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## ESTABLISHED 1845.

MUNN \& CO., Editors and Proprietors.

## published weekiy at

NO. BY PARK ROW, NEW YORK.
O. D. MUNN.
A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.
One copy one year, postage included ${ }^{\text {Ond }}$
${ }^{8_{1} 76}$



MUNN \& CO., 37 Park Row, New York.

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ce.. 37 Park Row, New York.
vol. XL., No. 21. [New Series] Thiryy-fifll Fear.
NEW YORK, SATURDAY, MAY 24, 1879.


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II.


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## the mental requirements of modern

 ENTERPRISES.Formerly the art of war, statecraft, the bar, the pulpit, poetry, and philosophy monopolized the brains of mankind. In these professions and pursuits men of superior mental force found expression for their thoughts; and besides these there were few occupations likely to invite or to develop the higher order of minds. The magnitude, complexity, and scientific character of modern material enterprises-commercial, constructive, manufacturing, agricultural, and the like
-have well nigh reversed the old state of things. The learned -have well nigh reversed the old state of things. The learned most inviting fields for intellectual effort; nor do they furnish the most effective means of mental development and culture. As an inevitable result, professional men no longer overtop their fellows in intellectual stature. Indeed it is sometimes asserted that the highest order of minds are now drawn to practicalaffairs, leaving to the professions only those of in ferior rank. Relatively this may be largely true; yet it by no meansfollowsthat the leading men of to-cay in the purely
intellectual callings are in any way inferior to the average of their predecessors. They are tried by a higher standard; they are surrounded by non-professional men of a mental stature impossible in former times; and so, although really great, they seem relatively small. Many a soldier, statesman, jurist priest, or writer, vastly famous in his day, owes his historic greatness rather to the littleness of his neighbors than to his own intrinsic nohility.
Speaking of the requirements of modern transportation, Prof. David Swing remarks that men are giving to railways now a mind which travel and carriage could never have thus diverted from learned pursuits when men journeyed on horseback or carried goods in pack saddles. In those days only a few boys who could feed horses, and a few drivers who could flourish a whip, were absorbed by the carrying business. The railway, with the pomp and circumstance of its engines and palace cars, its vast machinery and money power, now attracts and employs men who would have been Pascals and Newtons, and Wesleys and Washingtons a hundred years ago. The external management of the railway has created, he says, the "railway king" of to-day, who had and could have had no counterpart in the days of the pack-horse; and as a consequence we must admit that "the steam car diverts
great brains, and places upon the railway throne men who would once have been princes in statesmanship, or literature, or religion."

Of course," remarks Professor Swing, " to this statement the objection is ready that perhaps the railway is making men of large brains out of those who would have been only teamsters in the mountains or sleepy drivers along a canal. This objection is indeed valid; but after you have estimated it at its full worth, the feeling will yet remain that many of the modern material pursuits are so immense and attractive, that they are actually drawing away a brain power which in other circumstances might havefound its way into the field of high statesmanship, or high thought, or into a broad and powerful pulpit."
The underlying sentiment of this complaint seems to be a vague and unreasonable fear that just so far as practical af fairs call for and develop mental force and a high quality of the other suesmanship and philosophy and reigion, and an supply of superior men. If the mental force of the race were a fixed quantity, and every great mind employed upon invention or transportation or other material pursuit must of
necessity be diverted from statecraft, philosophy, or literature, there might be some ground for complaint-provided it were certain that invention and productive industry were less beneficial to the race than a correspondingly high order of closet thinking. But the mental force of a people is not any particular calling, every new calling which invites or de velops a higner order of intellectual power or executive capacity practically increases the mental
Thirs, ultimately if not immediately.
The circumstance that our preachers and politicians do not tower above the rest of men as they used to is no evidence that they are intellectually inferior, but rather that the common intellectual average of men of affairs is higher than it used to be. To manage properly a great railway, steamship line, manufactory, or to devise and develop a novel and useful industry, often calls for a wider range of knowledge, a higher grade of intellectual and moral force, than is nee a losophy, or fill the loftiest pulpit.

## three successful efforts.

Three notable feats of human effort and endurance have just been brought to successful issue. The first was of questionable utility in spite of the possible advantage of knowing the maximum capacity of the human frame for long-continued and severe exertion. In the six days' walking and running match, in London, ending April 26, the winner's score was 542 miles, beating by 21 miles the best previous record in a similar contest. During the first three days the winner, Brown, made 300 miles, a feat never before achieved. It is said that he left the track at the close in excellent physical condition.
The second achievement was also of doubtful utility. As a means of advertising his already sufficiently advertised swimming suit, designed for life saving, in case of disaster ible tastk of floating and paddling from Pittsburg to New

Orleans. The Ohio was full of ice when he started, and the venturesome swimmer was often in imminent peril from being crushed in the ice floes as well as frozen by the intense cold. The voyage of 2,342 miles was completed in 80 days, the voyager being reduced almost to a skeleton by the severity of his self-imposed task.
Of a very different nature was the splendid feat of the Sugar Notch coal miners, who, to rescue seven comradessix men and a boy-buried in a mine, accomplished the great work of driving and timbering a passage way of 1,200 feet through rock and coal, mostly rock, in the brief space of four days and nights. The imprisoned miners were found alive and well, notwithstanding their confinement of five and a half days. The party had been shut in by the falling of some acres of mine roof, caused, it is said, by a reckless stripping of the supporting pillars of coal; and luckily the door boy, who had gone in to warn the miners of their danger when the roof began to give way, rode a mule, which the men killed and ate after they found they could not get out. There was plenty of pure water in the mine, and. out. There was plenty of pure water in the mine, and.
though gas accumulated somewhat in places, a spot was found where the air was fairly good and it was safe to build a small fire for cooking their mule meat.
It must not be forgotten that the noble band of rescuers toiled with slender hope of finding their buried comrades alive. If the latter had not been crushed by the falling roof or drowned by water, there was a strong probability that they had perished by the fire which broke out in the mine when the roof fell, or had been smothered by the liberated gases of the coal. Yet the bare possibility of saving life urged the generous toilers on, and happily their efforts were rewarded by the highest success.
The men who planned and cut the relief drift were not surrounded in their labors by admiring crowds, like the contestants for pedestrian honors; they had not the almost daily "grand receptions," " ovations," and the like which gave the river swimmer an abundance of noisy notoriety and sub stantial encouragement. They were probably unconscious of doing anything specially commendable; anything more than any miner would do for a comrade in distress. Yet who will say that the achievements of Brown or Boyton, how. ever plucky or enduring, were not trivial in comparison?

## $\rightarrow+\cdots$

## the electric light in paris

The application of the General Electric Light Company for a three years' concession of the lighting of a number of public ways in Paris was rejected by the Municipal Council, January 28; and it was decided, at the same time, that the city should no longer contribute pecuniarily or otherwise to the experiments of the company. The reasons for this decision are, in brief, the practical failure of the electric light to meet the wants of public lighting steadily, efficiently, and economically. In their report the Counil express the conviction that electric lighting is still in a peiod of trials and tentative processes, especially as to the reg ularity of its working. The frequent number of extinctions and their duration require the maintenance of gas a pparatus concurrently with the electric apparatus, thus complicating matters and increasing expense. Finally, the high cost of electric lighting does not allow of its adoption for public electri
uses.
Ver
Very naturally the City Gas Company is much elated at the failure of what threatencd to be a serious rival. In the annual report of the Council of Administration of the company, presented March 27 , it is asserted that the electric light was unequal in intensity and color; in foggy weather its brilliancy diminished with distance much more rapidly than gaslight; and its sudden and frequent extinction made it incompatible with the requirements of a service so important as public lighting. This everybody knew; but not so many were aware that in the Avenue de l'Opera a steam engine of wenty horse power was necessary to supply the electric centers extending along 360 meters, and that the application of electric lighting to the 1,800 kilometers of the streets of Paris, at present lit by gas, would require a motive force of 100,000 horses, more than double the power employed in all the industries of the departments of the Scine and Seine-et-Oise united; and the street lighting represents only the ninth part of the gas lighting in Paris.
How far a report by the clectric company would modify these assertions we do not pretend to say. Obviously, however, up to this stage of the contest the victory rests with gas. At any rate the officers of the gas company are confi ent that the gas industry has nothing to fear from electric experiments thus far conducted.

## NE W PROCESS FOR PRESERVING AND ORNAMENTING IRON.

We recently published an account of the Barff process of preserving iron by forming upon its surface an enamel of ron oxide by means of superheated steam and a high temperature.
We have now to describe another process, discovered by M. Dodé, by which iron is not only preserved from rust, but its surface may be ornamented, so as to resemble gold or siler, all at a comparatively small expense.
In the Dode process the iron article, cast or wrought, is first dried, and then dipped in or painted with a composition of borate of lead, oxide of copper, and spirits of turpentine, which soon dries on the surface of the article. The objects are then passed through a furnace and heated to cherry red, enghest temperature being from $500^{\circ}$ to $700^{\circ} \mathrm{F}$. At this heat the metallic pigment fuses, enters the pores of the iron
and becomes homogeneously adherent thereto. Iron articles so heated are rendered impervious to rust. The process is superior as a preservative to galvanizing, while the cost is estimated at only half a cent per superficial square foot. This coating is of dark color.
The above is the foundation process, after which other processes, which give ornamentation to the article, may be added as follows: After the iron has been treated as just de scribed, it may be enameled, so as to have a smooth polished surface, by painting it with a compound made of borate of lead, litharge, and essence of lavender. An extensive variety of colored cnamels, of great durability and fine polish, may thus be produced. The cost is two to three cents per superficial square foot.
When an ornamental surface resembling dull silver is wanted, the iron article, after having been treated by the process first above described, is now painted with a mixture of dry chloride of platinum dissolved in ether. The article is then again heated to $350^{\circ}$ to $400^{\circ} \mathrm{Fah}$., whereby the platinum becomes incorporated with the inoxidated surfaces, and a firm, durable, and excellent dull silvered appearance is attained. The cost of this last process is stated to be from three to six cents per superficial square foot.
When a highly polished silver surface is wanted, two coats of the enamel, before mentioned, are first given, and an increased quantity of the platinum solution is used.
A golden surface, instead of silver, may be obtained by preparing a compound in which chloride of gold instead of platinum is used.
A paper on this discovery was lately read before the Socicty of Arts, London, followed by a very interesting discussion, all of which are given at length in our Supplement for the current wcek, No. 177. Many splendid specimens of iron articles treated by the process were at the same time submitted for inspection.

## who originated the atlantic cable?

The recent cable celcbration has called out a claim for the late Col. John Henry Sherburne, of Washington, D. C., as descrving the honor of originating occan telegraphy. The claim is based on the following entry in the journal of the Scnate of the United States Scnate for the second session of the XXXth Congress. to wit: "Monday, January 28, 1849. The Vice President presented the memorial of John Henry Sherburne and Horatio IIubbell, praying the aid of Government in the establishment of a telegraphic communication across the Atlantic Occan, which was referred to the Committec of Commerce."
In the memorial referred to the geographical points are indicated from which the communication can be most conveniently made between Newfoundland and Ireland, the distances given, the probable existence of soundings quite across suggested, or the possibility of anchoring buoys without soundings, and the apparatus necessary to effect the design
The sudden death of Colonel Sherburne is claimed, by his son, to have prevented the carrying out of his father's favorite project.
The right of Cyrus W. Field to the honor of inaugurating the tirst Atlantic cable does not scem to be in any way lessencd by the earlier project of Coloncl Sherburue and Mr. IIubbell. The idea of occan telegraphy was not original with cither. As early as 1842 , Professor Morse tclegraphed through insulated wire, a submarinc cable, stretched between Castle Garden and Governor's Island. And with reference to later investigations, Professor Morse wrote in a letter to the Secretary of the United States Treasury, under the date of August 10, 1843, these memorable words: "The practical inference from the law just clucidated is that a telcgraphic communication on my plan may with certainty be established across the Atlantic! Startling as this statement may now seem, the time will come when the project will be realized.'
Possibly, if Coloncl Sherburnc had lived, he, and not Mr. Ficld, would have becn the founder of the first Atlantic Telegraph Company. Possibly also he might have fought the enterprise through to successful issue. This, however, is a question of fact, not of possibilities. Col. Sherburne proposed-and dicd. Mr. Field proposed, and happily lived to sce his plans succeed.

## THE WORLD-CIRCUIT AND TIME PUZZLE

The everlasting problem of the two men traveling in opposite directions around the world and meeting to find their time reckoning at variance, must be the source of much revcnuc to the postal department. Sooncr or later every youth falls foul of it, and, getting into a dispute over it, appeals to his favorite newspaper for a decision. The number of such communications coming to the office of the Scientific American is in one sense highly gratifying, in that it shows no small percentage of the youth of the country to be among its friends. Nevertheless the incessant repetition of even an interesting question becomes monotonous in the course of years. In the hope of setting the matter at rest for a little while, to the saving of time and correspondence, to say nothing of disputation, the question may properly be taken out of the department of "Notes and Queries," an
at greater length than would be possible there
The great trouble with the question clearly arises from the
circumstance that it involves two diffcrent ways of noting circumstance that it involves two different ways of noting time-by sunrises, and by actual duration as measured by the clock-while those who attempt its solution do not always secp the two ideas of time distinct and separate.

Sometimes the journey is supposed to be made in one day at others a year is allowed. Let us begin with the first case. as to make the circuit of the world in twenty-four hours, we will consider the cases of $\mathrm{A}, \mathrm{B}$, and C , the first going west ward, the second eastward, the third remaining at home. The time of starting is, say, noon, January 1, and each is pro ided with an accurate calendar clock
At noon, January 1, A starts on his journey, travels with the sun, and makes the circuit of the world in twenty-four hours by the clock.
B, starting at the same instant, travels eastward at the same rate ( $15^{\circ}$ an hour), and completes his journey in twenty-four hours by the clock.

C remains at home
When it is noon, January 2, by C's reckoning, both by the sun and by the clock, the three men compare their reckonings. Obviously the three clocks will agree in indicating noon, January 2. During the preceding twenty-four hours, however, the sun, to A, has been steadily at the meridian, and utterly useless as an indicator of time movement. A has seen neither sunrise nor sunset, and in comparison with C's sun reckoning, he has missed one sunrise, and has accord ingly lost one day. Meantime B has seen the sunrise twice, once more than C , and twice more than A . By sun reckening, therefore, $A$ and $B$ are two days apart.
Suppose the time of the journey prolonged to a year of 365 days, the calendar clocks not being interfered with. Obviously all three clocks will register the same absolute duration and stand, at noon, January 1, one year later than the time of starting.
Assuming A's progress westward to be uniform, he must, by the direction of his travel, lengthen each day (in other words, put back sunrise) nearly four minutes, the aggregate for the year making one whole day; and of course, if his speed is variable, that would be the averagegain-that is, to each day's length, making the aggregate number of dilys for the year one less than if he had stood still. As a consequence, he will see the sunrise but 364 times in 365 days bythe clock in other words, his date by sun reckoning will be noon, December 31, the year of starting.

The days of $B$, on the other hand, will be similarly shortened. He will sce the sun rise 366 times in 365 days by the clock, and his date, by sun reckoning, will be noon, January 2 , the year after starting.
Thus, reckoning by sunrises, A will be one day behind C, and $B$ one day ahead of $C$. The reckoning of $A$ and $B$ will, therefore differ by two full days.
Since the meridian of $180^{\circ} \mathrm{E}$. or W. of Greenwich falls in mid Pacific, touching no land of consequence, it is usually chosen as the line for time correction, the day lost or gaine being there added or dropped, as the case may require.

## PROF. BERT'S NEW ANESTHETIC.

Not long since we calicd attention to an important paper read by M. Paul Bert bcfore the French Academy, and in which the author suggested the benefits to be derived in sur. gical operations from the use of nitrous oxide as an anæsthetic, when combined with oxygen and administered under tension. M. Bert's conclusions were drawn solely from ex periments that had been made by him on the inferior animals.
The first trial of the new anæsthetic on a human being has ecently been made in Paris, and has proved so successful in every respect that it deserves to be made known in all its de-
tails. The experiment, according to the Paris correspond tails. The experiment, according to the Paris correspondent of the Lancet, was performed on the 13th of February, in the "Acrōpathic" establishment of Dr. Daupley, Rue Males-
herbes. Dr. Labbé, surgeon to Lariboisière Hospital, was to herbes. Dr. Labbé, surgeon to Lariboisière Hospital, was to operate on a young woman of twenty for in-growing nail; and M. Préterre, who has great experience in the use of nitrous oxide, was to apply the gas. The other persons present were Prof. Paul Bert, and MM. Reynard, Laffont, and Blanchard. At 11 o'clock the party entercd the large compressing
bell of the establishment, and the patient reclined on some bell of the establishment, and the patient reclined on some
mattresses on the floor. At ten minutes pasteleven the pressure had increased to 17 centimeters without any of the party having experienced any discomfort, except some noises in the ears and a feeling of tension in the membrana tympani, but which were casily removed by a movement of dcglutition. At this moment M. Préterre applied to the patient's nose and mouth the apparatus which he is in the habit of using, and which communicated with a large bag containing 120 liters of the following mixture: Nitrous oxide, 85 parts; oxygen, 15 parts. After a few scconds of hesitation the patient began sibility and muscular relaxation were complete. sibility and muscular relaxation were complete. Dr. Labbé
then leisurely performed the operation, during which the patient never gave a single sign of pain or reflex action. Her eyes were shut and insensitive, the pupils slightly contracted. About the fourth minute, as Dr. Labbé was beginning the dressing, there were a few contractions of the hands and feet; but this was all, and, as the operation was now over, the apparatus was removed.
It was then fifteen minutes past eleven. The contractions ceascd, and the patient remained motionless and asleep for half a minute. She then complained of pain in her toe, and cried a little. Less than a minute afterward she sat up, and declared she had felt nothing during her sleep, but that (to use her own words) "she had gone to heaven, and had seen everything blue with stars." She declared she felt no pain, except slight headache, to which she is subject. Nothing could be more striking than this calm and quict awakening,
compared with that which follows chloroform. Her pulse
had been constantly calm, and her complexion natural and had b.
The following technical figures given by Prof. Bert are of scientific interest: The depression commenced at 11:15 o'clock, and ended at 11:19. The total pressure having as cended to $75 \mathrm{c} .+17 \mathrm{c} .=92 \mathrm{c}$. The tension of the nitrous oxide was expressed thus: $85 \times \frac{92}{7}=104$, or, in other words, was slightly above that of pure nitrous oxide breathed in the open air under normal tension. The tension of the oxygen was $15 \times \frac{92}{75}=18 \cdot 4$, or, in other words, slightly below that of ordinary air (20.9). But the difference is too slight to be of any consequence.
This experiment has successfully shown that Prof. Bert's mixture, which does not produce any anæsthetic phenome non under ordinary pressure, has the effect when applied under tension of producing complete insensibility. Prof. Bert, therefore, claims for the new anæsthetic that its application is simple, that it is easily dosed, that it is perfectly harmless, and that it is not preceded by a period of excitement, or fol lowed by the stage of reaction.

## The Microphone in Mine Disasters

The buried miners at Sugar Notch tried very hard, by pounding on the walls and doors of their rocky prison, tole their friends outside know they were alive, but did not suc ceed. The question is raised whether the long and distress ing uncertainty as to their fate might not have been relicved had a microphone been employed. Also whether it would not he possible to devise and make known to all worker underground a simple code of microphonic signals, to be communicated by rapping and heard by means of the mi communicated by rapping and heard by means of the microphone, whereby some sort of intercourse might be kept
up between those without and those within a minc under up between those wit
such circumslances.

## International Postal Cards.

The Post Office Department has approved a design for the new international two cent postal card provided for by the Universal Postal Union and the recent act of Congress. On the upper left corner are the words " Universal PostalUnion, United States of America," in English and French, the Postal Union requiring that the inscription shall be in the language of the country from which the card is sent and in French. On the right upper corner is the stamp, consisting of the head of Liberty copied from the gold double eagle, surrounded by a ribbon border, with a monogram "U. S." at the top and a buckle at the bottom with the figure " 2 " in octagon blocks on either side. In the upper half of the circle are the words "postal card," and in the lower half "two cents." The card has also, to more clearly define it from the ordinary one cent card, a neat border around the edge on the address side.

## Hand-Training in Education.

In a paper on hand-training in the public schools read bcfore a Massachusetts County Teaching Association, the reader, Rev. G. L. Chaney, laid special cmphasis on the need of giving public school children the proper bias toward, not against, manual labor. At present children are taught in such a way that they look down upon manual iabor. Education should not thus be prejudicial to the la boring interests of the country. Industrial education is absolutely necessary for us as a people. Hand-training is in reality mind-training, or "brain-building by hand." Mr. Chaney argued that special trade schools should be main tained by manufactories, for which the public school train ing should be a preparation. The work of the Industrial School Association in Boston was alluded to as an example of what might be accomplished in the manipulation of tools common to all the trades.

Dr. James B. McCaw, according to the Canudian Journal of Medical Science, remarks that dialyzed iron (which has recently been recommended as an antidote to arsenic) is simply a peroxide of iron, and exceedingly sensitive to oxygen. Hence, on slight exposure to the atmosphere, it unites with the oxygen of the latter, forming a solid oxide. He suggests the following formula as one not generally known for an antidote to arsenic, and claims for it precedence over all others; first, because it forms the surest anti dote; and second, because the ingredients are always readily accessible, even to the country physician who carrics saddle bags: Tincture of chloride of iron, one drachm; bicarbonate of soda (or potash), one drachm; tepid watcr, a teanate of soda (or potash), one drachm; tepid watcr, a tea-
cupful. Mix. The sesquioxide of iron is immediately cupful. Mix. The sesquioxide of iron is immediately
formed in a solution of chloride of sodium. Give this mixformed in a solution of chloride of sodium. Give this mix
ture almost ad libitum. It is a perfect antidote to arsenic.

## It is a perfect antidote Coal in Switzerland.

The Continental and Swiss Times, published in Geneva, ontains the following suggestive advertisement:
"American anthracite coal for sale at 50 francs per 1,000 kilos. Carriage free. Apply J. Lafond, 10 Ruc Bonivard.
If $\Lambda$ merican coal can be sold at a profit in Geneva, we see no reason why a more advantagcous market may not be found at Marscilles and other ports on the Mcditcrranean, thus furnishing an opening for another of our products.

Professor Lewis Swift, of Rochester, has been clected Fellow of the Royal Astronomical Socicty of England, as token of appreciation of his astronomical discoveries.

