MEASUREMENT OF ELECTRICAL APPARATUS.

The observant reader of our electrical literature cannot fail to notice the unmethodical style in which the proportions of machines, wires, etc., are expressed by many of our best writers, while the careful student is annoyed and his time wasted by the constant necessity for translating feet and inches into the metric system and *vice versa*.

The weight of a dynamo is given in pounds, tons or kilogrammes, while its output is expressed in "units," horse-powers, electrical horse-powers, watts, kilowatts or volts and amperes separately numbered.

We have the dimensions of the bed-plate of a dynamo in feet, those of its armature and magnet cores in inches, while the area of its pole-pieces is reckoned in square centimeters; the length of its field coils is so many yards, meters or feet, while the cross-section of this wire and of the armature windings is given in a small fraction of a square inch, in mils and occasionally in square millimeters; and then the thickness of the armature laminæ is written in hundredths of an inch.

The sizes of wires are indicated by the arbitrary numbers of the makers; in thousandths or hundredths of an inch; in mils and millimeters; in diameters of "nearly three-tenths of an inch," "about five-sixteenths of an inch," approximately one-eight inches," etc., etc., etc.

Why should this heterogeneous style of measurement be longer tolerated? Electro technics has a clear, consistent and logical nomenclature of its own, the exclusive use of which would greatly simplify computations and the solution of all problems involving the measurement of electrical apparatus and would facilitate the writing, printing and reading of descriptions of machines, records of tests, experiments, etc.

It has been said that the meter, centimeter and millimeter with their symbols, m., cm. and mm., do not convey to English readers such definite ideas as yards, feet and inches. If this be true, it is also true that such readers can have no clear conception of the most usual electrical units, since these are based upon the metric system, an elementary knowledge of which is indispensable to their understanding of these units.

The English unit of length is said to have been based upon the length of the arm of a king who centuries since returned to the dust whence he came. The unit, the yard, was arbitrarily divided into certain portions having no natural relation to it or to each other, and this smallest portion has again been divided into mils, which are absurdly small, too small to be of much practical use. They cannot be seen by the naked eye and are, therefore, mere abstractions to the ordinary workman who frequently needs to know the relation which should subsist between units of current and the cross-sections of conductors.

The square millimeter is small enough for all theoretical as well as practical purposes. Is not the idea of three amperes to the square millimeter more easily grasped than that of 520 mils to the ampere? In the first case we have a small number of amperes flowing through a small, but readily seen, unit of area, while the second requires us to conceive the passage of one ampere through a large number of invisible and impractical mils. Moreover, the meter is based upon a painstaking survey of an arc of the meridian, planned and executed by a body of competent scientific men. The decimal divisions of this unit render the computation of problems expressed in them ideally easy and the nomenclature of the metric system carries its meaning with it.

As the second is the unit of time in most electrical computations, why should not the revolutions of armatures be expressed as so many per second instead of 60 times that number? And the use of the centigrade degree is estimating the rise of temperature in dynamos, would be entitled to a place in the system of measurement which is here advocated.

It would, perhaps, be too much to expect the wire makers to reconstruct their guages in conformity with the metric system, but that would follow as a natural consequence of the consistent use by electrical engineers, dynamo and motor builders of the clear and systematic electrical nomenclature we already possess. This would not only facilitate all our own work and study, but would give to our writing a value in the eyes of continental readers which it cannot now have, since they could scarcely be blamed if they concluded that our electrical "manners and customs" and the results attained thereby, were as slipshod, haphazard and generally untoward as our style of expressing them too often is.—HOWARD PEACOCK, *in The Electrical Engineer*.

AN OPTICAL ILLUSION.

We are going to present to our readers the solution of a problem that came in our way by accident during our peregrinations in search of curiosities of all kinds, and which consists in making a few persons appear like an innumerable crowd. This interesting scientific recreation was exhibited some time ago in a public establishment near the universal exposition. It is now no longer in existence, but doubtless we shall soon have an opportunity of seeing it again at our fete day shows.

The realization of this optical illusion, however, is one of the simplest of matters, and requires the use of but very elementary material.

Let us imagine that three perfectly plain and very clear mirror glasses, as large as possible, form a prism whose base is an equilateral triangle. A person placed in the interior of this prism will see his image reflected a very large number of times. A very simple geometrical construction, and one which we recommend our young readers to carry out as an exercise in optics, by the simple application of the principle that the angle of incidence is equal to the angle of reflection, allows us to see that the image of any point whatever placed in the centre of this triangle of glass plates will be reproduced indefinitely by groups of six images distributed symmetrically around points regularly spaced in the prolongations of the planes of the three glasses.

A person, therefore, sees his image reproduced indefinitely in groupes of six until, the successive reflections attenuating the intensity of the images, the latter cease to be visible. Three or four persons massed in one of the angles present the illusion of a compact and mixed crowd standing upon the sidewalk and awaiting the passage of a procession. The hats waving in the air convert the peaceful waiting into an enthusiastic manifestation, which is so more the surprising in that it is made by but half a dozen persons at the maximum.

The accompanying figure gives an idea of this remarkable effect, and the three persons, whose images reflected *ad infinitum* produce the curious result that we call attention to, would have much trouble to believe that they were the subject of an illusion.

Upon the whole, the experiment is nothing more than an application of the principle of the old kaleidoscope enlarged and revived, in the sense that the observer has before his eyes the successive reflections of his own image, and that the