

WEIGHTS
OF THE
PHARMACOPOEIA.

BY ALFRED B. TAYLOR.

There seems to prevail a very general impression that the Medical Convention for Revising the Pharmacopœia will, at its approaching session, adopt, among other improvements, some reform in the system of Weights and Measures at present in use by apothecaries. Especially in view of the recent action of the London, Edinburg and Dublin Colleges upon the subject, does it seem probable that some similar modification will be expected and attempted here.

The incongruity and inconvenience of our present duplex tables of weights are too universally admitted to need a condemnation; and the method pursued to unite and harmonize these discordant elements by the British Colleges, after careful deliberation, might appear as being on the whole the simplest and best adapted to effect the object. Without altering the "Apothecaries' Table,"—that is, the *divisions* and *denominations* by which the pharmacist is accustomed to estimate in compounding his preparations,—the new British system simply reduces the Troy ounce to the value of the avoirdupois ounce. The latter ounce weighing $437\frac{1}{2}$ grains, and the former ounce 480 grains, the new ounce is thus made to weigh $\frac{437.5}{480.0}$ of its former amount; and all the other weights of the apothecary—bodily—are diminished in the same proportion, or, in other words, our grains, scruples, drachms and ounces are all reduced $\frac{17}{192}$ (about $\frac{1}{11}$) in weight.

With a full appreciation of the labor and consideration undoubtedly bestowed upon this reformation, and with as full an appreciation of the ability and high professional authority

enlisted in its favor on this side of the water, we yet venture to question its judiciousness, and to suggest what appears to us a preferable scheme. We confess that the new British system does seem to us very much like the discarding of a substance for the retention of a shadow. What virtue is there in 20 times — 3 times — 8 —, that these should be preserved after all their old significance is lost? The surrender of our very *standard* of pharmaceutic weight, the GRAIN, is a sacrifice which ought to be compensated by very undoubted advantages. The grain is perhaps the most important standard unit of our whole metrology. Not only is it at present the recognised measure of the physician and pharmacist throughout a great portion of Europe,*—that in which chiefly is embodied the long-acquired experience and accumulated knowledge of the healing art,—the laboriously ascertained and accurately observed relations and values of all the more active portion of the *Materia Medica*,—but it is the measure, which outside of our profession is the one almost universally employed as the unit of comparison for all minute investigations and precise determinations.

Believing, therefore, that the *grain* is the weight that of all others we can least afford to lose, (unless at the price of a very perfect system in return,) we propose to retain this unit at its present value,—the 7000th part of the pound, *and to abolish all intermediate denominations*. This, it appears to us, would displace the anomalous “Troy weights” with the least practical inconvenience, and would form the simplest mode of reconciling our professional with the common or commercial system. Those who advocate a decimal system of division for weight would probably find this the very easiest and most expeditious method of introducing such a system; for if we had no other unit but the grain, we should of necessity group and compound it by our common decimal arithmetic.

If any one should take exception to the high numbers sometimes involved by this scheme, we would ask which is the more concise and distinct form,—the expression “875 grains,” or the expression “ $\bar{3}i.$, $\bar{3}vi.$, $\bar{3}j.$, and gr. xv.?” Which is the more

*Holland, which in 1817 adopted the French system of Weights and Measures, still retains the English “Apothecaries’ Weight.”

480
360
20
15
875

easily written?—or which the more readily conceived and remembered? Much has been said in praise of the beautiful and simple system of the French; and we seek not here to underrate it: but we should like some earnest advocate of its adoption to show wherein the expression “8 *hecto-grammes*, 7 *deca-grammes*, and 5 *grammes*,” (which, translated from its Greek form into plain English, is “8 *hundred-grammes*, 7 *ten-grammes*, and 5 *grammes*;)” we should like the advocate of this, we say, to show in what respect it is better or more convenient than the simple expression, 875 *grammes*?

So far, then, as the “grain” should be thus employed, it would exhibit practically all the benefits of a decimal metrology, and, in a manner attended with the least possible sacrifice of, or interference with, established values and reckonings. It would relieve the physician from the mental effort of constant reductions in writing his prescriptions. It would have the good effect of dislodging that relic of Latin ignorance—the Roman numeration. It would have the further advantage of abolishing those superfluous cabalistic symbols of weight, which, however precious to the mystery of alchemic craft, are but little congenial with the frank, direct and catholic spirit of modern utilitarianism. And it would diminish materially the risk of error both in reading and in writing medical prescriptions, where error is, alas, too frequently of serious consequence.

There would probably be no occasion for carrying the employment of our proposed “grain unit” higher than 875 grains,—the eighth part of the pound. From and above this weight, we should propose the use of the *eighth-pound*, the *quarter-pound*, the *half-pound*, and the *pound*. The separate weights necessary for the carrying out of our project would be the following:—

Table of Weights.

| | | | |
|-------------------|-------------------|-------------------|-------------|
| 1 gr. | 2 grs. | 4 grs. | 8 grs. |
| 10 grs. | 20 grs. | 40 grs. | 80 grs. |
| 100 grs. | 200 grs. | 400 grs. | 800 grs. |
| $\frac{1}{8}$ lb. | $\frac{1}{4}$ lb. | $\frac{1}{2}$ lb. | 1 lb. |
| (875 grs.) | (1750 grs.) | (3500 grs.) | (7000 grs.) |

It will be seen that the plan here proposed disturbs nothing,

except to a slight extent, the present notation or mode of reading. All the values heretofore employed in the Pharmacopœia remain unchanged. This, in our opinion, gives the "grain scheme" a very great superiority to the avoirdupois scheme adopted by the British Colleges. It is true that their new series of weights differ from the old by only an eleventh part (an amount perhaps not distinguishable by simple observation); but this difference is as real, and in a very large majority of cases where these weights are to be applied, is as seriously important, as would be the substitution of the French *milligramme*. The difficulty and labor of acquiring a familiarity with the new weights, and the tedium of constant reductions for a long time to come, would also be as great as if a radically different system had been adopted. By the "grain scheme" no such difficulty would exist. The pharmacist and the physician would employ the notation by *grains*, the week after its adoption, with as much facility as they would the present system. Perhaps it would be more correct to say that they would experience an increased facility in its use.

An evil of no slight magnitude in this unnecessary disturbance of familiar values, and in the transitional disorganization unavoidably consequent upon it, is that it would prove a formidable obstruction to any higher and more useful reformation. Men, after having just passed through the labor of a long and troublesome apprenticeship required for the acquisition of any new system, are naturally indisposed to repeat the process soon again with another system, however excellent, or whatever the benefits it may ultimately promise. If the change proposed, therefore, is not one of such value and importance as is likely to secure a *general* and a *permanent* establishment,—if it is not as full and satisfactory a remedy of present ills as might be attained, and thus leaves much to be accomplished at some future time,—this question of the amount of disturbance involved by the substitution becomes a pertinent objection, and is one which should be thoroughly and thoughtfully considered. Not unfrequently have seeming improvements proved barriers to real reforms.

The practical application of the "grain scheme" is so obvious that it would appear scarcely necessary to present an example of its notation. Indeed our present Pharmacopœia exhibits

cases where the plan has been adopted in preference to the regular notation, to avoid the use of mixed quantities. Thus, the formula for "Fowler's Solution," (*Liquor Potassæ Arsenitis*), instead of employing $\mathfrak{z}i.$, gr. iv. for the ingredients, calls for 64 *grs.* each of arsenious acid and carbonate of potassa. In like manner, the formula for *Liquor Arsenici et Hydrargyri Iodidi*, instead of requiring $\mathfrak{D}j.$, gr. xv. , calls for 35 *grs.* each of iodide of arsenic and red iodide of mercury. We may add here an example showing the character of change which would be ordinarily required. A simple formula will suffice, as that of the familiar "Dover's Powder," for instance.

Pulvis Ipecacuanhæ et Opii. (U. S. P.)

| | | | |
|---------------------------------|---|-----|------|
| Take of Ipecacuanha, in powder, | - | 60 | grs. |
| Opium, in powder, | - | 60 | " |
| Sulphate of Potassa | - | 480 | " |

Rub them together into a very fine powder.

In cases such as these, this mode of writing would be even easier than the present mode; and it would have the advantage of presenting all the ingredients in measures of the same units, thereby greatly facilitating their comparison and computation, or the estimation of their several divisions where a given number of doses is contained in the preparation. There are, however, some preparations of the Pharmacopœia which are not so manageable, and which in their present form certainly exhibit very awkward proportions. Thus, in the preparation of *Acetum Opii*, (Black Drop,) the quantity of opium is prescribed at $\mathfrak{z}viii.$ (3840 *grs.*, or 1 *half-pound*, 340 *grs.*) for 3 pints and 4 ounces of the resulting solution. Now, it is not easy to perceive any good reason for such a proportion as this,—giving $1181\frac{7}{13}$ *grs.* of opium to each pint of the preparation. The quantity of opium should be instead, 1152 grains to the pint, (1 *eighth-pound*, 277 *grs.*—a reduction of only $29\frac{7}{13}$ *grs.* in the pint,) giving us the convenient proportion of 72 grains to the fluid ounce, (instead of as now, $73\frac{11}{13}$ *grs.*) or of 9 grains to the fluid drachm. And the quantity directed by the formula should be either 1 pint, 2 pints, 4 pints, or 1 gallon. The binal progression (1 oz., 2 oz., 4 oz., 8 oz., 1 pint, 2 pints, &c.) should indeed be the law

*Half a pound, avoirdupois.

fluid?
Yes.
yes.
yes
(92)

of quantity for all the mixtures and solutions of the Pharmacopœia.

In the apportionment or distribution in pill preparations of the Pharmacopœia, a similar reform seems greatly needed. The quantities of different pills indicated by the several formulas are properly varied according to the nature and use of the preparation; but they are most usually ordered in numbers having a decimal expression. Thus, among the more common numbers will be found 80, 120, 180, 200, 240, 480, &c.—more inconvenient numbers than which for practical division could not easily be selected. To make a given mass into 180 pills, for instance, is quite a troublesome task, notwithstanding the great variety of factors this number can boast:—(2×90 ;— 3×60 ;— 4×45 ;— 5×36 ;— 6×30 , &c.) The required number may be obtained either by dividing the mass into 12 parts of 15 pills each, or into 10 parts of 18 pills each, or what would be the more usual course, into 9 parts of 20 pills each. But to divide into three parts, and each of these again into three parts, would be very tedious and inconvenient; or to weigh the whole mass, and then weigh off one-ninth part, and divide into pills, and so on successively, would leave the last portion sensibly too light by the drying which would take place in the mean time. The pills would thus be found to be of very unequal value or strength; and the only way to avoid this would be to complete the nine independent weighings at once.

Now, if instead of a system of division so tedious and difficult, we made use of that simplest and most natural of all the scales,—the scale of *final division*,—we may carry the bisection to any extent, with the greatest facility and accuracy, and without any reference to the absolute weights of the several parts. It is the peculiar merit of this scale that we can divide by it any plastic mass, or any given quantity of powder, (or even of a liquid,) into halves, quarters, eighths, sixteenths, thirty-seconds, or sixty-fourths, &c., with perfect precision and with expedition, without the use of any weights whatever; an advantage that can be alleged of no other system of division. Moreover, in the case of a large pill-mass, it would evidently be of no consequence to the equality of the resulting pills what time had elapsed between the first and last division, or how much weight had been lost in the interim by evaporation.

The pill-machines of the pharmacist, as ordinarily constructed, are provided with twenty-four grooves, for the division of pills: a very suitable and convenient number. The reform, then, that we propose on this subject is, that accepting the number 24 as the unit, all the pill formulas should be based in quantity upon multiples of this unit, and in the binary scale of progression; that is, we would have all the pills of the Pharmacopœia ordered in quantities of 24, or of 48, (2 times 24,) or of 96, (4 times 24,) or of 192, (8 times 24,) or of 384, (16 times 24.) There is no occasion whatever for any intermediate quantities. An example or two of the change indicated will illustrate fully the project. Thus, the formula for the "Compound Cathartic Pills" of the Pharmacopœia specifies ziv. , ziii. and ðii. of the respective ingredients, and 180 for the number of the pills. The new form we propose would be as follows:—

Pilulæ Catharticæ Compositæ.

| | | |
|---------------------------------------|-----|------|
| Take of Compound Extract of Colocynth | 256 | grs. |
| Extract of Jalap - - - - | 192 | " |
| Calomel - - - - | 192 | " |
| Gamboge - - - - | 48 | " |

Mix and make into 192 pills.

The only difference between this pill and that of the Pharmacopœia is the use of one-fourth of a grain of gamboge, instead of the rather awkward amount of two-ninths of a grain, ($\frac{2}{3}$ gr. in a dose, for $\frac{2}{3}$ gr.)—an addition of $\frac{1}{36}$ gr. to each pill, or of $\frac{1}{12}$ gr. to the dose,—a difference wholly insignificant, when it is considered that the full dose of gamboge is from 2 to 6 grs. The object of this change is of course merely to avoid the inconvenient amount of $42\frac{2}{3}$ grs., which would be required by the present formula.

Pilulæ Ferri Iodidi. (U. S. P.)

| | | |
|----------------------------------|----|------|
| Take of Sulphate of Iron - - - - | 72 | grs. |
| Iodide of Potassium - - - - | 96 | " |
| Tragacanth, in powder - - - - | 12 | " |
| Sugar, in powder - - - - | 36 | " |

Beat with syrup, and make into 48 pills.

Twice

Yes

Pilulæ Ferri Compositæ. (U. S. P.)

| | | | | | | |
|--------------------------|---|---|---|---|-----|------|
| Take of Myrrh, in powder | - | - | - | - | 144 | grs. |
| Carbonate of Soda | - | - | - | - | 72 | " |
| Sulphate of iron | - | - | - | - | 72 | " |
| Syrup, q. s. | | | | | | |

Mix, and make into 96 pills.

Pilulæ Scillæ Compositæ. (U. S. P.)

| | | | | | | |
|---------------------------|---|---|---|---|-----|------|
| Take of Squill, in powder | - | - | - | - | 96 | grs. |
| Ginger, in powder | - | - | - | - | 192 | " |
| Ammoniac, in powder | - | - | - | - | 192 | " |
| Soap | - | - | - | - | 288 | " |
| Syrup, q. s. | | | | | | |

Mix, and make into 192 pills.

Pilulæ Aloës et Myrrhæ. (U. S. P.)

| | | | | | | |
|--------------------------|---|---|---|---|-----|------|
| Take of Aloes, in powder | - | - | - | - | 768 | grs. |
| Myrrh, in powder | - | - | - | - | 384 | " |
| Saffron | - | - | - | - | 192 | " |
| Syrup, q. s. | | | | | | |

Beat together, and make into 384 pills.

These formulas are sufficient to show the convenience of the system, and its adaptation to any range of quantities. By the apothecary, at least, the great advantages of this principle of distribution will, we imagine, be at once and universally recognised; and as it is upon him that the obligation of a faithful dispensation of the provisions of the Pharmacopœia rests, we suppose it will be generally conceded that his convenience should be chiefly consulted in a matter which, like this, can affect directly the interests of no one else.

Philadelphia, March, 1860.

Jan. 22, 1861.