settled, that the tensile strength of iron and steel when tested by stretching, is not lessened by low temperatures. On the contrary, it would seem from Mr. Spence's experiments to be increased rather than diminished.

MR. COOPER'S RECENT GIFT TO THE MECHANICS OF NEW YORK.

Mr. Peter Cooper has given one hundred and fifty thousand dollars to the trustees of the Cooper Union, in addition to the million dollars previously bestowed by him on the institution, to be expended in the purchase of books for a free reading room, and for such other purposes as the trustees may elect, for the benefit of the mechanics of New York. To call this act princely munificence, is a very inadequate expression of the appreciation in which the citizens of New York hold the last generous deed of Mr. Cooper. A prince who steals his wealth can easily afford to be liberal; one of nature's noblemen, who earns his money by the toil of his hands, when he bestows his wealth, gives what belongs to him, and is entitled to vastly more praise.

Mr. Cooper, in early life, was too poor to pay for instruction, and was compelled to acquire knowledge in the intervals of toil and at great disadvantage. He resolved that if fortune should favor him, he would found an institution in which the poorest mechanic could obtain gratuitous instruction in the evening, in such departments of learning as would add to his usefulness and chances of success in his career. Having felt the want, he knew how to apply the remedy; and, in after years, as fortune smiled upon him, he did not, as many others have done before him, forget the promise of humbler days, but set too work to carry out his intentions in his life time, and under his own energetic supervision. The Cooper Union was founded and dedicated to science and art. It has prospered under his hand. Competent teachers have been engaged to give instruction to the thousands of mechanics and women who have applied for admission. The free reading room has been thronged by persons who have gone there to prepare articles for the press,or to snatch a little information in the intervals of their work.

The School of Design for women has opened up a field of usefulness to a large class of society which has very limited opportunities for earning a support. The large hall of the Union has been the theater of popular scientific lectures before immense audiences, and thus the seed sown is scattered in every direction; and the beneficent influences of the Cooper Union are felt in the workshop and family circle by a class of persons who would otherwise have been excluded from these advantages.

There is something grand in the conception and execution of a plan of such magnitude as this; and it is rarely that the privilege is accorded to any one in his lifetime to do so much good.

The occasion of the new gift by Mr. Cooper was the anniversary of his eightieth birthday. He has "by reason of strength," attained four score years, but this strength cannot be "labor and sorrow" to one who has called down so many blessings on his head. The gratitude of the poor is a rich inheritance, and our mechanics know how to thank those who have helped to lessen their toil and to elevate their condition.

Mr. Cooper has long been anxious to see the whole of the Institute building devoted to the purposes of the foundation, but it has been necessary to provide an income to meet expenses; and to do this, the various stores and rooms of the lower floor have been let. The room thus taken up for the purposes of trade is greatly needed for the collections of apparatus, minerals, ores, and drawings required by the pupils; and it would be a handsome mode of expressing their appreciation of what Mr. Cooper has done, if the wealthy manufacturers of the city were to contribute a fund, the interest of which would equal the rent to be derived from the stores. We should like to see the whole edifice swarming with persons in search of knowledge, while the money changers find a resting place elsewhere.

It would be a just recognition of Mr. Cooper's claim upon the respect of the community, if our citizens were to raise a fund for the endowment of the institution which he has established at an expense of a million dollars. We dare say that every mechanic in the city of New York would cheerfully give a dollar towards such a testimonial fund, if the movement could be organized by responsible persons. It would be a beautiful thing to see the declining years of the good old man sweetened by these evidences of regard, and, as he has taken care, during his life time, to accomplish all this good, it would be well for the recognition of it to come while he is yet able to understand and appreciate it.

DEATH OF THOMAS BRASSEY, THE GREAT ENGLISH RAILWAY CONTRACTOR.

The subject of the present obituary notice, whose death is announced in our latest foreign exchanges, was one of the great men of his time. His field of labor was one that does not generally attract the attention of the world, yet Mr. Brassey was widely known in both hemispheres, as the most extensive railway contractor in the world. He is said to have left the largest personal estate ever administrated upon in England, and this wealth was not acquired by stock jobbing and speculation, but in the legitimate business to which he devoted his life.

Mr. Brassey was born at Baerton, England, in 1805. At the age of sixteen he was apprenticed to a surveyor, and was taken into partnership by his instructor at the end of his term.

His first contract of importance was ten miles of the line of the Grand Junction Railway from Liverpool to Birmingham, in 1835. This contract proved profitable to himself and satisfactory to the company.

His next great contract was on the London and Southampton Railway, exceeding in amount four millions of pounds sterling. One would think such a contract as this was business enough for one man, but not content, Mr. Brassey undertook at the same time portions of the Chester and Crewe, and the Manchester and Sheffield Railways, besides entering into partnership with Mr. W. McKenzie, o execute the Glasgow and Greenock line. These gent'emen, still remaining. partners, undertook in 1840 the construction of a French railway from Paris to Rouen.

Between 1844 and 1848, Brassey and McKenzie contracted to construct five other French railways, and Mr. Brassey, on his own account, contracted to build three lines in Scotland and two in England and Wales. It is stated that Mr. Brassey had at this time 75,000 men in his employ, and that the weekly wages paid by him amounted to from fifteen thousand to twenty thousand pounds sterling.

T e last of the various works named, the Great Northern Railway, was finished in 1851. From this date up to the time of his death, Mr. Brassey was engaged, for the most part singly, but at times in partnership, on the following works: Works in Shropshire, Somersetshire, and the county of Inverness; the lines of the Sambre and Meuse, the Dutch Rhenish, the Barcelona and Mataro, and the Maria Antonia Railways, in Belgium, Holland, Prussia, Spain, and Italy; the Grand Trunk Railway, in Canada, 1,100 miles in length; six more railways in France; six more in Italy; the Bilbao and Miranda line in Spain; arious contracts in Norway, Sweden, Denmark and Switzerland, and the temporary railway over the Alps at Mont Cenis, which he built and maintained, at considerable loss; contracts in Turkey, still unfinished; the greater part of the East India Railway, the Calcutta and South-Eastern Railway, and other works in India; several hundred miles of railway in Australia; contracts for the first railways constructed in South America, and docks at Callao, in Peru; contracts for making, extending, or widening thirty-one English and Welsh railways; the construction of the Barrow Docks, and the Runcorn Viaduct.

The contracts performed by Mr. Brassey and his partners, from 1848 to 1861, comprised over 2,374 miles; and amounted to twenty-eight millions of pounds sterling.

This astonishing record leads the reader naturally to ask what manner of man this was, who could manage successfully a business, whose ramifications embraced the entire civilized world? The various obituary notices which have appeared in our foreign exchanges, unite in attributing to Mr. Brassey modest tastes, liberality in his views, large but unostentatious charity, the utmost keenness and sagacity in looking out for his own interests, extreme caution in preliminary examination before entering upon a contract, with remarkable boldness in making large contracts when his judgment was formed, and strict integrity in fulfilling the spirit as well as the letter of his agreements. He was extremely systematic in everything, and remarkably clear in all his statements. These qualities, united with an untiring energy and a physical constitution that enabled him to endure an amount of labor sufficient to break down three ordinary men, exactness in the minutest details of business, unruffled calmness under all circumstances, kindness of heart, and justice in his treatment of subordinates, make up a character rarely met with, and which might safely be predicted to win in almost any occupation. The greatest prosperity did not seem to elate him, and the heavy losses he sometimes sustained affected his composure as little as his gains.

One of the principal elements of success in his career, was his reliability in the performance of work as agreed. This character, established in his earlier contracts, was maintained in all his subsequent works.

In 1866, Mr. Brassey lost a sum larger, it is said, than any one business man of his time could have lost without bankruptcy, yet he died one of the richest men of the period.

In another column will be found an anecdote of Mr. Brassey, which illustrates the character of the man very forcibly.

THE PRESENT AND THE PAST.

NUMBER IV —TRANSPORTATION

To moisture, either as affected by changes of temperature, or as containing in solution corrosive gases, as the chief agent in disintegrating rocks, we must add the chemical and mechanical agency of plants, and even the wear and tear of the surface, produced by the movements of animals upon it. The volcano, also, from the loose ashes and scoriæ which it ejects, readily contributes a share to the burden of the rain-flood; and as the materials thus set loose travel downwards, they receive constant additions from the beds of the rapid streams, in which the incessant fretting of the pebbles and grit gradually wears away the hardest rock. Thus the water of a river must contain material derived from every part of its course; and the greater the variety of rocks in the region which it drains, the more varied will be the character of its sediments. Nor does it contain matter merely "in suspension," such as will, when movement ceases, settle to the bottom as sediment; but, being a great solvent, it always contains substances "in solution," which will only be deposited, or "precipitated," by some change in the chemical condition of the water, or be withdrawn by the agency of the plants and animals that inhabit it. The mud that settles at the bottom of a tumbler of dirty river water, is an example of a sediment; the fur that is deposited in a teakettle, on boiling the same river water, is carbonate of lime that was held in solution. Our readers must forgive us for lingering upon such elementary facts; we do so because people, generally well informed, will use these terms with the greatest inexactitude. Thus we have, even while writing this article, chanced upon the phrase, in a leading newspaper, "the sediment was held *in solution*" in the flooded waters of the Tiber, the words evidently referring to matter existing, mechanically divided, in suspension therein.

Everything tells us that the river, though a great destroyer, is no restorer. When a mountain brook, brawling riotously over its rocky bed, whirling along, in its quietest times, pebbles and sand, and, in the excitement of a flood rolling down even vast boulders, subsides to the majestic river, carrying along only the finest sediments, it may, from time to time, spread layer upon layer of alluvial soil over its banks, or gradually silt up its deep pools; but, sooner or later, geological changes will occur; its outlet will be lowered, it will become rapid, its course will change—now cutting here, now there, and thus itself, eventually, removing the same soil that it had laid down, and transferring the materials a stage further towards their ultimate goal. The extensive new-made lands, that form the deltas existing at the mouths of so many of the largest rivers, can scarcely be said to be the work of the river, since they are due to the action of the tides and marine currents, that prevent it from sweeping its burden out into the ocean. But even these, if we may judge from the infrequency of such deposits in geological formations, have but small chance of being permanently preserved. Being generally loose aggregations, bordering on, and even extending out into, the sea, they are the first to be devoured when a change of level, or an alteration in the direction of the currents, gives them over as a prey to the waves. Not that deposits from fresh water do not occur frequently, and of great extent, in the geological series, but these appear to have been formed mostly in lakes. Thus the river, in its geological aspect, is the link between the continents of the Past and those of the Future, a striking emblem, even from the scientific point of view, of the ever lapsing Present.

When the substances, swept down by the river, at last reach the sea (which they do in a very finely divided condition, as silt, or the finest grained sand), they become mingled with the materials abraded by its waves. The depth to which the action of the waves extends is, as we have said before, limited, so that the abrasion of the land only takes place in comparatively shallow waters. Violent storms, however, disturb sediment that has temporarily subsided at greater depths, and tides and other currents sweep finely-divided materials far out into the depths of the ocean. As, however, marine currents are never sufficiently violent to carry heavy materials, the movements of pebbles, boulders, and even of coarse gravel, can only be accomplished in the neighborhood of coasts, within the breaker action, where, as shingle, they will be tossed and retossed, continually rounding and being rounded, polishing and being polished. At each returning wave, the grating sound, as the pebbles are thrown forward and sucked back, tells you that every stone moved has lost some almost infinitesimal portion of its substance, just as surely as your grindstone wears, by being used, or your knife, by being constantly cleaned.

Thus most of the pebbles we see on a beach are ground to sand and dust, which, when reduced fine enough, will be borne off to sea; and we also learn from this history that pebbles can only accumulate permanently by being drawn back by the waves, in violent storms, into deeper waters, or by such a rapid change of level of the coast-line as shall raise or sink them out of reach of the waves, more rapidly than the latter can grind them up. It is essential to recollect those facts in studying the history of the conglomerate rocks that occur so frequently in geological formations; at the same time, however, we must not forget that it has been suggested of late that some of such conglomerates, containing large boulders, may have been accumulated by the agency of icebergs and glaciers, and may, therefore, indicate the recurrence of several glacial periods in the world's history; periods such as that, of which we have conclusive evidence, which, over a large part of the northern hemisphere, intervened between the Tertiary period and the Recent.

Excluding, however, these possible exceptional cases, pebble beds in a geological formation indicate to us, just as certainly as shingle in an existing sea does to a navigator, a coast near at hand; that, in fact, the geologist is somewhere near the dry land that bordered the ancient sea whose deposits he is studying. The navigator would, moreover, tell us that, as a general rule, the further from land, within soundings, the finer the nature of the deposit on the sea bed. Outside the pebbles he may reasonably expect to find gravel; outside the gravel, sand; beyond the sand, gritty mud; and still further at sea, impalpable ooze. This is precisely what we should infer from the carrying powers of waters; as the strong currents, originating in the confined channels near the shores, expend themselves in the open sea, they will deposit first sand, then mud; while finally, where no off-shore currents prevail, the very finest particles will subside. The same effect virtually takes place if you agitate a mixture of gravel, sand, and dirt, in a tumbler, and leave it to settle; excepting that, instead of the sustaining power dying out in time, as within the limits of the tumbler, it continues to exhaust itself contemporaneously over the range of the current. In this rule of the distribution of sediments, we have the true key, as we shall show, to one portion of the history of geological formations; a key that, pointed out long since, has, strangely enough, never been made to serve its real purpose until very recently, and remains even now unappreciated by the majority of geologists.

The general rule of the distribution of deposits is often obscured in areas where currents are numerous and constantly shifting; and we may there find a difficulty in tracing out upon a chart, such an exact disposition as above described.

But from the very fact that the currents in such a region are so variable, thus constantly removing what they have but recently laid down, it will be less likely that their deposits will be preserved, and in our present geological studies we may disregard the exception, save to remember that it exists.

A PHILANTHROPIC TEMPERANCE MAN.

Our readers will find in another column an advertisement, for which the writer pays us one hundred and ten dollars. It offers a prize of five hundred dollars for a plan to suppress the sale of intoxicating liquors and tobacco in New Jersey. This prize is offered by a man too modest to have his name published, but who has provided guarantees of his good faith, which will be found upon perusal of the advertisement in question.

However much the possibility of securing the desired result, by the offer of such a prize, may be doubted, the man who offers it has given practical proof of his earnestness in the cause of temperance.

The field chosen for the exercise of inventive genius is a peculiarly difficult one. If our memory serves us, there is a town in New Jersey known as Hoboken, which has been a favorite Sunday resort for New York guzzlers, ever since the Sunday liquor law went into operation in this State. The man who can devise a way to prevent drinking in Hoboken will prove himself a genius of no mean order, and will fully earn the prize offered.

The Lyceum of Natural History.

The New York Lyceum of Natural History celebrated its fifty-third anniversary on the 27th of February. This organization includes, on its list of members, all of the leading scientific men of the city, and its reputation, as an active publishing society, is high in this country and in Europe.

The report of the treasurer showed the society to be out of debt, with a handsome surplus, to be carried to next year's account. During the year, Volume IX. of transactions has been completed. One hundred and six learned societies, from all parts of the world, exchange transactions and proceedings with the Lyceum, so that our New York institution is rapidly accumulating a library of great value; it does not, however, speak well for the city that the society has no permanent resting-place, nor any proper receptacle for its library and collections.

It was announced that Mr. Waterhouse Hawkins would address the next meeting, on the "Rehabilitation of extinct animals," with illustrations and drawings.

NEW PLASTIC MATERIAL.—A beautiful plastic substance can be prepared by mixing collodion with phosphate of lime. The phosphate should be pure, or the color of the compound will be unsatisfactory. On setting, the mass is found to be hard, and susceptible of a very fine polish. The material can be used extensively, applied, in modes that will suggest themselves to any intelligent artist, to high class decoration. The inventor has given it the somewhat pretentious name of artificial ivory.

THE DRAINING.—Draining tiles, laid without collars, can be protected at the joints by laying the tiles close together, and wrapping a newspaper, two or three times folded, round the ends. This plan is better than using straw, shavings, or grass, and, when the earth is packed down on the tiles, is perfectly secure.

NOTICE TO ADVERTISERS.—The circulation of the SCIENTIFIC AMERICAN having so largely increased, we are compelled to go to press hereafter one day earlier than formerly. Advertisers must bring in their advertisements as early as Thursday to insure their publication in the next issue.

TWO HUNDRED tuns of silver ore per week pass through Salt Lake City.

A SHAFT is being forged at the Bridgewater Iron Works, Mass., that will weigh forty-two tuns.

THE new hammer in the Bessemer Steel works at Harrisburg, Pa., weighs 35,000 pounds.

NEW BOOKS AND PUBLICATIONS.

A DICTIONARY OF WORDS AND PHRASES USED IN COMMERCE with Explanatory and Practical Remarks. By Thomas McElrath, late Chief Appraiser of Merchandise at the Port of New York. Part I., pp. 72, 8vo. New York: N. Tibbals & Son.

The application of science to the arts, and the increase in the number of commercial articles, have been so great during the present century, that special dictionaries of the words and phrases used in each science or trade have become indispensable. Mr. McElrath proposes to supply this want for the department of commerce, with which he became very familiar while occupying the office of Chief Appraiser at the Port of New York, and previously to that, as Corresponding Secretary of the American Institute. The design of the book is to give the technical words and phrases used in mercantile transactions, also statistical information, tariffs, weights, measures, coins, rules of exchange, maxims of law, and descriptions of most articles known in trade. We can recommend it as a valuable work of reference. The following we select as illustrations of the character of the work: "Asbestos, a mineral of the hornblende family, fibrous, flexile, and elastic found in silky filaments which, when mixed with oil, may be woven into a fire-proof cloth, and is used in various manufactures. It is of various colors, white, green, and brown. It is employed in the manufacture of iron safes, and by the natives of Greenland it is used as the wick for lamps. It is found on the eastern side of the Alleghanies and in other parts of the United States, but it is said that nowhere is it so abundant or of so good a quality for weaving as that which is found at Staten Island, within a few miles of the city of New York. The island of Corsica is noted for the excellent quality and abundance of this mineral. It is sometimes called amianthus, and also mountain flax." . . "Bath brick, a polishing brick made of a peculiar kind of clay, a calcareous substance deposited from the river or estuary at and near Bridgewater in England. The water is conveyed into vats or pits at the high spring tides, and is left there until the clay deposits itself at the bottom of the vats, when the water is drawn off at low tide. It is then manufactured into bricks, dried, and burnt; they are of the form, and nearly the size of common building brick, and are largely imported into the United States, and are used mostly for cleaning table-knives."

MYSTERY OF EDWIN DROOD. By Charles Dickens. Price, 25 cents.

MAD MONKTON. By Wilkie Collins. Price, 50 cents.

Messrs. T. B. Peterson & Bros., of Philadelphia, have just issued the above works for general circulation through the mails.

THE PHOTOGRAPHIC WORLD.

This is a new monthly magazine, somewhat similar in character to the Philadelphia *Photographer*, and is issued by the same publishers, Messrs. Benerman & Wilson, Philadelphia, Pa. The *Photographic World* is edited by Edward L. Wilson, an able writer and practical photographer. The new magazine contains a large amount of valuable information relating to the economy and practice of the art to which it is devoted, and will doubtless attain a wide and permanent circulation.

SCRIBNER'S MONTHLY MAGAZINE.

The March number of this new and popular magazine is out, and, as usual is full of original and interesting matter. Some of the best writers in the country contribute to this monthly. J. G. Holland, the popular author, is its editor. Scribner & Co., publishers, 654 Broadway, New York.

WE are in receipt of Nos. 1 and 2, Vol. II., of the *American Journal of Syphilography and Dermatology*. Edited by M. H. Henry, M. D., Surgeon to the New York Dispensatory Department of Venereal and Skin Diseases, and published by F. W. Christern, No. 77 University Place, New York city. It is an ably conducted quarterly journal, devoted to the dissemination of professional knowledge upon two classes of diseases, intimately connected, and unfortunately, far too prevalent. To the profession, this quarterly must possess peculiar interest.

THE SEED CATALOGUE of B. K. Bliss & Sons, for 1871, is a valuable work, of 138 large pages. In addition to full information respecting cultivation, with the names, prices, and descriptions of some two thousand species, it also contains over two hundred excellent engravings of flowers, new varieties of vegetables, etc. Some colored plates are also given. Price 25 cents. See advertisement in another column.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—COATING FOR BOAT BOTTOMS.—What is the best material for coating the bottoms of small pleasure boats, used partly in fresh and partly in salt water? The coating is desired to protect the bottom from fouling, and to preserve the wood.—A. A. R.

2.—CANDLE WICKS.—Is there any preparation which will prevent candle wicks from smoking and smelling badly, when the flame is extinguished?—E. D. F.

3.—IVORY KEYS.—I have attempted to glue the ivory on to a melodeon key, from which the ivory veneer had loosened. The glue shows through, changing the color of the key, and the ivory curls up. How ought I to do this work?—J. H.

4.—GLASS STOPPERS.—How are glass stoppers ground fit the necks of bottles?—L. D.

5.—PULVERIZED SOAP.—Can hard soap be reduced to a fine granular powder? and if so, how?—M. B. C.

6.—FUSEES.—How are the fusees, used for cigar lighting, made, and what is the composition used?—L. B.

7.—KEY MAKING.—What sort of machinery is used, to cut the wards in blank keys, in large establishments?

8.—SOLDERING FLUID.—How can I make a soldering fluid for soft solder that will work well on iron, brass, or copper, and that will no require the removal of grease, or the cleansing of the surfaces to be united —C. W.

9.—SPINNING TIN PLATE.—Can common tin plate (iron and tin alloy) be spun up successfully, like brass? I do not succeed, though I can spin up brass well enough. Can any one help me by advice in this matter?—T. J. K.

10.—GRAFTING WAX.—Will some one give the best recipe for grafting wax for use early and late in the grafting season?—J. H. A.

11.—CEMENT FOR GLASS SYRINGES.—What is a better cement for the pewter cups of glass syringes than plaster of Paris? These cups, cemented in the ordinary way, come loose when the syringes are used, and cause great annoyance. Nearly all the syringes sold for medical use are defective in this respect.—P. E. G.

12.—CANNED OYSTERS.—What is the method of canning oysters? Will some one give me the title and publisher of a good work o food preserving?—J. M.

13.—BLEACHING AND COLORING BROOM CORN.—I wish recipes for the above purposes.—F. B.

14.—PAINT FOR OLD WEATHER-BOARDING.—I wish a recipe for the cheapest and best paint for outside work, so as to save oil, in the first coating on old dry weather-boarding or brick-work.—W. O. D