Electric Lighting by Primary Batteries.

We have no wish to discourage inventors of primary batteries, but, on the contrary, we would urge them to renewed exertion, for there is a large and we believe remunerative field before them. But let them not spend their time in attempting impossibilities, or in writing treatises to demonstrate facts which were published thirty years ago with much greater minuteness and accuracy. It is not the cost of the zinc which has hitherto prevented the use of batteries, but the expense of the liquids, which generally increases as that of the zinc diminishes, their acid nature and unpleasant fumes, and, above all, the unmechanical construction of the cells and the difficulties caused by corrosion, creeping, leakage, and the like. A battery which was free of these objections would have an extensive sale for electric lighting.

The reason that isolated installations increase so slowly is the prejudice people feel to introducing gas or steam engines, with their attendants, on to their premises, far more than on account of their cost, and if these could be replaced by a series of boxes which would only need skilled attendance once in three months (say), we should find a rapid increase in electric lighting, even if the cost were double or threefold that of gas in large towns.—*Engineering.*

"PERCENTOGRAPH."

The device shown in the accompanying engraving is for reducing common fractions to decimals, and is particularly designed to be used by railroad and other transportation companies for determining percentages and proportions in dividing rates, revenues, or expenses on the basis of mileage; but the uses to which it may be put are extensive, as will be readily seen from the description.

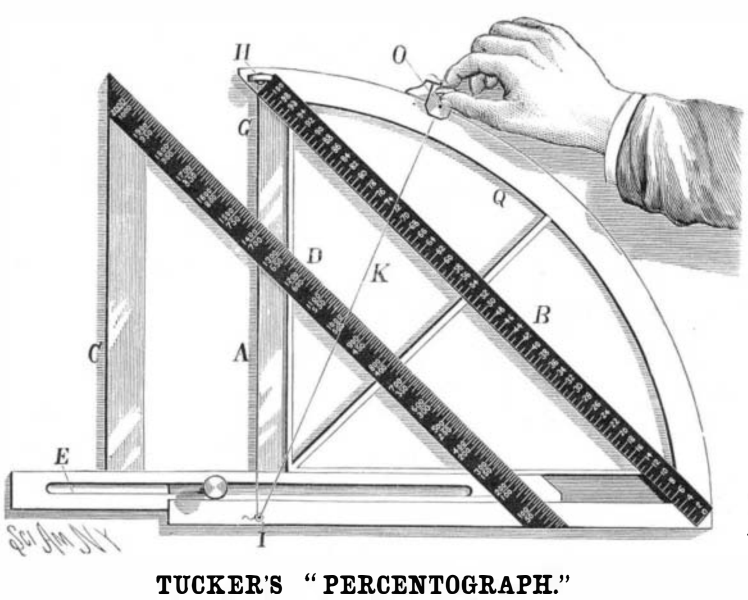
A stationary triangle, A, has a percentage scale, B, arranged along its hypothenuse; a similar triangle, C, is fitted to slide in the fixed triangle, and is likewise furnished with a scale, D, on its hypothenuse, which represents a series of numbers the percentages of wh'ch are to be ascertained. The numbers in the scales, B and D, increase from the right upward to the left, the former extending from 0 to 100 and the latter from 0 to 1,000, or from 0 to any number higher than 1,000 according to the value given to the graduations; thus, if each graduation is made to count 2 instead of 1, the scale D will indicate 2,000 as the highest number. In the engraving the scale D is marked off to indicate both 1,000 and 2,000 at the end, two sets of numbers being used, one double the other, to mark the graduations. When the scale D is moved against the scale B the graduations will exactly register with each other, and the percentage numbers will correspond with the numbers whose percentage of 1,000 or 2,000 they represent. The base of the movable triangle is provided with a slot, E, and a set screw by means of which it may be adjusted and held in any given position.

The vertical side of the stationary triangle is provided with a stretched cord, G, or equivalent device, which serves as a marker on the scale D. This cord is connected to set screws, H I, and is arranged at right angles to the base of the triangle. A second cord, K, is attached to a collar loosely mounted on the pin, I, and its other end is attached by a set screw, O, to a slide that moves on a segmental bar, Q, the circle of which is drawn from the pin, I. This cord is used to mark the percentage on the scale, B, and also to mark the numbers on both scales.

If it be desired to ascertain the relative proportion of railroad lines, in interest aggregating say 1,400 miles, move the scale D until 1,400 intersects cord G on its upper edge, then tighten set screw. The cord K is then moved until it intersects the number of miles of road forming a part of the 1,400 miles, when the relative proportion will be indicated on the stationary scale, B. Thus, if cord K be moved until it intersects 490 miles, the scale B will indicate 35 per cent, and remaining distance, 910 miles, in proportion, forming the total 100 per cent. From this it is obvious that the percentage which any part of 1,400 bears to the whole will be indicated on the scale B by moving the cord K to the number of miles required (of the 1,400).

In many instances there are roads which from their position demand an arbitrary proportion, and will not prorate on mileage basis. The percentograph provides for this emergency. For instance, if line Springfield, Mass., to New York demand 20 per cent of any rate on business to Petersburg, Va., thus leaving 80 per cent for lines New York to Petersburg, Va., move the cord K until it intersects 80 per cent on the scale B, then move scale D until 388 miles intersects cord K (distance N. Y. to Petersburg, Va.), then move cord K until it intersects 98 miles (N. Y. to Philadelphia), and scale B will show 20·2 per cent; and so on each road its proper proportion of the 80 per cent, as indicated.

Further information may be obtained from the patentee, Mr. S. J. Tucker, of Richmond, Va., or from Mr. M. S. Foote, of same place.

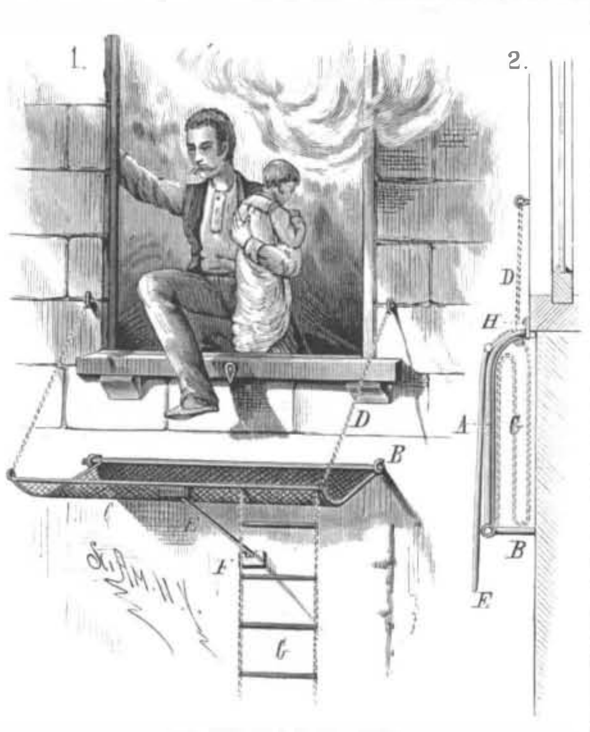


TUCKER'S "PERCENTOGRAPH."

THE relative efficiency of electricity, gas, and oil, for use in lighthouses, is being tested in England, where the Trinity Board has selected certain ranges about three miles inland from the South Foreland lighthouse as lines of observation, along which measurements are to be made. These experiments are expected to last several months.

FIRE ESCAPE.

A frame made of iron or steel bars is pivoted to eyebolts, B, projecting from the wall of the building such a distance below the window that when the frame is held against the wall its outer edge will be below the sill, as shown in Fig. 2. Strong wire netting is secured to the frame, whose outer end is curved upward. Chains, D, are secured to the outer corners of the frame and to the wall or window frame, to hold the frame in a horizontal position when lowered. A brace rod, E, pivoted to the middle of the outer edge of the frame, rests on a projection, F, of the wall. Secured to the frame is a chain or rope ladder, G, which is folded and held within the frame when the latter is not in use. When the frame is swung down the ladder will unfold and the free end will pass down to the ground, or to a like fire escape at the



EYL'S FIRE ESCAPE.

next window below. Persons fleeing from the fire step on the balcony formed by the frame and netting, and then descend by means of the ladder. Fig. 1 is a perspective view, showing the escape in position to be used, and Fig. 2 is a sectional view showing the fire escape folded against the wall.

This invention has been patented by Mr. Emil C. Eyl, of Jefferson City, Montana.

Inventions of a Half Century.

"The number of inventions that have been made during the past fifty years is unprecedented in the history of the world. Inventions of benefit to the human race have been made in all ages since man was created; but looking back for half a hundred years, how many more are crowded into the past fifty than into any other fifty since recorded history! The perfection of the locomotive, and the now world-traversing steamship, the telegraph, the telephone, the audiphone, the sewing machine, the photograph, chromo-lithographic printing, the cylinder printing press, the elevator for hotels and other many storied buildings, the cotton gin and the spinning jenny, the reaper and mower, the steam thrasher, the steam fire engine, the improved process for making steel, the application of chloroform and ether to destroy sensibility in painful surgery cases, and so on through a long catalogue. Nor are we yet done in the field of invention and discovery. The application of coal gas and petroleum to heating and cooking operations seems to be only trembling on the verge of general adoption; the introduction of steam from a great central reservoir to general use for heating and cooking has been in part a success; the navigation of the air by some device akin to our present balloon would also seem to be prefigured, and the propulsion of machinery by electricity is even now clearly indicated by the march of experiment.

"There are some problems we have hitherto deemed impossible, but are the mysteries of even the most improbable of them more subtle to grasp than that of the ocean cable or that of the photograph or telephone? We talk by cable with an ocean rolling between; we speak in our voices to friends a hundred miles or more from where we articulate before the microphone. Under the blazing sun of July we produce ice by chemical means, rivaling the most solid and crystalline production of nature. Our surgeons graft the skin from one person's arm to the face of another, and it adheres and becomes an integral portion of the body. We make a mile of white printing paper and send it on a spool that a perfecting printing press unwinds and prints, and delivers to you, folded and counted, many thousand per hour. Of a verity this is the age of invention, nor has the world reached a stopping place yet."

Rotary and Reciprocating Steam Engines.

In a recent letter to the *Tribune*, Prof. R. H. Thurston, of the Stevens Institute of Technology, gives the following:

It is assumed that the reciprocating engine is essentially defective; that the conversion of the reciprocating motion of the piston into the rotary motion of the crank and fly-wheel involves, necessarily, some appreciable loss of power and efficiency; that the variation of speed of the reciprocating parts, from a state of rest at the "dead points" to maximum velocity at half stroke, must necessarily cause loss of power, increased wear and tear, and dangerous impact at high speed, and must thus restrict, to a very serious extent, the development of greater power by the adoption of higher velocities of piston. It is these notions which have been the usual stimulus to inventors who have, during the past century, been endeavoring to produce rotary engines capable of competing successfully with the always standard reciprocating machine. The patent records teem with such devices, many of them ingenious, more of them crude and unmechanical.

Rotary engines have usually proved to be wasteful in their use of steam, subject to rapid depreciation in power and efficiency, and to great loss of power by friction of working parts. Engineers are, therefore, likely to look with interest, and with a little surprise, upon a motor of this class which is not subject to these defects, even though it may not prove to be the superior of the best engines of the more common type.

But the assumed objections to the reciprocating form of steam engine are, to a considerable extent, imaginary. The conversion of a reciprocating motion into rotation does not necessarily involve loss of power, and need not, and in good engines does not, cause objectionable jar or injury of the working parts. The limit to the increase of speed of the modern "high-speed" engine is not set by the difficulties of the kind above described met with in its operation, but rather by the impossibility of carrying more than a certain amount of power through fast running machinery with absolute certainty that lubrication may be secured, without interruption for an instant, day after day, indefinitely. The inertia of parts, which has been so generally assumed to be detrimental to the action of the machine, has an equilibrating effect with the irregularity of steam distribution due to the expansion of the steam; and this balance may be adjusted for speeds greatly exceeding even the highest attained by the most radical of the high-speed engine builders of the day. The rotary engine has not, therefore, the advantage in this respect claimed for it in the past by many engineers as well as by non-professionals. It has, however, evident advantages which have been hitherto more than compensated by the apparent impossibility of securing that economical distribution of steam which is easily and satisfactorily obtained in the standard forms of engine, and by the failure of nearly every form of rotary, in competition with the reciprocating engine, when compared with respect to freedom from internal friction and leakage of steam past the piston. It is always safe for the layman, when asked to put his capital into rotary engines, to assume that the machine possesses these defects to a fatal extent, unless the contrary has been proved to be the case by careful tests made by engineers of known skill and integrity.

The engineer is, therefore, pleasantly surprised when he finds one of this class of engines doing good work, and he will be still more pleasantly surprised when he finds the difficulties which have hitherto been met, in the endeavor to secure good steam distribution, high economy, and perfect regulation, such as is seen in the best reciprocating engines, combined with the undeniable special advantages of the rotary engine.

These latter impediments being overcome, the rotary will supersede the reciprocating engine, but I think not till then, except for very small powers. Our small reciprocating engines do not compare favorably with larger sizes, in respect either to economy, exactness of regulation, or power per pound of weight of machine. They are usually capable of great improvement, but a small machine of this class will probably never do as good work as a large one. For the present, at least, the best rotary engines must compete solely with the smaller reciprocating engines.