

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS.

One copy, one year \$3 00
One copy, six months 1 50
CLUB RATES { Ten copies, one year, each \$2 50 25 00
{ Over ten copies, same rate, each 2 50

VOLUME XXX, No. 14. [NEW SERIES.] Twenty-ninth Year.

NEW YORK, SATURDAY, APRIL 4, 1874.

Contents:

(Illustrated articles are marked with an asterisk.)

Answers to correspondents.....	218	Metals as exhibited by the frac-	209
Arnot, Dr.....	201	tise, the character of.....	209
Astronomical notes.....	216	Metrological science.....	208
Island of Paradise, a new*.....	215	Mine in the world, the greatest.....	212
Bottle, patent*.....	210	New subscribers, to.....	209
Bushes and persons.....	218	Norwegian antiquities.....	213
Cable and Faraday, launch of the.....	212	Olis, essential.....	215
Catching the sea by means of oil.....	212	Pacificocean deep sea soundings.....	215
Carnivorous plants.....	207	Patcother, um magnum, the*.....	210
City of Peking, launch of the.....	209	Patent decisions, recent.....	216
Coffee and milk as an aliment.....	214	Patents, official list of.....	219
Detroit river tunnel, the.....	208	Patents, official list of Canadian.....	220
Education of children, early.....	218	Patents, recent American and for-	217
Electro-sympathetic clocks.....	214	eign.....	217
Fire, a street.....	216	Photography, dry plate.....	215
Fire extinguishing apparatus for	217	Pine way transportation.....	213
buildings.....	217	Planetary system, harmony of the.....	213
Floats for ships' boats.....	213	Propagating house, the.....	211
Fuel manufacture, artificial.....	213	Railways, English and American.....	213
Galvanic electricity.....	210	Scaffold, improved adjustable*.....	211
Geyser basin, the new.....	210	SCIENTIFIC AMERICAN as a pre-	203
good work in Canada.....	213	ventive of boiler explosions.....	203
Inventions patented in England	216	Sclasure, tooth-edged cutting*.....	210
by Americans.....	216	Shark, the basking.....	216
Iron columns.....	210	Shifting engine, improved.....	212
Iron making, new process of.....	213	Stove for smoke houses, improv-	214
Locomotive engineers, the broth-	208	ed*.....	214
erhood of.....	208	Sulphur, a hill of.....	209
Magneto-electrical instrument, a	211	Threshold, improved adjustable*.....	210
new*.....	211	Tunnels.....	212
Mechanics, the marvels of.....	208	Turbine wheel, improved*.....	214

THE SCIENTIFIC AMERICAN AS A PREVENTIVE OF BOILER EXPLOSIONS.—VALUE OF ITS CORRESPONDENCE.

Our readers, in their kind letters of commendation of the SCIENTIFIC AMERICAN, very frequently tell us that the information they derive from its columns is of the greatest value to them in their several callings, and every day we are told that a single hint put in practice is often the means of making or saving considerable sums of money. Of course these flattering testimonials are very gratifying to ourselves, and we are glad to know how the money was saved or earned: whether, in fact, the writers measure the amount of practical information they gain in dollars and cents, and then are unable to think of any sum which will adequately express its value, or whether from its columns they obtain ideas which enable them to improve the quality of their work, and so derive increased incomes; or whether, in some special instance, a direct gain can be traced or an accident avoided. Sometimes, however, a correspondent enlightens us, and sends an item which is not only interesting to the editor, but serves a useful purpose to others. A letter now before us is an excellent example in point.

Mr. S. E. Worrell, of Worrell, Hannibal county, Mo., writes that he has read the SCIENTIFIC AMERICAN for fourteen years, and that he has learned more from its pages than during the period he attended school. In perusing a recent number, he goes on to state, his attention was attracted by the report of boiler inspections by the Hartford Boiler Insurance Company. "On glancing over the article, I remembered," he writes, "that I had not heard the escape of steam from our safety valve for some time. Upon going to the mill the next morning and on making an examination I found that the valve would not rise even with the steam gage standing at 120 pounds and the weight off the lever. I even had to knock the lever up with a hammer, and then could not get it back until the steam was entirely out of the boiler. I afterwards found the valve stem had become rusted in the cover of the valve. Our boiler is only a small one, but its explosion might have caused the loss of a number of lives and of much property."

We congratulate our correspondent on his narrow escape from a probable casualty. We commend him for his careful attention to what he reads. If every mechanic, on receiving a number of the SCIENTIFIC AMERICAN, would thoroughly consider its suggestions, and seek to apply them to his individual case, there is no doubt but many of the disasters occurring in the use of machinery would be avoided. The information imparted by practical men in their various callings in the correspondence columns of this paper is of great value to all classes of readers, coming, as it does, from the experience and observations of those willing to impart hints beneficial to others, expecting, in return, that others will communicate information of benefit to themselves.

We would suggest that this feature of the paper may be made still more useful and interesting, if every subscriber will take the trouble to communicate some new fact or discovery he has made, whether by accident or experiment.

A few lines of such information from the workshop are frequently of more practical value than a volume of essays on some abstract science by the most learned author. Certainly every subscriber can furnish during the year at least one item of interest. This will give nearly fifty thousand facts from as many different sources, which would furnish, in the aggregate, an amount of information not otherwise attainable.

THE BROTHERHOOD OF LOCOMOTIVE ENGINEERS.

Those of our readers who are familiar with the course of events during the strike of railroad engineers, which occurred, principally on western lines, some two months since, will remember that the demonstration elicited a strong letter of disapproval from Mr. Charles Wilson, Grand Chief Engineer of the Brotherhood of Locomotive Engineers. This document, which went the rounds of the public press, while unreservedly condemning the movement, also stated that such action on the part of members of the above named association was in direct opposition to the principles and practices of their organization. To the opinions thus plainly expressed, and to the influence exerted by Mr. Wilson, the failure of the uprising may be in no small measure attributed; and hence to his good sense, moderation, and just views is mainly due the prevention of imminent losses to both contending parties. It would naturally be thought that the men engaged in the controversy, even if rendered somewhat irrational at the time by the incident excitement, would on sober second reflection perceive the sound reason in Mr. Wilson's action; and consequently, if they did not feel a certain amount of gratitude for his clear-headed advice, would at least tacitly recognize the justice in the position he had assumed. But not so the locomotive engineers. Having called a convention at Cleveland, Ohio, recently, they proceeded to arraign the course of their president. So far as we can learn from the reports of the meeting, the discussion was carried on principally by noisy individuals who had been foremost among those fomenting the past disturbances. However this may be, the result of the deliberations was far from evidencing either the common sense or the justice of the delegates; for, by an almost unanimous vote of 120 to 18, the acts of the strikers were approved and Mr. Wilson requested to resign his presidency of the order.

The locomotive engineers of this country are as a rule an able and thoroughly reliable body of men. To their hands are entrusted immense responsibilities, and from them are required the exercise of an amount of skill, cool judgment, and, at times, absolute heroism which raise them far above the average mechanic. Of how uniformly they have met and do meet all these requirements, their past record, coupled with the small percentage of railway casualties yearly occurring in this country (considered in relation to those happening elsewhere) offers abundant testimony. It is in view of these very facts, however, that we find ourselves at a loss for an explanation of the action above noted. Are we to understand that the men to whom are hourly entrusted hundreds of lives and property of untold value mean deliberately to endorse the malicious acts of the wretches who misplaced switches, who shot workmen down at their posts, who disabled machinery, and committed other wilful and malicious crimes against not merely their employers, but against the entire community? If such be the inference, (and we can form no other from the strong evidence of the vote, on the one hand and the letter which gave rise to the convention, on the other), then the Brotherhood of Locomotive Engineers as it now stands has as an organization manifestly survived its time of usefulness, and the sooner it disappears from the public gaze the better. It has sunk down to the level of those who perpetually seek to promote disorder by the threadbare arguments of eternal antagonism between employer and employed, and to have submitted itself to the leadership of the violent extremists who somehow contrive to creep into the counsels of nearly every trade organization.

Mr. Wilson, we understand, proposes to appeal to the Brotherhood as a whole, against the action of their delegates, and invites such members as do not acquiesce in the course of the latter, to join him in forming a new society on the old basis, as expressed in the letter referred to in the beginning. We trust that this invitation will meet with a cordial response from every right-minded man in the Brotherhood; and that for their own sakes, if only to relieve their reputations from the slur which the convention has cast upon them, the large majority of the members will hasten to repudiate the disgraceful vote of their representatives.

THE MARVELS OF MECHANICS.

During the last siege of Paris, the inhabitants from time to time effected communication with their friends beyond the German investing lines by means of carrier pigeons. In fact, a regular pigeon post was organized, having one of its receiving stations in London. Here the written messages for Paris were received, and, by photography, reduced to microscopic size, each letter being reduced so small as to be invisible to the eye except as a speck. Some two thousand of these specks were then printed on bits of tissue paper about an inch and a half square, which was rolled and carefully attached to one of the tail feathers of the pigeon. On the arrival of the bird in Paris, the postal officials placed the paper under the microscope, which enlarged the several specks into readable communications, which were duly copied in writing and delivered to the persons to whom they were addressed. The total postage received for the transmission of one of those tiny bits of paper frequently amounted to two thousand dollars.

Small as this photo writing seems, it has been surpassed by mechanism. In a recent number of the *Lens*, Dr. J. J. Woodward, U. S. A., gives an enlarged photograph of microscopic writing done by machinery on glass, by means of a diamond, executed by Mr. William Webb, of London. The writing consists of the Lord's Prayer, which is written upon glass, within a space equal to one two hundred and ninety fourth part of an inch in length by one four hundred and fortieth part of an inch in width, or a space perhaps equal to the dot in this letter i. The photograph given by Dr. Woodward shows this dot of writing enlarged so as to oc-

cupy a space of about two inches long by one and a half inches broad. All the words are brought legibly out on the photograph, the total number of letters being 227; and such is the exceeding fineness of the original writing that 29,431,458 letters written in the same way would only cover one square inch of glass surface. The combined Bible and New Testament contain in all 3,566,480 letters; hence it would be possible for Mr. Webb to write the entire contents of more than eight bibles within the space of one square inch. Two specimen plates containing the microscopic writing above alluded to have been supplied by Mr. Webb for the United States Museum at Washington. Their cost was fifty dollars each.

The Webb machine, however, does not equal, in the fineness of its writing or perfection, the prior instrument of Mr. N. Peters, a wealthy banker of London, who, as long ago as 1855, was able to write nearly three times finer than Webb. So perfect was the Peters machine that it was competent to engrave the entire contents of the Bible and New Testament twenty-two times over within the space of a single square inch.

METROLOGICAL SCIENCE.

The American Metrological Society, the first session of which was held during December last in this city, forwards us a copy of its constitution and by-laws, in which the objects of the association are fully set forth. These, briefly, are to improve the system of weights, measures, and moneys at present existing among men, and to bring the same as far as practicable into relations of simple commensurability to each other. The universal adoption of common units of measure for the expression of quantities which require to be stated in presenting the results of physical observations or investigation, and for which the ordinary systems of metrology do not provide, is also to be advocated, and it will be the effort of the society to secure, in regard to the denominations of weight, measure, and money, the acceptance of the decimal system.

President Barnard, of Columbia College, has been elected President, and the names of several well-known scientific gentlemen, including Professors Hilgard, Newton, Cooke, Elliot, and Thurston are among the officers and council. The association has already begun its labors and has prepared two memorials to Congress which are now open for signatures of all persons interested in their objects. In 1866, Congress legalized the use of metric denominations, and in the recent coinage act the weights of all silver coins of the United States, except the trade dollar, are thus set forth. The first memorial prays that means be taken by suitable legislation to introduce the metric system more directly into, while not interfering with, the general business of the people. The passage of laws is urged, rendering the system obligatory to the Post Office Department; in reports of public works conducted under authority of the Federal Government; in all statistical or other documents involving statements of quantities, issued under similar sanction; and in the estimation and computation of custom duties of the United States.

The second memorial refers to the legal weights of our gold coinage, and asks that the pure gold contained in the dollars shall be exactly one gramme and a half. The *Engineering and Mining Journal*, in commenting on the subject, adds that it is only necessary that the fineness of standard gold should be everywhere nine tenths (as it is everywhere already, except in Great Britain), that the weight of pure gold in coins should be given on the coins in metrical units, and that the mints of civilized countries should do honest work: when the immediate results would be that the gold coins of nations adhering to the plan could safely be made legal tender in exact proportion to their weight.

The gramme of pure gold would thus become the world's unit of money, and the problem of an international coinage thus quickly and easily settled.

THE DETROIT RIVER TUNNEL.

An interesting history of the attempted construction of the tunnel under the Detroit river, between Detroit and Windsor, on the Canada shore, is given in a paper read by Mr. E. S. Chesborough, C. E., at the last annual convention, and published in the *Transactions*, of the American Society of Civil Engineers. Up to July, 1872, it seems that the prospects of the work were quite favorable; but in the latter part of that month, when excavation at the Windsor end had progressed about 250 feet through hard ground, a sudden irruption of sand and water occurred, which threatened to fill the tunnel out to the sump and choke the pumps. Three bulkheads were built, each nearer the shaft, and the last one quite close to the same, before a successful stand was made. After a delay of several days, operations were resumed; but hardly had thirty feet of new tunnel been made when another irruption ensued, and again bulkheads were resorted to. After beginning once more, a third break followed, and finally a fourth, when the contractors, finding that the work was costing four times the price they received for it, determined to make a lift shaft at the end of the drift on the Windsor side and start a new drift 10 feet higher than that of the drainage tunnel. This was done; but the irruptions again appeared, coming from the bottom instead of the top of the excavation, there being a vein of sand at the level of the top of the lower drift. Finally, after advancing 370 feet from the shore shaft, it was decided to abandon progress in that direction.

On the Detroit side, other difficulties were being encountered. At 1,180 feet from the shaft, the ventilating apparatus proved inadequate and two of the workmen were killed. At 1,220 feet (new machinery having been established) the