

THE CONVENTION OF THE CIVIL ENGINEERS.

We continue our abstract of the proceedings of this association.

Mr. G. W. R. Bayley, of New Orleans, La., followed, with an exhaustive communication on the subject of

THE TEREDO

or ship worm, well known for its ravages upon timber under water. It belongs to the first subclass of mollusca, known as *acephala*. Although having no head, the animal feeds itself and reproduces its kind. The body is surrounded by folds of the mantle, and it has a shell consisting of two valves. The animal secretes calcareous matter and deposits it upon the extreme edge of the shell, when the secretion hardens and becomes converted into a layer of solid testaceous substance. Every newly formed layer enlarges the diameter of the shell. The ship worm moves by means of an extensive fleshy organ called a foot. It is a muscular mass, capable of being pushed out from between the mantle lobes and the valves, and of adhering, by the exhaustion of the air and water under it, firmly to the front end of the tube, when the teredo is engaged in excavating or boring.

The long bridges across Bay St. Louis, 10,055 feet, and Bay Biloxi, 6,136 feet, built (on heavy, yellow pine piles from 15 to 20 inches and more in diameter) in 1869 and 1870, had to be reconstructed in the winter and spring of 1871 by driving an entire new set of piles in the place of those destroyed by the teredo. The Bay St. Louis bridge piles—the new ones—were covered with felt and copper, and the Biloxi bridge piles with felt and zinc, from the water line to the bottom, the depth of Bay St. Louis being from 10 to 12 generally, and at Biloxi Bay from 10 to 15 feet. In 1872 the writer found that many of the piles in the Bay St. Louis bridge had been damaged by the teredo below the coppering. To remedy the evil, sand and clay were hauled and dumped round the new piles in sufficient quantities to cover the exposed posts, thus cutting off the teredos' connection with the aerated salt water, and killing them in a few days. The piles much injured were replaced with new ones, previously charred, with coal of tar poured on them, washed with clear oil, and coated with coal tar varnish; and all loose or broken sheets of copper were renailed under water. It was estimated that this coppering, already considerably thinned by decomposition, was good for perhaps three or four years.

The teredo, cannot penetrate any soft, fibrous, or spongy substance, as felting, thick paper, or the bark of pine timber, and this is the reason why the spongy, fibrous wood of the cabbage tree palm is never attacked. The action of salt water upon copper or zinc sheets is very destructive, and tarred felt is even a better protection than metal for submerged timber; with metal only, the sea water can penetrate under the sheets, especially when loose or broken; and when sea water ebbs and flows with the tides, so can the ship worm enter and work. If felt, saturated with the dead oil of coal tar and well coated with thickened coal tar, can be secured to and maintained on the outside of submerged timber, it may be considered safe from the ravages of the teredo.

The partial report of the committee on the

MANUFACTURE OF RAILS

was next submitted. The English system of rails is not applicable to this country, as it requires strength, while the American system demands endurance and wear. Where there is the most wear of rail, strength should be the first consideration, and the rails should contain the greatest amount of metal; but where there is less wear, the rails should be as light as experience shows to be safe. As there is the most wear on the head of the rail, there should also be at that point the greatest amount of metal. There was no theory more erroneous than that a head of 2½ inches wide was more endurable than one three inches wide. With the present heavy machinery, the narrow high rails will not last as long as the low wide rails. An inflexible or rigid rail is more sure to break than one moderately flexible. If the rails were laid on a better foundation, and there were no frost, the rails might be made stiffer. In answer to the question why rails should not be made square, the committee believed that it would be too flexible, especially when of iron, and that rails with stem and base were much better. It would be even advisable to place 60 per cent of the metal in the head; but a double headed rail wears out faster than a single. The average wear of an iron rail is equal to a pressure of 4,000,000 tons of dead weight, or 10,000,000 tons of gross weight. The stone ballast of the American roads has been too large; and on a good road a rail would last fully 25 per cent longer than on a bad one. In cold weather, the metal is more brittle than in summer; consequently the breakage of rails in winter is greater in proportion. No definite figures had been received as to the comparative values of iron and steel rails, but the committee were of opinion that a steel rail was 20 per cent better than a good iron rail, 40 per cent better than a fair iron rail, and 100 per cent superior to the ordinary rail used on many railroads.

FIRE IN THE COAL FIELDS.

Mr. Martin Coryell, of Wilkesbarre, recited the particulars of the conflagration now existing in the coal at the Kidder slope. At first water was pumped out of the mines by locomotives; but subsequently, this proving unsuccessful, a new plan was adopted. Steam boilers were erected at various points, and the work of forcing steam into the mines was begun. This appears to be working with great success. At one time during the height of the fire, the thermometer at the mouth of the air shaft registered 212 degrees. When 50 pounds of steam pressure were forced into the mine, the thermometer fell to 120°; and when 70 pounds pressure was in-

duced, the thermometer fell to 100°. The men are now at work boring a nine inch hole with a diamond drill, so as to be enabled to put in, at a different point, another stream of steam to aid the others. The work is apparent going on successfully. The steam has evidently created a great amount of carbonic acid gas; but as yet there have been no means of ascertaining the quantity thus created, or whether it was aiding the steam in doing the work of extinguishing the fire. The mines are at least 600 feet below the surface, and therefore very difficult to reach.

An interesting history of the

DOCK SYSTEM OF NEW YORK CITY

was given by Mr. John D. Van Buren. The speaker, after sketching the past dock facilities of the port and pointing out the advantages as a harbor, referred to the operations at present in progress.

The river wall, recommended by General McClellan and adopted by the present department, is composed of *béton* blocks weighing from 25 to 50 tons each, extending from the foundation to within two feet of low water mark, and above this level, concrete laid in mass, faced with ashlar granite masonry. The idea of using *béton* blocks for this arch is due, he said, entirely to General McClellan, and the late operations of the department show that the plan is an exceedingly expeditious and cheap one. On the Christopher street section, now being built by the department, 14 blocks, weighing about 450 tons, were laid in one day, and 109 blocks, weighing 3,560 tons, were loaded, transported, and laid in 18 days of from 10 to 12 hours each. The crew consists of 10 men, including captain and engineer. The total cost of loading, transporting, and laying, in 14 feet of water, will not exceed \$1.50 per cubic yard. The cost of the blocks, exclusive of the rent of yards, is about \$12.50 with cement at \$5 per barrel, this material alone costing about \$8.50 per cubic yard. It does not cost the city, considering all expenses, over \$16 per cubic yard laid. This wall is being built considerably within the estimate, made by General McClellan, of \$2,500,000 per mile, including the cost of filling.

The departments are now building four large wharves of wood on the Christopher street section, of an improved quality, and have nearly completed three of them. Another is built at Canal street, North river. In these structures they have not found it possible to allow the engineers to introduce any artificial preservatives, except external coatings of fish oil and paint; but in the general character and strength of the woodwork and fastenings, every care has been taken to make them complete and of the very best quality. The pile heads are the only novel features of these piers; they are constructed of built-up columns 20x20 in section and 75 feet length, placed in rows 12½ feet apart, and about 9½ feet apart in rows. The rows are sheathed for low water up to the girders on both sides with 5 inch planking, the ends of which are protected with boiler plates. The heads of the columns are securely passed into the caps and girders. The piles used in the pier, some of which are 94 feet long, are driven in rows 8 feet apart, and 5 feet apart in the row. The square timber is 12x12 in section.

The plan of construction, then, which seems to commend itself as the proper one for the improvement of the water front of New York is: To construct a quay wall along the main street of granite masonry, increasing the width of the street considerably, and from the wall to throw out piers of the very best quality of wood, preserved against decay by all possible means, and at once establish a broad main street and have good piers built and taken care of according to a settled plan; and it will shortly follow that all known means of facilitating the handling and transportation of freight will be introduced by the interested persons then under certain general restrictions.

These public works should go slowly on, say at the rate of half a mile per annum. If in 10 years the wall could be completed on the East river and to West 11th street on the North river, its progress would be all that could be desired. The city would then possess the finest dock facilities in the world.

THE EDUCATION OF CIVIL ENGINEERS

was the topic of a paper by Mr. Thomas C. Clarke, of Clarke, Reeves & Co., the well known iron bridge constructors. Mr. Clarke contrasted the English and Continental systems of professional education, and pointed out that the former was mainly practical, while the latter required the student to be thoroughly versed in theory before entering upon actual work. He believed in combining the advantages of both systems, and advocated a thorough training in the natural sciences. Too much time, the speaker said, was now wasted in studying the higher mathematics, which rarely are brought into practical use. The student should be limited to ordinary analysis, and the time thus gained devoted to the study of Nature. After graduating from college, practice in the field should be immediately begun, and then, after an insight had been obtained into the actual labor of the profession, the young engineer might profitably attend a technological school for the purpose of devoting himself to some specialty. In conclusion, reference was made to the late John Edgar Thompson, and his life was held up as an example of the value of concentration of energies upon business and of thorough training, by which the possessor was enabled to conduct the great operations under his control.

EXCURSIONS, ETC., OF THE CONVENTION.

The reading of papers being concluded, on the following day the delegates made visits to the Stevens Institute at Hoboken, where they inspected the Stevens Battery, and subsequently to the East river bridge, Hell Gate excavations, and Fourth avenue improvements. An excursion was also made to Ashley, Pa., the ascent of Wilkesbarre Moun-

tain accomplished, and the mines of the Wilkesbarre Coal and Iron Company examined. The journey terminated with a visit to Mauch Chunk, a ride over the Switch Back railway, and an inspection of the works of the Bethlehem Iron Company and the Lehigh Zinc Company at Bethlehem, Pa.

New Remedy for Dysentery.

In a recent issue of the *Archives de Médecine Navale* is published an official note, addressed by Dr. Robert, who is the medical chief of the naval division of China and Japan, to the Inspector General of the Health Service in the French navy, calling attention to a drug used by Chinese physicians in the treatment of dysentery. It consists of the root bark of the *ailanthus*, very common in China, also cultivated in France and in this country.

The bark of the root is the only part employed. An infusion of the bark, however, exhales a slightly nauseous odor, and possesses an excessive bitterness, resembling that of sulphate of quinia. The Chinese physicians employ the root in the fresh state only; but Dr. Robert, having been compelled to use some that had become dry, found no sensible difference in its action in the two states.

For administration, 1½ ounces weight of the root is cut into very small pieces and triturated with 2 ounces of hot water for a few minutes in a mortar, in order to soften the bark, and then strained. A teaspoonful of this strong infusion is administered as a dose morning and evening, alone or in a cup of tea. Taken in this form, it provokes vomiting. The medicine is administered in this manner during three days, the patient being kept upon full diet. After that time the *ailanthus* is omitted and the diet is altered to broths until health is restored. If after eight days' treatment the patient is not cured, the Chinese physicians recommence the use of the *ailanthus*; but Dr. Robert states that he has not met with a single case in which this resumption has been necessary, although he had under his notice some where the disease had lasted several months, as well as others of more recent origin.

The principal symptoms which follow the administration of the *ailanthus* are said to be nausea, and sometimes vomiting, followed by a temporary lowering of the pulse. The disappearance of blood from the evacuations commences on the first day and is completed on the second; the colic ceases a little later. The effect of the drug upon the color of the evacuations is variable. Dr. Robert sums up by expressing his opinion that the administration of the *ailanthus* gave superior results to those of ipecacuanha, astringents, alone or combined with opiates, or calomel.

French Improvements in Manufacturing Steel.

Those who have followed for the last dozen years the progressive steps in the manufacture of steel know the difficulties which surrounded the first efforts in the Bessemer process. These were not thoroughly surmounted, nor the process rendered thoroughly practical, until the idea was struck of pushing the refining process to complete decarburization, and then adding to the bath a certain proportion of iron rich in manganese, called *spiegeleisen*. The object of this seemed to be to add again to the metal the necessary quantity of carbon to make it steel, and also to give it, at the same time, certain mysterious virtues, which were known as a steely propensity. It was soon recognized that the importance of this addition was more considerable than at first supposed. The best gray irons were not suitable to replace the *spiegeleisen*. It follows, then, that the manganese must affect the iron in a useful manner. A more minute investigation of the process shows that, under complete reduction of the carbon, the iron becomes oxidized and brittle, and the action of the manganese is to destroy this excessive oxidation, and to restore to the metal its original good qualities.

In the Martin Siemens process, also, the addition of a manganese iron was recognized from the first as practical and necessary. This method answered all requirements for rolled rails and such goods; but a demand arose for a metal milder and softer, for plates and parts of machines. Here this addition of *spiegeleisen* involved a serious dilemma. For with the necessary quantity of manganese must be introduced so large a quantity of carbon that the hardness was produced, which was precisely the thing wished to be avoided. There was then no other resource than to push the reduction of the carbon further still, so as to be perfectly sure of total removal of the carbon, and then, by the addition of a quantity of *spiegeleisen* as rich as possible, to get a minimum of carbon in the resulting steel. This is, at best, but an uncertain and dangerous method, though much in use at present, and is very liable to give a result too hard, or still very oxidized and brittle.

The company of Terre Noire sets itself to produce alloys of iron and manganese, and claims to be able to make alloys of iron with manganese having forty to seventy per cent of the latter, and that, so to speak, in illimitable quantity. This gives a metal very mild, but with all the tenacity of steel. Another great field for the use of ferro-manganese has been unexpectedly discovered, both by the company at Terre Noire and, independently, elsewhere. A series of experiments had been made, upon ores of inferior quality and with large admixture of phosphorus. In seeking to purify or use these ores in some way, it was found, most unexpectedly, that the phosphorus was no detriment to the laminability and tenacity of the metal, provided that the carbon, combined with the manganese, was very small indeed. Here is a great field for the use of ferro-manganese—to produce mild steel from many second rate brands of iron. This renders the working up of all the old material of wrought iron rails into steel, which opens a most valuable market for the old permanent way of many railroads.

The above details give sufficient grounds for supposing that

ferro manganese will become quite in large demand, and hence give ample employ to any company undertaking the special manufacture and application of it.

- 1. The sale and manufacture of alloys of iron and manganese. 2. The application of those alloys to the production of metal with all the properties of mild steel.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE NEWLY DISCOVERED CRATER OF MAUI.

Mr. T. M. Alexander, in a letter to the Hawaiian Gazette, gives an interesting account of his discovery of very remarkable volcanic phenomena on West Maui, one of the Sandwich Islands.

PROGRESS OF THE EAST RIVER BRIDGE.

Work upon the great suspension bridge between Brooklyn and New York, which has been temporarily suspended, is now resumed. The Brooklyn tower has reached an elevation of 222 feet above high water mark.

The New York tower is now 123 feet high, and will probably reach 200 feet during the present season. The anchorage on the Brooklyn side is 6 feet high, and contains 8,334 cubic feet of masonry.

THE GERM THEORY OF DISEASE.

That hay fever, a disease quite prevalent during the present month, is traceable to vegetable organisms, is a curious discovery, tending toward the confirmation of the theory that disease is originated and propagated by independent organic germs.

On examining the nasal secretions with a powerful immersion lens, he found the organisms to be absent except when the disease attacked him during spring.

A SIMPLE ANALYSIS OF ARABLE EARTH.

M. Schloëing gives the following simple process for separating the clay in soils from other constituents, and consequently for determining the quantity of the former present.

The earth is thrown in water and the calcareous matter is eliminated by means of hydrochloric or other suitable acid. The carbonate of lime and humic acid, found in nearly all vegetable earth, hinders the clay from remaining in suspension in the water, and it is hence precipitated.

CORROSION OF TIN.

Tin is generally regarded as the least liable to change of all our common metals; but a case, recently reported to the American Academy of Arts and Sciences by Mr. S. R. Sharples, State Assayer of Massachusetts, cites a circumstance which appears to be wholly contradictory to such a theory.

During the month of March last, an interval of nearly two years having elapsed since the above examination and the tank lining being some five years old, the proprietors called Mr. Sharples' attention to the fact that the lining had become perfectly riddled by corrosion, and this although there

had been a free and constant circulation of fresh water, an analysis of which showed even better results than before. There were 4.20 parts of inorganic matter and 0.80 parts of organic matter in 100,000, and no nitrates were present.

This extensive corrosion can hardly be accounted for, as the weight of present authority points strongly to the unalterability of tin under similar circumstances.

Sir Charles Fox.

Sir Charles Fox, the distinguished civil engineer, died recently in England, aged 64 years. He was an assistant to the celebrated Robert Stephenson, by whom he was appointed assistant engineer of the London and Birmingham railway when that work was begun.

Hospital Hygiene.

Dr. Alphonse Guérin, an eminent surgeon of the Hotel Dieu in Paris, has recently presented to the French Academy of Sciences a remarkable memoir on the influence of atmospheric germs on surgical maladies, in which he strongly advocates tow dressings for wounds.

DECISIONS OF THE COURTS.

United States Circuit Court--Southern District of New York.

PATENT HAIR NET.—JOSEPH DALTON vs. ABRAHAM G. JENNINGS. [In equity.—Before Blatchford, Judge.—Decided May 21, 1874.]

Blatchford, Judge: This suit is brought on letters patent granted to the plaintiff March 5, 1872, for an "improvement in Ladies' Hair Nets." The specification says: "The claim is a head net, composed of a main set of meshes fabricated of coarse thread, combined with an auxiliary set or sets of meshes fabricated of fine thread, substantially as described."

If the claim, to sustain it in view of the former net, is to be limited to a claim to the combination of two sets of threads when they are so connected with each other that the set can be entirely broken away without destroying the other, then the defendant has not infringed.

NEW BOOKS AND PUBLICATIONS.

THE TUNNELS AND WATER SYSTEM OF CHICAGO—Under the Lake and Under the River. Illustrated. Chicago: J. M. Wing & Co.

This handsome volume gives a complete and interesting account of the extensive system of tunnels in Chicago, by which water supply and subaqueous communication is obtained in that enterprising city.

KINDERGARTEN TOYS, AND HOW TO USE THEM. A Practical Explanation of the First Six Gifts of Fröbel's Kindergarten. By Heinrich Hoffmann. New York: E. Steiger, 22 & 24 Frankfort street.

This book contains full explanations of the kindergarten apparatus, which, on account of its simplicity, gradual progressiveness, and accuracy, is the most effectual method of imparting instruction to very young children, and has the especial merit of being thoroughly amusing to the little pupil.

THE AMERICAN YACHT LIST FOR 1874, containing a Complete Register of the Yacht Clubs of the United States and Canada. Compiled by Niels Olsen, Steward of the New York Yacht Club. Price \$1. New York: L. H. Biglow & Co., 13 William street.

In addition to the information specified in the above title, this well arranged volume contains illustrations of all the ensigns and signals of the various yacht clubs.

THE PRINCIPLES OF SCIENCE—A Treatise on Logic and Scientific Method. By W. Stanley Jevons, M.A., F.R.S., etc. Special American Edition. New York: Macmillan & Co.

In his "Scientific Use of the Imagination," Professor Tyndall has, in popular language, conveyed a clear idea of the mental processes by which the investigator is enabled to proceed from the known to the unknown.

original research and discovery. The author describes his book as "a simple and general description of the devices by which exact measurement is effected, errors eliminated, a probable mean result attained, and the probable error of that mean ascertained."

A UNIVERSAL TABLE FOR EXCAVATIONS AND EMBANKMENTS, applicable to any Base or Slope Whatever; and the Calculations of All Solids to which the Prismoidal Formula is Applicable. By William Zimmerman, C. E.

This is a very elaborately calculated table of the measurement of earth-work, applicable to every possible configuration of cross section of cuttings and embankments. It is well illustrated with diagrams, showing its universal use for the work for which it is intended, and for which engineers and contractors will find it especially valuable.

The sixth volume of the new edition of the AMERICAN CYCLOPEDIA, published by Messrs. D. Appleton & Co., of this city, has recently appeared. We know of no work in which there is a more copious supply of information, brought down to the latest dates, or in which the possessor can be more truly said to have placed at his disposal a digest of everything that has been written upon almost every conceivable subject.

The July number of that admirable children's magazine, ST. NICHOLAS, is superlatively good. The literature for the youth of this country is, as a general rule, so much of the morbidly mawkish order—we know of no better term to express its nature—treats so much of those intensely well-behaved children who are always doing such exasperatingly charitable and aggravatingly good actions—that we feel a genuine satisfaction in turning over the pages of a work that tells the youngsters stories which we know they will read and reread until the very paper becomes worn and limp with innumerable fingermarks.

SCRIBNER'S MONTHLY, for July, opens with a continuation of Edgar King's Papers on the Great South, in which the history, resources, and enterprise of Missouri are described with considerable detail.

SCRIBNER'S MAGAZINE for July contains an excellent variety of contents, among them illustrations of the Heart of the Republic, which refer especially to the City of St. Louis, and include a view of the new bridge at that place.

GODEY'S MAGAZINE for July is as attractive as ever. This number is the first of the forty-fifth year of the work.

Inventions Patented in England by Americans.

- (Compiled from the Commissioners of Patents' Journal.) From May 22 to May 28, 1874, inclusive. CARBURETTING AIR, ETC.—J. M. Cayce, Franklin, Tenn. CAR COUPLING.—W. Todd, Portland, Me. IRON AND STEEL MANUFACTURE.—E. Peckham, Antwerp, N. Y. MOWER AND REAPER.—W. A. Wood, Albany, N. Y. REDUCING IRON ORES, ETC.—N. W. Wheeler, New York city. SPINNING AND WINDING FIBERS, ETC.—G. Draper et al., Hopedale, Mass. STEEL SHOVELS, ETC.—T. J. B. Ake, Pittsburgh, Pa. STRAW FABRICS, ETC.—N. A. Baldwin, Milford, Conn. TOY.—W. W. Rose, New York city. YEAST POWDER, ETC.—E. P. Eastwick, New York city. WOOL CARD EVENER.—F. F. Burlock, Birmingham, Conn.

Recent American and Foreign Patents.

Improved Building Block.

Thomas B. Rhodes, Leestonia, O.—This invention relates to an improved building block formed of concrete or other material, which in its plastic condition may be molded into the required form, and will become sufficiently hard and durable for making permanent fireproof walls or structures.

Improved Electrical Condenser.

Charles A. Browne and Isaac S. Browne, North Adams, Mass.—This invention relates to the construction of Leyden jars or condensers, composed of india rubber plates with embedded tin foil sheets; and it consists in so constructing the condenser in sections that, in case a rubber plate is ruptured by a spark, the damage can be repaired by simply readjusting the sections, or, at most, by the loss of a section only instead of the whole jar, as when all the plates are vulcanized together.

Improved Trunk.

William J. Large, South Brooklyn, N. Y.—To the till of the trunk are attached bars, which slide up and down in ways in the trunk body. By suitable mechanism, by raising the lid to open the trunk, the till will also be raised, giving convenient access to the interior.