

REFORM IN WEIGHTS AND MEASURES. BY E. M. RICHARDS.

The unit of long measure being established, as stated in my last article, the unit of square or surface measure was directly obtained from it; this latter unit is a decimeter squared, that is to say, it is a square, each side of which measures 10 meters, and consequently it contains 100 square meters; this is called the Are. The other denominations of this species of measure were formed decimally, on the same general plan as that indicated for long measure, only that the operations were not so far extended. The usual multiple is the hectare—a square of 100 meters on each side; and the corresponding sub-multiple is the centiare—a square meter. These terms are found sufficient, and are those usually employed in transactions relative to land.

The measure of capacity likewise depends on the meter. The unit of this measure is called the Liter, and it is a cube, each of whose sides measures just one decimeter; it is raised to a higher or lower denomination by the same prefixes as in the other cases; and it is generally used for liquid measure; while the hectoliter is for grain. A cubic meter of water, or 1,000 liters, is a tun in weight. The standard of weight was thus obtained; it is the weight of a cubic centimeter of pure water under certain fixed conditions of temperature, pressure, &c., and it is designated a Gram. (The various standards and their multiples and sub-multiples are spelled in this article as they would naturally be in English, not as they actually are in French.) The multiples are the decagram, which equals 10 grams, the hectogram of 100 grams, and the kilogram of 1,000 grams. A thousand kilograms would form a cubic meter of water, and is, as mentioned above, the equivalent of the tun, for heavy weights, and is termed a millier. The sub-multiples are the decigram, centigram, &c. The milligram is a very light weight indeed; being about .015 of a grain Troy, while the kilogram equals about 2.2 pounds Avoirdupois.

The only remaining denomination is that for solid measure, the unit for which is the Stere, equal to a cubic meter, and therefore equal to the kiloliter, the above-mentioned measure of capacity. The multiples and sub-multiples of the stere are the decistere, equal to the tenth part of the standard, and the decastere, containing one hundred of them.

In France the unit of coinage is the Franc, weighing five grains, and composed of a specified amount of pure silver and alloy, being thus connected with the metrical system.

It is to be remarked that, as tables of specific gravity are always calculated with reference to the proportion between the weight of pure water and the various substances, and as the table of weight in the above system is decimally arranged, likewise having water for its basis, the specific gravity will show the absolute weight of the substance under consideration; thus, silver being 10.474 times heavier than water, and a centimeter of water weighing a gram, a centimeter of silver weighs 10.474 grams; or a cubic meter (a stere) of silver would weigh 10,474,000 grams, or equal to 10 tuns, 474 kilograms; and so of any other substance.

From the foregoing it will be seen that there is provided one ample set of measures for each kind of work, namely, the Meter and its denominations for long measure, the Are for square or surface measure, the Liter for capacity, the Gram for weight, and the Stere for cubic measure; the last being only another name for a solid meter. Finally, the coinage of the country is intimately related to the measures; forming, it may be said, "part and parcel" of them, and all intimately based on the size of the globe itself! It is a very beautiful and philosophical arrangement, infinitely superior to our lengthy and imperfect contrivances, though these latter have been simplified by law. But the greatest advantage of all connected with the French system is that it is decimally arranged. Very great men—principally generals and statesmen—have stigmatized the decimal system as being unnatural and "contrary to the mind of man;" but it is not known that computers and those who have much to do with figures are in any way opposed to it. On the contrary, it is believed that those who have had fair experience of both sides of the question will declare, by a sweeping majority, in favor of a reform in this branch of our "institutions."

It is not here advocated that the currency of this

country should be changed; it is a very admirable one, as it now is; but the adoption of the French system of weights and measures would greatly benefit all classes. Of course, no reform can be brought about without inconveniencing some persons; and the one here proposed would no doubt, at first, be perplexing to all; but the ultimate gain would be so great that this temporary trouble would be as "dust in the balance" compared with it.

At one time the writer of this article was opposed to the French nomenclature, as being too lengthy; but he now likes it, and would adopt it along with the measures themselves. It certainly would be injudicious to retain our present names and give to them a different value from what they now possess; such a course would be certain to cause mistakes. If we get new quantities to deal with, we assuredly must give them new names.

The foregoing imperfect sketch of a very interesting subject is hastily drawn up, hoping that it will be the means of calling attention to this too-much-neglected matter.

THE LIGHT FROM LOAF SUGAR.

Messrs. Editors:—I was much interested in the perusal of two articles published on pages 325 and 371, Vol. II., SCIENTIFIC AMERICAN, and entitled "Philosophy in an Eggshell." Your able correspondent "R. W." gave a very satisfactory explanation of the cause of the difference in temperature between the large and small ends of an egg; but in regard to the phosphorescence of sugar I think that still more light can be thrown on the subject. "R. W." asserts that "the light proceeding from either the friction or fracture of sugar is wholly electric," but his only proof of the assertion is that the experiment will not work in damp matter. Although I have never observed this last peculiarity, the following variation of the general experiment is quite familiar to me. I mix the sugar with the whites of eggs in the same manner as is done for the frosting of cake. This mixture when spread out and dried, emits a stream of light on being scratched quickly with a sharp point, forming a brilliant phenomenon when performed in the dark, as figures and even words can be written as if with liquid fire. If this is electricity it evidently must be frictional; and the principle indications of a disturbance of the electric fluid in any body or bodies are attraction and repulsion.

If we present two pieces of sugar to a pith ball, suspended by a silken thread, we do not find the slightest attraction—not even to a fiber of cotton. If we take the electroscope (an instrument for showing the slightest trace of electricity) we may perhaps perceive a slight disturbance of the gold leaves, but not so great as we should have from merely striking together two pieces of wood or almost any other substance.

To show the electric light, it is requisite that quite a considerable quantity of the fluid be disturbed. For instance take a half a sheet of common brown wrapping paper, and hold it to the fire till it is perfectly dry and slightly hot; now draw it briskly between the body and the sleeve of the coat, so as to rub it on both sides at once by the woolen. The paper will now be found highly electrical, so that if held near a papered wall, it will fly up quickly and adhere for a considerable time. Then if quickly torn off, in a darkened room, it will clearly show the electric light accompanied by a faint snapping noise. If the paper when excited be held over a large feecy feather, the latter may be made to fly up to the distance of a foot or more, showing a powerful attraction. Again: support a bright tin plate upon a clean and dry drinking glass; excite the paper as before, and lay it upon the tin; now hold a knuckle to it quickly and you will receive the electric spark. In this manner a Leyden jar may be slowly charged.

A large variety of substances show electrical phenomena by friction, such as a lump of sealing wax or brimstone when rubbed with a piece of flannel, a piece of india-rubber, a sheet of writing paper, or (as a more familiar experiment to the juveniles) the rubbing of a black cat's back in the dark, on a frosty night (all these experiments succeed much better in dry or frosty weather) or the brushing down a horse in the dark, when we frequently hear a crackling noise and perceive bright sparks of light. These are all electrical effects, and are at the same time accompanied by a strong attraction, as will be

found by experiment. On bringing a metallic point near an electric light, we perceive a star on its tip, showing that the fluid is attracted by it, but the light from the sugar shows nothing of this kind. The light proceeding from loaf sugar is generally conceded to be of a phosphorescent character, that is, it is a light which is emitted without sensible heat or combustion. This we see almost every day in a variety of forms; for instance, the fire-fly, and what is generally termed the "fox-fire"—a light proceeding from decaying wood or vegetable matter. Many minerals also show a light on being struck or rubbed together in the dark. Most varieties of quartz—even our common white pebbles—show a beautiful light; some red, others blue. Some of them appear to be luminously transparent at the instant of being struck together, giving a sufficient light to see the hour by a watch-dial. During the decomposition of certain animal substances a kind of phosphorescence may also be observed. Thus, if a small piece of fresh herring or mackerel be put into a two ounce vial of sea-water, or fresh water to which a little common salt has been added, and the vial be kept in a warm place for two or three days, there will then appear a luminous ring on the surface of the water, and if the vial be shaken, the whole will give a phosphorescent light. I recollect, in fishing in the night, on one occasion, on opening a box of "angle worms," they presented the appearance of a *living mass of fire*; creating quite a sensation among the company who unanimously agreed to call it "electricity" without giving a thought as to how electricity should come in a damp metallic box like that. I have observed a strong propensity of the public in general to ascribe everything strange or unnatural, or which they cannot explain, to the agency of electricity. I have even seen ascertained in print, that "the sparks produced by flint and steel are electrical phenomena." In like manner, the most astonishing effects exhibited by spiritualists, mesmerizers, and psychologists, are all confidently ascribed to the agency of electricity. Perhaps this might be preferable to supposing such effects to be due to the influence of departed spirits; but I should prefer calling them mysterious phenomena of the human mind.

I recently had some conversation with a lecturer on psychology who explained everything by electricity. His experiments were, of course, curious and interesting. The "subject," he said, was charged with electricity though standing at the time on good conductors. I asked him why the electric fluid did not immediately pass off and restore the equilibrium with the surrounding bodies, and also why it did not show its presence to the electroscope when the latter was presented to his person. The lecturer's explanation was that it was a different kind of electricity, or electricity in a different state—in fact that it showed no attraction and repulsion, nor a test of electricity in a single point: that it was merely a mysterious agent. Why call it electricity at all? why not term it anything else with equal propriety?

When quite young, I had a passionate longing for an electrical machine; and I made one that answered every purpose at trifling expense (but not of loaf sugar). As this plan may be of use to the readers of the SCIENTIFIC AMERICAN I will give it here:—I procured a common round pie-dish made of tin, and about eight inches in diameter; this I filled with a mixture of one pound of resin and two ounces of beeswax, which compounded on being melted, poured in and suffered to cool, formed an electric plate. I next took a round piece of wood, six inches in diameter, and half-an-inch thick, with the corners rounded off, and covered it with tin-foil; cementing a long two-ounce vial with the neck downwards into the center for an insulating handle. This completed the apparatus. Scrape the resinous plate slightly with a knife so as to roughen it; then rub it quickly with a piece of flannel or silk handkerchief; then place the wooden plate on it, and touch it with the finger; now remove it by means of the glass handle and it will give a strong spark (in good weather) more than one inch in length. A Leyden jar can easily be made as described in our school philosophies; and in the absence of tin-foil, a common tea-chest sheet lead answers a very good purpose.

One word of caution:—In making my first Leyden jar I used a common green glass jar, such as is used for fruit, and I was extremely puzzled to know why it would not hold a charge, but it would not do at all. The com-