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**Contents.**

(Illustrated articles are marked with an asterisk.)



TABLE OF CONTENTS OF

## SCIENTIFIC AMERICAN SUPPLEMENT

No. 917.

**For the Week Ending July 29, 1893.**

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### THE WORLD'S FAIR INTERNATIONAL ENGINEERING CONGRESS.

The committee in charge of the programme and arrangements for this congress, which opens its sessions on Monday, July 31, has perfected its plans, and there is every promise of the largest gathering of engineers that has ever been held. Headquarters for the engineering fraternity have been established at No. 10 Van Buren Street. These rooms are very commodious and offer every facility for engineers to meet, look after their correspondence, peruse all the leading technical journals of this country and Europe and to enjoy meeting eminent engineers from all parts of the world. In order to facilitate social intercourse, special informal gatherings are held every Monday evening, and these meetings are very popular, from seventy-five to a hundred people usually being in attendance. These headquarters will be kept open for the special entertainment of engineers visiting Chicago during the time of the Exposition. A meeting room for engineers has also been opened in the gallery of the Mining building, in the southwest corner, room number four. In this room the leading scientific papers are on file, and there are almost always a number of engineers present resting from sight-seeing or enjoying the opportunities that the room offers.

The work of this congress comprises seven divisions, as follows: Division A.—Civil Engineering, in charge of the American Society of Civil Engineers. Division B.—Mechanical Engineering, in charge of the American Institute of Mechanical Engineers. Division C.—Mining Engineering, in charge of the American Institute of Mining Engineers. Division D.—Metallurgical Engineering, in charge of the American Institute of Mining Engineers. Division E.—Engineering Education, in charge of a special committee. Division F.—Military Engineering, in charge of Major Clifton Comly. Division G.—Marine and Naval Engineering, in charge of Commodore George W. Melville, Engineer-in-Chief, United States navy.

### NAVAL TORPEDOES.

Up to the present time the most practical forms of torpedoes used in connection with vessels of war have been the Whitehead torpedo, worked by compressed air, and the Sims-Edison torpedo, worked by electricity.

The Whitehead torpedo is the one now most extensively adopted, and it was with one of these missiles, delivered from the Chilean war ship Almirante Condell, that the insurgent ironclad war steamer Blanco Encalada was sunk in Caldera Bay on the morning of April 23, 1891.

The Whitehead torpedo, briefly described, consists of a cigar-shaped cylinder of metal carrying in its front end a heavy charge of dynamite, and at the rear two propellers, which are worked by compressed air, with which the main body of the cylinder is charged under a high pressure.

To start the torpedo on its mission of destruction it is placed in a special gun, aimed toward the enemy, and then fired, with a low charge of powder, the propellers having previously been set in motion. The instant the torpedo strikes the water, the revolving propellers take effect and maintain the initial velocity imparted by the gun. The torpedo flies along with a speed reaching thirty miles an hour, and explodes on contact with the intended target. This torpedo is provided with guides or wings and may be made to travel under water, and continues to move until the compressed air is exhausted.

The Sims-Edison torpedo also consists of a cigar-shaped cylinder, provided at its head with an explosive charge, next a reel of small wire cable, an electric motor, and at its rear a propeller is worked by the motor. The electric current is furnished from on board the ship through a wire cable, which reels off as fast as the torpedo advances. The torpedo is steered as well as propelled from on board the ship through the wire cable. The distance of travel of the torpedo is limited to the length of the cable, which may be from one to two miles. Within this range the torpedo may be propelled at the rate of fifteen to twenty miles per hour, may go under water, and its direction of flight can be governed with the utmost ease and accuracy. It has the advantage that its motive power may be indefinitely maintained; whereas the motive power of other torpedoes is soon exhausted. Many successful harbor trials of the electrical torpedo have been made; but we call to mind no example, as yet, of its use in actual warfare.

The Howell torpedo, the invention of Captain Howell, U.S.N., is the simplest device, and might be styled the gyroscopic torpedo. It depends for its motive power upon the momentum of a heavy flywheel. This torpedo is a small cigar-shaped vessel, operated by double propellers, no engine or motor other than a flywheel being required. The torpedo may be started from a gun, similar to the other described weapons. The torpedo may be set to run either on the surface or under the water, and owing to the gyroscopic character of its motive power, it will automatically maintain, with great exactness, the line of travel on which it is set. Prior to discharging the torpedo, its flywheel is set in motion at a high velocity. The flywheel of an 8 foot torpedo is capable of storing up a power of 347,000 foot pounds and driving the torpedo half a mile or more with great speed.

The Cunningham torpedo is a new candidate for warlike honors. It is operated on the same principle as a rocket; its motive power being derived from the burning of pyrotechnic compound, the gases of which issue with force from its rear end, and the reaction drives the torpedo ahead. This device is the invention of Patrick Cunningham, of New Bedford, Mass., who is also the inventor of quite a number of improvements relating to rockets.

The Cunningham torpedo has lately been tried with success by government officers at Newport, R. I. Like the others, it is cigar-shaped, and carries the explosive charge at its head. It is intended to serve either as a submarine torpedo, moving wholly under water, or to travel on the surface of the water, as may be required.

It has no screw or propeller, but has extending from the explosive chamber to the stern eight ribs or spirals, with a twist of one turn in forty-eight feet. These give the torpedo a rotary motion similar to that imparted to a bullet by a rifled gun. All the portion of the torpedo aft of the chamber for the explosive is filled with a rocket composition tightly pressed in. The gases escape forward through a large number of small holes just aft of the explosive chamber, and aft through a smaller number of larger holes in the stern. It is the escape of this gas that forces the torpedo through the water. The torpedo tried was seventeen feet long and fifteen inches in diameter. Electricity exploded the rocket composition. The firing tube was run out, so that the torpedo was four feet below the surface when fired.

The propulsion of boats on the rocket or reaction principle has been several times experimentally tried with success. The last experiment in this line that we recall was that of Buisson and Ciurcu, made on the River Seine, in France, in 1886. In a 25 foot boat the inventors placed a small boiler or receiver, which from time to time they charged with blocks of combustible, the gases from which were conducted into another cylindrical vessel called the reservoir, from which the gases were allowed to escape into the air; the reaction thus produced propelled the boat ahead with great velocity. The office of the reservoir was to hold a reserve of gas under pressure while the main receiver was being newly charged and fired. Many successful experiments were tried, extending over a period of four months. But, finally, one fatal day, from some unexplained cause, too great a gas pressure suddenly took place, and the receiver exploded. Mr. Buisson, and a lad who was steering the boat, both lost their lives.

### COLONEL AUCHMUTY, FOUNDER OF THE NEW YORK TRADE SCHOOLS.

Colonel Richard T. Auchmuty died at his summer home in Lenox, Mass., on July 18. He was born in New York in 1831; his great-grandfather was rector of Trinity Church in 1763. Colonel Auchmuty received a college education and afterward studied architecture with Mr. James Renwick and finally became a partner. He served in the civil war, and on his return home devoted himself to charitable work and founded the New York Trade Schools, which he successfully conducted until his death. In 1889, when the schools were incorporated, Colonel Auchmuty and his wife added $160,000 to their previous gifts. J. Pierpont Morgan gave $500,000 at the same time as an endowment fund. At these schools a thorough course of instruction is provided for each of the trades. The branches taught are bricklaying, plastering, plumbing, carpentry, house and sign painting, fresco painting, stone cutting, blacksmith work and tailoring. Low tuition fees are charged and instruction is given either day or evening. The New York Trade Schools are conducted on the principle of teaching thoroughly how work should be done; the scholars actually work at their trades in the school until they become proficient. The system which Colonel Auchmuty inaugurated was a new one and has produced remarkable results. It has attracted much attention both in this country and in Europe, and is regarded by many as the solution of the labor problem. Hundreds of young men trained in these schools have become skilled workmen, and command the highest wages. The trade schools are fully described in our SUPPLEMENT, No. 781.

### LIBRARIES IN CHICAGO.

The recent decision of the Supreme Court of the State of Illinois sustaining the will of John Crerar is an incident of much public interest, as it means the establishment of a free public library in the south division of the city of Chicago. Such an institution as this new library gives promise of being will be of inestimable value even to a city as well supplied with libraries as Chicago is, for by the provision of Mr. Crerar's will $2,500,000 was set aside as an endowment for this library. Just where the library will be established is still unsettled, further than that by the re-

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quirements of the will it shall be in the south division of the city, or, as it is usually called, the South Side.

This munificent bequest calls attention to the library privileges that Chicago already enjoys, and which are probably not equaled to a corresponding degree by any other city in the country. For years the Chicago Public Library has been noted for the number and quality of its books and for the large number of volumes it circulates among readers. The annual report of this institution recently published shows that it contains 189,350 volumes. It has twenty-nine delivery stations and six branch reading rooms. During the past fiscal year it circulated 2,094,094 volumes and periodicals, and of this immense number 988,601 volumes were for home use. The daily average circulation of books for home use was 3,272. Just at present this library is in cramped quarters in the upper story of the City Hall, but contract has been let and foundation is nearly completed for a new library building, which is to be situated in the heart of the city convenient to the North, South, and the West Sides of the city.

On the North Side of Chicago is a fine library, which, in many of its departments, is without equal in the country. This is the Newberry Library, which, perhaps, by an unfortunate bequest in the will of Mr. Newberry, who founded it, is limited to being a library for reference. The last report of this institution, made six months ago, shows that there are 107,157 volumes and 39,501 pamphlets. This library is especially strong in the departments of music, bibliography, American history, biography, and genealogy, fish, angling, and fish culture. In the department of music it is believed to exceed any other library in the country in the value of its books. This library has an endowment of $3,000,000. A new building has just been erected, and will be occupied in a few months, which is one of the finest specimens of architecture in Chicago. It is an immense building, occupying half a small square, but the other half belongs to the library association, so that at any time when necessary the building can be extended. The books in this library are classified and arranged in departments, and each department will have separate rooms, where the books will be kept and where people wishing to refer to any volume may be by themselves and not in a general reading room. The capacity of this new building is 800,000 volumes.

There is another library in Chicago which is destined to play an important part in the education of the city, and that is the library connected with the Chicago University. This institution is situated at the extreme southern end of the city between Fifty-eighth and Fifty-ninth Streets, and, with its immense resources, both in money and intellect, will undoubtedly soon have one of the finest libraries of any university in the country.

### An Ancient Canal in the Crimea.

The Russian engineer Melnikoff writes from Odessa to the Smithsonian Institution, says the Philadelphia *Evening Telegraph*, describing the ruins of an ancient canal discovered in the Crimea, which he regards as one of the wonders of the world.

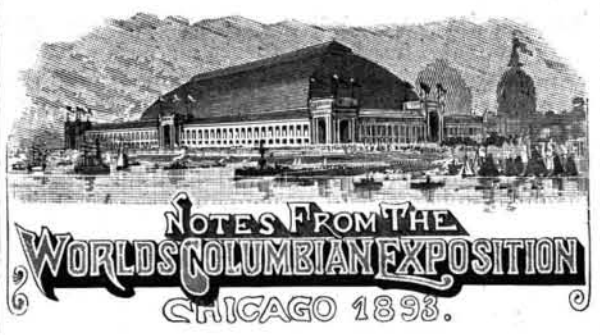
At each end of the western side there was a lofty castle, the ruins of which remain to this day, the cubical contents exceeding 750,000 meters. A part of these stones, as well as those with which the bed of the canal was paved its entire length, were removed some time ago to build a town which adjoins.

During the Crimean war some of the stones remaining were utilized in the construction of hospitals for the wounded soldiers, which structures are still standing. Along the banks of the canal there were at least six towers, but what purpose they served, unless for defense, is uncertain. There was also a high wall, which extended its entire length. At an equal distance from each end there was a gigantic fortress, built in the form of a square and covering a space of 32,400 square meters. The canal is as straight as an arrow its entire length, except at this point, where it forms three sides of a square about the fortress. Here there was a smaller canal on the outer side, which may have provided greater security.

One of the gateways of the fortress is still partially preserved, and through it passes a dilapidated road. The canal was built by Assande I, of Bosporus, in the seventh century B. C., and is nine kilometers long. Mention is made of this in the writings of Pliny and Strabo. It passes by the modern town of Perekop, and is not far from the Greek city of Neapolis. Its width on the bottom was about five meters and its depth ten meters. Whether it served formerly as a great and towering fortification or not, it certainly contained water enough to sail ships of considerable burden.

### Artificial Gum Arabic.

According to *Rev. de Chim. Ind.*, a product possessing the properties of gum arabic is obtained by boiling 1 kgm. flaxseed with 8 kgm. sulphuric acid and 10 liters water, filtering after three or four hours, adding four times the volume of alcohol, washing and drying the precipitate. The product is amorphous, colorless, insipid, and dissolves in water like gum arabic.




Compressed air is used more or less throughout the grounds and buildings at the World's Columbian Exposition, and there is a complete system of pipes for its distribution. Four Norwalk compressors are used, alsoan Ingersoll-Sargent and a Rand compressor. The latter two have a capacity of 200 and 500 horse power respectively. Compressed air operates the elevators in the Transportation building and many freight elevators throughout the grounds. Several locomotives are represented in operation, the energy for this being supplied by compressed air. The air brake exhibit and other exhibits in the Transportation building use compressed air. In the Mining building are several rock drill exhibits, also in the Palace of Mechanic Arts machines are operated by compressed air.

The drainage is divided into three departments. One devoted to the disposal and carrying off of water from the roofs of buildings during storms; another to the surface drainage and disposal of all accumulations of rain water; the third is that of the sewage proper. The rain water from the roofs is emptied direct into the lagoon. The surface drainage from the high grounds flows by gravity into the lake.

The surface drainage from the low parts of the grounds is collected in underground pipes constructed of wood with a bottom of concrete. Three centifugal pumps lift the water, giving it sufficient headway, so that it flows by gravity into the lake. These pumps are operated by electricity. This sewer also carries off the condensing water waste from the Palace of Mechanic Arts.

The remaining general sewerage system of the grounds is operated by compressed air. The main sewer consists of cast iron pipes 30 inches in diameter, and the pressure of air throughout the system varies from 35 to 47 pounds per square inch according to the distance from the sewage pumping plant. Nearly every one of the large buildings on the grounds forms a district in itself. By this division into districts the work of maintaining and operating the system can be more readily carried on and the drainage is more efficient. All sewage is forced through the pipes by the compressed air at a rate of about three feet per second, and is carried immediately to the sewage purifying works, which are at the extreme southeastern corner of the grounds. Here the sewage is made to rise to a tank in the top of the building, where it flows over a sieve and falls into this tank. The sieve separates all the large articles that may be floating in the water, and at frequent intervals they are raked off and taken to the crematory, where they are burned. From this tank the water is distributed by means of pipes into the four precipitating tanks.

Two methods are followed for precipitating the solids in the sewage. In two of the tanks copperas and lime are used and in the other two sulphate of alumina and lime. Large pipes run from the receiving tank direct to each of the four precipitating tanks. The copperas or the sulphate of alumina, whichever is used, is combined with the water as it enters the pipes. As soon as the chemical enters the pipe the water passes through a mixing device, which is simply a sort of paddle wheel, and which thoroughly mixes the chemical with the water. The water then passes on through the pipe, and just before it reaches the tank milk of lime is added. Again the water comes in contact with a device for mixing, so that the chemical shall be thoroughly combined with the sewage. This second mixing device consists simply of a shallow cone. The water pours into this cone, and as it is forced up over the edges, flowing into the precipitating tank, the proper mixing takes place. When the sewage enters the precipitating tank, it does not at once combine with the sewage already in the tank, but passes nearly to the bottom through an inner tank or main designed for this special purpose, then rises to the top outside of this inner tank and passes over an overflow. During the passage of the water down this inner tank and up around the outside of it all solids held in suspension are precipitated, so that the water which flows through the wasteway is nearly clear and is discharged into the lake.

The solid matter, or sludge as it is called, is drawn from the precipitating tanks and passed through a filter press by compressed air at about 104 pounds pressure. The pressed sludge is removed to the garbage crematory, where it is burned. The garbage is collected each night and is carried by the cart load to the crematory, where it is burned. Oil is used for fuel in these furnaces. Refuse is never allowed to accumulate and the garbage is burned every night.

The sanitary arrangements at the Exposition are most excellent, and the system has shown that it is equal to any demands that are liable to be made upon it.

The exhibit made by the Oil Well Supply Company, of Pittsburg, Pa., illustrates in a most perfect manner the skill and science reached in the matter of driving wells for this and other purposes. The exhibit is located in a special building. Working models illustrate the drilling of a well, showing the machinery at work. A second illustrates the manner in which oil is pumped from wells. The structures are inclosed in glass. The Liliputian workmen are armed, as they frequently are in real life, with a bottle of whisky in one pocket and a plug of tobacco in another. The third model is that of a flowing well. All the pipes and tanks for controlling the oil are shown, and the peculiar intermittent flow of the crude petroleum is perfectly reproduced. Derricks used for sinking the wells are also exhibited. There are two large outfits of full size, and such as are built for sinking the deepest wells. The greatest depth yet reached is 4,600 feet. These two large outfits are of different types, one being the most modern, with steel construction and improved power-applying device, while the other is constructed mostly of wood and is of the type that has been so extensively used in the oil regions of Pennsylvania and elsewhere. The company making this exhibit has planned to sink a well 3,000 feet under the steel outfit, and one length of casing, 12 inches in diameter and 30 feet long, has already been driven. Smaller portable outfits are also shown, designed more especially for drilling wells from 800 to 1,000 feet deep. One of these outfits comprises a steam vehicle and adjustable derrick, all in the one machine, which can be hauled by horses or run by its own steam power.

A full line of all the drills, tools for recovering broken drills, torpedoing apparatus, including the go-devil which fires the torpedo, etc., is shown.

The driving of wells in this country is done on what is called the cable system; that is, steam or other power is used for operating the drill, which is suspended on a cable. But in order to add completeness to the exhibit and to compare latest improved methods as utilized in this country with cruder methods as used in other countries, there is shown a complete pole outfit, which consists of splices of poles which are fitted together.

The rest of the exhibit in this building consists of a full line of engines from 12 to 60 horse power, valves and fittings of all kinds, some of the valves being as large as 30 inches in diameter; pipe-threading machines, and a fine line of photographs illustrating the oil well business in all its phases, from the preliminary work of preparing the well to complete buildings, flowing wells, tanks and wells on fire, etc. A large framed picture shows the first oil well that was drilled by Colonel Drake, near Titusville, Pa., in 1859.

In the Horticultural building the wine exhibit is very extensive. The most noticeable pavilion in this department is the one erected by the four California wine producers, C. Carpy & Co., Arpad Haraszthy & Co., Napa Valley Wine Company, and J. Gundlach. This pavilion is constructed of the bark of a giant redwood tree, from Mendocino County. The tree from which this bark was taken was 30 feet in diameter at the base and 290 feet high. The section which this pavilion represents is 47 feet high, and 9,760 pounds of bark was brought from California to use in this structure. Two passageways afford entrance into the lower part of the pavilion, and a narrow winding stairway leads up through it, giving egress to the gallery floor. Over the entranceway, at the right, is a statue of a Franciscan father, representing him in the act of tilling the soil. These representatives of the church first established grape culture in California in the old mission days. Over the left entranceway is a figure of an Indian woman, such as were connected with the mission stations in the early days. Between these two statues is a third one, representing one of the figures by Schmidts, typical of California. Growing up from the base of the tree are grapevines, with an abundance of ripe fruit hanging from the vines. The interior of the tree affords a spacious room, in which there is considerable display of the products of the vineyards.

Adjoining this pavilion is the pavilion and exhibit of Leland Stanford's Vina vineyard.

Two rooms, each of much length, are utilized for the fruit exhibits, those of oranges and lemons being very attractive. The largest exhibit of these fruits comes from the counties of San Bernardino and Los Angeles, California. At one end is a large pyramid of lemons and oranges; at the center is a model of the Liberty bell, entirely covered with oranges, except for the black zigzag space left to represent the crack in the bell. Tropical plants, glasses of preserved fruits, photographs, and other things add to the attractiveness of this exhibit. Smaller exhibits of oranges and lemons and grape fruit are made from other counties in California, as well as from other parts of the world, the exhibit from the most distant points being made by New

(*Continued on page 70.*)

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