N. F. IV.

DOMESTIC VOLUMES.

4 mils = 1 teaspoonful.
8 mils = 1 dessertspoonful.
15 mils = 1 tablespoonful.

It is useful to remember, also, that, practically, there are 28 (28.3495) grammes in 1 avoirdupois ounce, and 30 (29.573) mils in 1 fluidounce.

In using the metric system for manufacturing the preparations of the U. S. P. IX and N. F. IV, the terms used should be few in number and simply expressed. The metric system is a decimal system and its terms should be expressed in whole numbers and decimals, as is done by the official standards.

Thus: 1.5 Gm. is expressed as one and five-tenths grammes, not as one gramme and five decigrammes; or 2.5 mils are two and five-tenths mils.

In analytical chemical work and in the expression of dosage, the same rule is followed in writing, but in speaking, where the quantities are less than one gramme, it is usual to express them in milligrammes, and if less than one mil, in tenths of a mil.

The growth of the metric system in this country, so far as pharmaceutical manufacturing is concerned, has been handicapped by reason of the fact that drugs are bought and sold by the older systems of weights and measures, and to use the metric system results in the production of unusual volumes. Thus, 1000 mils equals 33.8 fluidounces or practically 34 fluidounces. The quantity of a fluid preparation usually made in a drug store is 32 fluidounces or less, and bottles holding this quantity are used for stock. But this difficulty can be readily bridged by using only 95 percent of the quantities of the official formulas and making 950 mils (32⅛ fluidounces) instead of 1000 mils; or better still, by using *metric* round bottom packer bottles, which can be readily obtained of glassware manufacturers in the following sizes: 60, 125, 250, 500 and 1000 mils or Cc.; these cost no more than bottles of corresponding volumes in the older system.

Pharmacists should use metric weights and measures for the making of pharmaceutical preparations whether physicians use the metric system in the writing of prescriptions or not.

The responsibility for the use or non-use of the metric system in the writing of prescriptions rests entirely with the medical profession, not with the pharmaceutical.

In this country, drug stores generally use two sets of weights, *i.e.*, one the apothecaries set for prescription purposes, of grains, scruples, drachms and ounces, and another or avoirdupois set of ounces, pounds, etc., for general use. For the measurement of volumes, there are generally used graduated glass measures of various sizes—60 minims and 120 minims, and 1, 2, 4, 8 and 16 and 32 fluidounces, with pints, quarts and gallon measures of metal.

Every drug store should have a set of metric weights from 1 centigramme to 50 grammes for prescription use, and, if they do manufacturing, a set from 1 gramme to 500 grammes, or, better, 1 kilo to 5 kilos. For volumetric work they should have metric graduated glass measures of 30 mils, 60 mils, 120 mils, 250 mils, 500 mils, and 1000 mils; and a few glass pipettes such as 1, 5, 10 and 25 mils; in fact, these latter are indispensable in applying the official tests. The 10 mil pipette and smaller should be graduated into one-tenth mils.

If graduated glass measures and pipettes in mils cannot be obtained, those

graduated in cubic centimetres can be used in their places, as the difference between the cubic centimetre and the mil or millilitre is practically negligible.

Horace Greeley once said that the way for the Government to resume specie payment was to resume, and, similarly, the way for the pharmacists of this country to use the metric system is to use it.

The U. S. Pharmacopœial Convention and the American Pharmaceutical Association have kept step with advanced scientific progress by recognizing the superiority of the metric system over the older system—the former for the Pharmacopœia and the latter for the National Formulary, and I know that I voice the desire of these bodies when I express the earnest wish that the pharmacists of this country will, with the advent of the new edition of these works, use the metric system in the making of the official preparations and not depend upon the makeshift of equivalents.

The metric system of weights and measures is rapidly becoming the world's universal standard. Its use is now obligatory in 34 countries and optional in 11 countries, and the United States of America cannot afford to take second place to any country.

At the opening of the present session of Congress, Representative Charles H. Dillon, of South Dakota, introduced a bill making the metric system permissive until July, 1920, after which time it is to be compulsory and exclusive. Ordinarily such a bill would be fated for the pigeon-hole, but this bill is being aggressively supported by Secretary of Commerce Redfield, who is himself a manufacturer of large experience in export trade and a firm believer in the metric system. Hence, the prospects for the adoption of the bill in the near future seem bright.

As Judson C. Welliver writes (*Munsey,* April, 1916): "It is now becoming apparent for the first time that the change (to the metric system) cannot long be postponed, and that it is going to be highly beneficial to business and science, and to technical and popular interests. It is probable that Great Britain will not be far behind us in adopting the French (metric) units. British manufacturers have had to use French measurements in many new operations since the war has drawn the two countries closer together than ever before, and even English conservatism will not stand out forever against a good system that is also a universal system."

KAOLIN AND FULLERS' EARTH.

Hess (*Journ. Am. Med. Assoc.*) has investigated the therapeutic difference between kaolin and fullers' earth, which he finds to be considerable when used in the intestinal disorders of infants. These two substances are considered to be the same in the dispensatories but they are by no means alike he says, either in their composition or physiologic action. It is difficult to get a standard analysis of fullers' earth, but he gives what may be regarded fairly typical of the two substances. The main distinction is that kaolin has a far greater amount of hydrous aluminum silicate and fullers' earth considerably more calcium. One of the most notable characteristics of the two substances is their power to adsorb various alkaloids. This adsorptive property can be tested by determining the quantity of earth required to remove from solution a given amount of dye. Direct clinical observation and experience, however, are needed to determine their therapeutic value.