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 decameter 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 measnre, 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 tho 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 fleecy 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 juviniles) 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 conceeded 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 ascerted 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 an 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 commrn 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 common glass manufactured in this country (similar to window glass) is *not* a non-conductor; the charge will pass through it readily, although many of our published works on electricity seem to have overlooked the fact. Nothing but clear, white English glass should be used.

Such an apparatus as that above described will answer almost every desirable purpose, and its cost is within the means of every one. Although I have now been engaged for several years in giving lectures on chemistry and electricity, making the principal part of my apparatus myself, yet I still carefully preserve my first electrical machine to remind me of the happy hours I occupied n making it in my boyhood days.

AMOS I. ROOT.

Medina, Ohio, June 29, 1860.

AMERICAN NAVAL ARCHITECTURE.

[Reported expressly for the Scientific American.]

THE STEAMER "SALVOR."

This steamer was constructed in Buffalo, N. Y., and has recently taken her appropriate position on the route of her intended service—Tampa Bay to Havana. As she is a well-built and staunch vessel in every particular, we surmise the details of her construction will prove of interest to the readers of the SCIENTIFIC AMERICAN; they are as follows:—Length on deck, from fore-part of stem to after-part of stern-post, above the spar-deck, 183 feet, 6 inches; breadth of beam at midship section, above the main wales (molded) 26 feet 6 inches; depth of hold, 12 feet 3 inches; depth of hold to spar deck, 19 feet, 3 inches; draft of water at load line, 9 feet 7 inches; tunnage, 470 tuns. Her hull is of white oak, &c., and square fastened with iron, treenails, butt bolts and large spikes. Distance of frames apart at centers, 18 inches. The floors are molded 12 inches; sided 12 inches.

The *Salvor* is fitted with one vertical direct-acting engine; diameter of cylinder, 30 inches; length of stroke of piston, 36 inches, diameter of propeller, 10 feet 8 inches; pitch of same, 19 feet, and has four blades, materials of same, cast iron.

She is also supplied with one return flue boiler, located in hold; possesses a water bottom; does not use blowers to furnaces; has one smoke pipe; no bulkheads; knees under spar and main decks; has two extra size anchors, and two masts. In addition to these features, she has one independent steam fire and bilge pump, and bottom valves or cock to all openings in her bottom. Ample protection has been made with tin, &c., against communication of fire from boilers. The cabins are on her spar deck; bunkers of wood; she is well coppered her rig is that of a schooner. This vessel is designed to carry large loads of cattle on her main deck. The machinery was constructed by and under the supervision of Mr. David Bell, of Buffalo, N. Y.

THE STEAM PROPELLER "JOSEPHINE."

This steamer was constructed by the well-known builders, Messrs. Harlan, Hollingsworth & Co., of Wilmington, Del., for the Philadelphia Steam Propeller Company, to ply between the ports of Philadelphia and New York. As she is claimed to be a good vessel of its description, we proceed to give the essential elements of its construction for the benefit of the readers of this paper. Length on deck, from fore-part of stem, to after-part of stern-post, above the spar deck, 135 feet; breadth of beam (molded) 22 feet 8 inches; depth of hold, 9 feet 3 inches; draft of water at load line, 6 feet 6 inches; tunnage 275 tuns.

Her hull is of wrought iron plates, $\frac{1}{4}$ and $\frac{3}{8}$ths of an inch in thickness, and very securely fastened with rivets $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{2}$ and $\frac{3}{8}$ths of an inch in diameter, every 3, $2\frac{1}{2}$ and 2 inches

The *Josephine* is fitted with one vertical direct-acting engine; diameter of cylinder, 30 inches; length of stroke of piston, 2 feet 4 inches; diameter of propeller, 6 feet, number of blades 4; materials of same, cast iron.

She is also supplied with one return flue boiler, located on deck; does not use blowers to furnaces; has no water bottom; one smoke pipe, one independent steam fire and bilge pump, and ordinary bilge injection. Ample protection against fire has been made; this vessel has two athwartship water-tight bulkheads, and freight-house on deck. The machinery was constructed by Messrs. Reaney, Neafie & Co., of Philadelphia.

We believe the propeller used on this vessel is the "Loper Propeller," invented by Captain R. F. Loper, of Philadelphia. The screw is all cast in one piece, its diameter is 8 feet; width of blade at hub, 2 feet 3 inches; and at outside, 4 feet 4 inches. The angle of the blades at the axis is 30°; at the outside 54°. The alteration of angle, on increasing pitch, affords a greater outward action of the blade at the entrance, and leaves the water without revulsion, thus avoiding the "slip." The blades occupy 6-10ths of the area of the circle, when viewed in the direction of the axis, thus leaving 4-10ths for the free escape of water between the blades. The weight of this wheel is about 3,000 pounds.

AN EXTRAORDINARY MILITARY DRILL.

A military company from Chicago—calling themselves the "Zouaves"—have recently visited this city and have astonished and delighted the New Yorkers with their extraordinary tactics. On one occasion the Zouaves paraded in the City Hall Park, in front of our office, and were then put through a course of the most vigorous drills in the manual; loading and firing, and company movements, in common, quick and double quick time; skirmish drill or disposition against cavalry and deployment. The universal sentiment was one of astonishment and commendation, and it was admitted on all sides that such a drill was never before witnessed in this city. The company seemed to move like a collection of clocks, even in loading and firing, and stacking arms.

In the manual, the light infantry drill commanded unusual applause. In the loading and firing, the regular ramming, and breaking of the cartridge with the hands, the return ramroad, and simultaneous firing, were excellent. In the company movements, the "break into platoons," "exchange ranks while on the march," "oblique by platoons," "wheeling," and "counter-marching," both in quick and double quick time, drew down continued plaudits, even from the military spectators who constituted the escort to the Chicago company. But the most surprising part of the drill was that without knapsacks; the deploying from one end of the park to the other in companies of five as skirmishers; formation of company pyramid, preparing against cavalry assault, the bayonet exercise, retreat and shout of the rally, produced a perfect *furore* of applause. The whole wound up with an exhibition of loading and firing while lying on the ground, running forward and retreating with an agility that would seem to enable them to dodge between the balls in a real engagement. Their surprising springiness, muscularity and general gymnastic excellence was particularly developed in these movements, and the rapidity with which they dropped down on their stomachs, turned over on their backs and loaded, turned back and fired, jumped up by platoons, ran ahead and repeated the same process, was highly interesting though somewhat ludicrous.

The drill lasted nearly three hours, including stoppages for rest, a few moments each time, and although performed under a scorching sun, on the hot sand, and comprising a series of vigorous exercises, the men stood it well and attended to their business. The entire drill of which the corps is capable includes a large number of movements not touched upon for want of time, including the silent manual, charging on a street crowd, and other novel movements. The latter was tried in one of the western cities on their way here, and their assumed ferocity and horrid yells at the charge set even the military scattering helter-skelter.

IMPORTANT INFRINGEMENT CASE.

Just as we were going to press, we received the following telegraphic despatch:—

CLEVELAND, Ohio.

JULY 20.—*Obed Hussey, versus Whitely, Foster & Kelley.*—This was a bill in chancery filed, in Cincinnati, to restrain the defendants from infringing Hussey's patents. A motion for injunction was reserved for argument at Cleveland, and was heard before Judges McLean and Wilson. The court held, first, that Hussey's patents had heretofore been adjudged to be valid on a final hearing, and the defendants had shown no good grounds for impeaching them; secondly, that the machines of Whitely & Co. infringed Hussey's patents; and thirdly, that an injunction be ordered as prayed for.

To Messrs. MUNN & Co., New York City.

A COLUMN OF VARIETIES.

An alloy consisting of 10 parts cast iron, 10 of copper and 80 of zinc does not adhere to the mold in casting, and it is of a beautiful luster when filed and polished. The most fractious metals are melted first and the zinc last, in making it.

The greatest discoveries have been made in leaving the beaten tracks of science and going into the by-paths. Let inventors mark this sentiment well.

Polished surfaces of steel and iron may be prevented from rusting, by exposure to water, if they are coated over with a mixture of lime and oil.

A transparent cement for glass is made by dissolving one part of india-rubber in chloroform and adding 16 parts, by measure, of gum mastic in powder. Digest for two days, and frequently shake the vessel in which these substances are contained. The cement is applied with a fine camel's-hair brush.

In a pumping engine there are two classes of work performed, namely, *useful* and *lost;* and the two, added together, make the *gross* work of the engine. The useful work in a given time is the product of the weight of water lifted in that time multiplied by the hight to which it is elevated; the lost work is that performed in overcoming the friction of the water in the pump, pipes, valves and piston.

A "combustible" means some simple or compound substance which is capable of combining rapidly with oxygen to produce heat. There are many combustible substances, such as phosphorus, sulphur, &c., but the most common are carbon and hydrogen, and these are found in nature intimately combined and on a large scale. The trees of the forest, the bituminous coal fields, and the fat of animals are principally composed of carbon and hydrogen.

An excellent furniture polish is made with one pint of linseed oil and about half a gill of alcohol, stirred well together and applied to the furniture with a linen rag. After this, it is rubbed dry with a soft cotton cloth and finished by rubbing with an old piece of silk, when a most beautiful gloss on the furniture will be result.

When the glass case which covers the magnet of a compass becomes electrified, it affects the needle. This deflection can be remedied by damping the glass with water, the moisture removing the electricity.

The speed to which the steamship *Persia* attained on her first trial trip, in 1856, was $16\frac{1}{2}$ knots per hour. Her engines have cylinders of $100\frac{1}{2}$ inches diameter and 10 feet stroke; her wheels are 38 feet 9 inches in diameter and make about 18 revolutions per minute. Her consumption of coal was, formerly, from 120 to 150 tuns daily, but she has just had an apparatus for superheating the steam applied, and by this it is expected that from 25 to 35 per cent of fuel will be saved.

One great canse of *mysterious* boiler explosions, we believe, is due to the inequalities of strength in the iron plates of which the boiler is constructed. The exact strength of a plate of iron cannot be ascertained without breaking it. Some plates of iron, of the same size and thickness as others manufactured from the same stock, have varied as much as 10,455 lbs., in breaking weight, to the inch, when tested.

The Electric Telegraph Company in London have an air-tight tube laid between their central station and other stations at Cornhill and the Stock Exchange, from which the air is exhausted by a pump and documents sent through the tube by atmospheric pressure, upon the same principle as Richardson's telegraph, which was illustrated on page 265, Vol. VIII. (old series), SCIENTIFIC AMERICAN. This system has been in operation, privately, in London, for several years, and it is now proposed to lay down a complete and extended series of public lines in London, on a scale which will receive not merely papers and packages, but parcels of considerable bulk, including the mail bags of the post-office between the railroads and the district offices; and a company is now in course of formation to carry out the object.

The new Commissioner of Patents, Gov. Thomas, desiring to infuse new life into the Agricultural department of his office, has sent out Col. Clemson to Europe to purchase good seeds suited to our climate and wants. Wheats, Italian barleys, &c., are to be special objects of acquirement. New and valuable seeds and plants are also to be obtained at any cost consistent with the appropriation of $60,000.