A SIMPLE METHOD FOR THE MEASUREMENT OF ELECTRIC CURRENT.

BY ICHIRO GOTO.

It may sometimes occur that the strength of an electric current is desired to be known when no measuring instrument is at hand. The following method which I have devised is very useful on such occasions, as nothing is required except a scale and a magnetic needle.

A small magnetic needle is suspended from a silk fiber and held vertically over a horizontal wire, say three feet long, a few centimeters under the center of the needle, the wire having a direction perpendicular to the magnetic meridian (Fig. 1). The current which it is desired to measure is then passed through the horizontal wire and in such a direction that its magnetic force on the needle is opposite to that of the earth's field.

By adjusting the height of the needle, a position can readily be found where the magnetic forces due to the earth and the current neutralize each other, at which point the needle acts as if it had lost its magnetism. Measuring this height of the needle above the wire gives the data required for substitution in the following formula:

Let d equal the height of the needle in cm., I the current strength in C. G. S. units, and H the horizontal intensity of the earth's magnetic field, also expressed in C. G. S. units. Then, since the strength of the field due to the current in the wire is expressed by $\frac{2\,I}{d}$, evidently in the neutral position,

$$H = \frac{2\,I}{d}, \text{ or } I = \frac{d\,H}{2};$$

or, since I is in C. G. S. units, the current, C, in amperes

$$= \frac{10\,d\,H}{2} = 5\,d\,H.$$

In Tokio H is very nearly 0·3, so for that place the formula becomes $C = 1{\cdot}5\,d$.

By this method I measured several currents which in another room were simultaneously measured with a Kelvin ampere balance as accurately as possible. The two results being compared, I found, much to my surprise, that there was a difference of only from 2 to 5 per cent between them.

For large currents the wire should be so arranged as to diminish the magnetic force on the needle due to the current, and Fig. 2 shows an arrangement for such a case. Similarly, for small currents the arrangement should be such as to increase the magnetic effect, as sketched in Fig. 3.

In the two foregoing cases the formulas are somewhat different, but yet remain simple of calculation. In the case of heavy currents (Fig. 2),

$$C = 5\,d\,H\left(1 + \frac{d}{D}\right) \text{ amperes.}$$

In the case of small currents (Fig. 3),

$$C = \frac{5}{n}\,d\,H\left(1 + \frac{d}{D}\right) \text{ amperes,}$$

where D is the distance apart of the parallel wires in cm. and n is the number of loops.

By the method here pointed out it will be seen that any current (strong or weak) can be easily measured, and with considerable accuracy, with the aid merely of a magnetic needle and scale. We are indebted to the courtesy of the Electrical World for the cut and copy.

The Horseless Carriage Bill.

We give below, from the Engineer, the full text of a bill, which was introduced in the House of Lords, for regulating the use of the horseless carriage. It will be seen that it is proposed to remove all restrictive enactments from a mechanically propelled carriage, provided it be under two tons in weight, unloaded, be not employed in traction, and do not discharge smoke or visible vapor. Such a carriage, as might be expected, is to be subject to general regulations applicable to traffic on highways, and Section 26 of the Highways and Locomotives Act, 1878, is to apply. That section confers upon county authorities power to make by-laws for prohibiting the use in any vehicle, whether drawn by horses or not, of wheels of unsuitable width, or having projecting studs or bars of a pattern forbidden by such regulations, and also for prohibiting the locking of a wheel in descending a hill, unless a shoe be used.

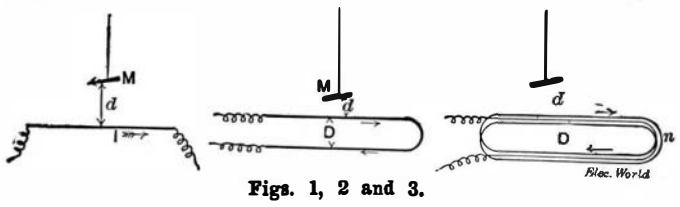
(1) The enactments mentioned in the schedule to this act, and any other enactment restricting the use of locomotives on highways and contained in any public, general, or local and personal act in force at the passing of this act, shall not apply to any vehicle propelled by mechanical power, if it is under two tons in weight, unladen, and is not used for the purpose of drawing any other vehicle, and is so constructed that no smoke or visible vapor is emitted therefrom, and vehicles so exempted are in this act referred to as light locomotives.

Provided as follows:

(a) Nothing in this section shall affect any power for the general regulation of traffic on highways, and a light locomotive is hereby declared to be a carriage within the meaning of the enactments relating to highways;

(b) Section 26 of the Highways and Locomotives (amendment) Act, 1878, and the enactments relating to hackney carriages and stage carriages respectively, shall apply to light locomotives as if they were drawn by animal power, and the said Section 26, as so applied, shall extend to London; and,

(c) So much of Section 6 of the Locomotives Amendment (Scotland) Act, 1878, and of Section 6 of the Public Health (Ireland) Amendment Act, 1879, as gives power to regulate the use of locomotives shall apply to light locomotives.



Figs. 1, 2 and 3.

(2) The keeping and use of petroleum or of any other inflammable liquid or fuel for the purpose of light locomotives shall be subject to regulations made by a Secretary of State, and regulations so made shall have effect notwithstanding anything in the Petroleum Acts, 1871 to 1881, and breach of any such regulation may, on summary conviction, be punished by a fine not exceeding £2.

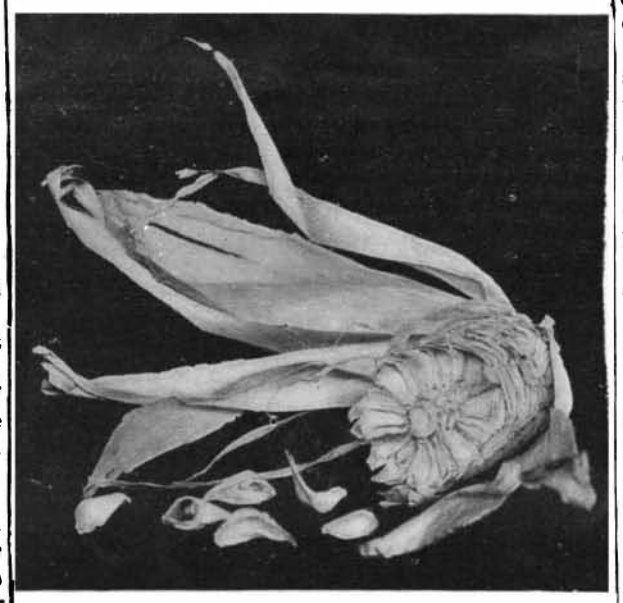
(3) If any person negligently drives a light locomotive, or suffers it to be without due control, he shall be liable on summary conviction to a fine not exceeding £10.

(4) The local government board may make regulations with respect to the use of light locomotives on highways, and a breach of any such regulations may be thereby made punishable by a fine not exceeding £10, recoverable on summary conviction.

(5) This act may be cited as the Locomotives on Highways Act, 1896.

POD CORN—ZEA TUNICATA.

We give an engraving of an ear of corn having each kernel inclosed in a separate husk. It was sent by Mr. George B. Matthews, of New Orleans, who supposed it was merely a freak of nature; but Mr. F. V. Coville, botanist of the United States Department of Agriculture, to whom the specimen was submitted for examination, says the corn is known as Zea tunicata, or pod



POD CORN—ZEA TUNICATA.

corn, considered by some of the best authorities to be the primitive form, from which have been derived the different varieties of pop, dint, flint, and sweet corn.

This variety has been found growing apparently wild in Paraguay and Mexico. The fact that individual kernels of ordinary varieties of corn are sometimes surrounded with a husk makes it probable that the podded corn was the original type.

Minute Workmanship.

In the twentieth year of Queen Elizabeth, says an English contemporary, a blacksmith named Mark Scaliot made a lock consisting of eleven pieces of iron, steel and brass, all of which, together with the key to it, weighed but one grain of gold. He also made a chain of gold, consisting of forty-three links, and having fastened this to the before mentioned lock and key, he put the chain round about the neck of a flea, which drew them all with ease. All these together, chain and flea, weighed only one grain and a half.

Oswaldus Northingerus, who was more famous even than Scaliot for his minute contrivances, is said to have made 1,600 dishes of turned ivory, all perfect and complete in every part, yet so small, thin and slender, that all of them were included at once in a cup turned out of a peppercorn of the common size.

Johannes Shad, of Mitelbeach, carried this wonderful work with him to Rome, and showed it to Pope Paul V, who saw and counted them all by the help of a pair of spectacles. They were so little as to be almost invisible to the eye.

Johannes Ferrarius, a Jesuit, had in his possession cannons of wood, with their carriages, wheels and other military furniture, all of which were also contained in a peppercorn of the ordinary size.

An artist named Claudius Gallus made for Hippolytus d'Este, Cardinal of Ferrara, representations of sundry birds sitting on the tops of trees, which, by hydraulic art, and secret conveyance of water through the trunks and branches of the trees, were made to sing and clap their wings, but at the sudden appearance of an owl out of a bush of the same artifice, they immediately became all mute and silent.

Myrmecide wrought out of ivory a chariot with four wheels and as many horses in so little room that a small fly might cover them all with her wings.

It is stated that the Salem Museum, Massachusetts, has in its possession a cherrystone containing a dozen silver spoons. The stone is of the ordinary size, the spoons being so small that their shape and finish can be distinguished only by the microscope.

Dr. Oliver gives an account of a cherrystone on which were carved 124 heads, so distinctly that the naked eye could distinguish those belonging to popes and kings by their miters and crowns.

A Nuremberg top maker inclosed in a cherrystone, which was exhibited at the French Crystal Palace, a plan of Sebastopol, a railway station, and the "Messiah" of Klopstock.

A Swede, named Leibshon, executed a portrait of King Oscar, in microscopically small letters, forming shorter or longer extracts from the Bible. He has also made, in a similar manner, what may be called "a speaking" likeness of Emperor William. The right eye consists of choice voices from the Psalms of David; the left of verses from Solomon's Proverbs, the Book of the Chronicles, and the Song of Solomon. The head consists of the whole Book of Kings. The uniform is composed of the Proverbs of Solomon and the Psalms of David. The name of the emperor is composed of a Hebrew prayer for the imperial family and two of the Psalms of David.

Peter Bayle, a clerk of chancery in the time of Queen Elizabeth, once wrote the Lord's prayer, the creed, the commandments, two prayers, and his own name and office in addition to the year, month and day of the Queen's reign, in characters so small as to be inclosed "in the head of a ring," which ring was afterward accepted by the Queen, and was worn on the august finger.

We have Pliny's statement that in his time there existed a copy of Homer's "Iliad" small enough to go into a nutshell, and a German, Prof. Schreiber, produced only a few years back, by the stereographic process, a copy of the German translation, extending to 600 pages, of both the "Iliad" and the "Odyssey," so small that a nutshell held the whole comfortably.

In the "Annual Register" 1764 it is stated that "Mr. Arnold, of Devereux Court, in the Strand, watch maker, had the honor to present his Majesty George III with a most curious repeating watch of his own making, set in a ring. The size of the watch was something less than a silver twopence; it contained 120 different parts, and weighed five dwts. seven grains and three-fourths."—Boston Journal of Commerce.

How Nails Are Named.

Two accounts are given of the origin of the terms "sixpenny," "eightpenny," "tenpenny," and so on, as applied to the various sizes of nails. According to one statement, when nails were made by hand the penny was taken as a standard of weight, and six were made to equal the weight of a copper penny. This explanation is open to criticism on account of the very small size of the nails, of which six were needed to balance even the large sized, old fashioned copper penny. Others are much more probable. One explanation holds that tenpenny nails originally sold for tenpence a hundred, sixpenny nails for sixpence a hundred and so on, the smaller nails selling for the lower price. Another explanation is that 1000 nails of the tenpenny size used to weigh ten pounds, 1000 of the sixpenny size six pounds and so for other sizes. Of the ordinary sixpenny nails there are eighty to the pound; of the eightpenny, there are fifty; tenpenny, thirty-four; twelvepenny, thirty-nine.

THE Swiss National Exposition begins at Geneva, Switzerland, May 1 next, and terminates October 15. Theodore Turrettini, mayor of Geneva, and one of the most distinguished electrical engineers in Europe, is president of the exposition, and the electrical exhibit will be the finest ever seen. The River Rhone supplies 12,000 horse power, to be electrically transmitted six miles to the grounds. There will be a traveling footpath, operated by electricity, traversing the great Machinery Hall.