SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico......... $3.00
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845)	$3.00	a year
Scientific American Supplement (Established 1876)	5.00	"
Scientific American Building Monthly (Established 1885)	2.50	"
Scientific American Export Edition (Established 1878)	3.00	"

The combined subscription rates and rates to foreign countries will be furnished upon application.

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, DECEMBER 19, 1903.

The editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

A MONUMENTAL STRUCTURE.

The opening of the new East River Bridge last Saturday marked the practical completion of what must ever be regarded as one of the most monumental engineering works of this or any age; for there is a certain sense in which this new highway, wider than many a city boulevard, that has been flung with so bold a hand from shore to shore of the East River, must be regarded as the greatest feat of bridge construction in the world. It is, of course, impossible in comparing great engineering works to say broadly that this or that one is the greatest or the most notable. One structure, like the colossal cantilevers that span the Firth of Forth above the ancient city of Edinburgh, may claim the distinction of being the greatest of all bridges, on the ground that its individual spans are the longest ever built; and it is a fact that this structure contains two main spans, each of which is 110 feet longer than the 1,600-foot span of our new East River Bridge. It might be argued that the Tay Bridge across the Firth of Tay, some forty miles to the north of the Forth Bridge, is entitled to the distinction because of its great length, the steel piers and girders stretching in an unbroken line for two miles across the waterway. The new East River Bridge surpasses all other great bridges in the great capacity of its suspended roadway, which not only has a clear width of 118 feet, but is double-decked, the total width of thoroughfare provided on the two decks amounting to 150 feet. This is nearly double the capacity of the old Brooklyn Bridge, which spans the same river about a mile and a half further to the south. There is no boulevard, nor any public thoroughfare, in Greater New York that can present such a scene of varied and voluminous traffic as that which will roll to and fro across the new structure, as soon as the necessary connections with our systems of transportation are made. There will be two tracks for elevated cars, four tracks for street railway cars, two 18-foot roadways, each of which, by the way, will be as wide as many a country turnpike, while overhead will be two fenced-off roadways for bicycles and two broad footwalks for foot passengers. So stiff and strong is the 1,600-foot span, so great is the inertia of the huge mass of steel framing and truss work of which it is built up, that when the bridge is loaded to its fullest daily capacity, it will hold the broad sweep on which its cables and floor system have been swung with so little variation of form, with such slight deflections, that it would take an engineer's transit and level to detect them.

IMPORTANT DEVELOPMENT IN ELECTRIC TRACTION.

The advantages to be derived from the use of high-tension alternating current directly at the motors are well understood, and the memorable controversy which took place in London recently between the Ganz alternating-current system and the American direct-current system is fresh in the public mind. If high-pressure alternating current can be used directly at the motors of the car, it becomes possible to make a great reduction in the cost of the line wire, and at the same time the cost of the expensive sub-stations and plant for the conversion of the alternating current to direct current is saved. The alternating polyphase motor, however, has drawbacks which in many quarters are considered to more than offset the advantages above referred to, and it was these considerations which led, in the case of the controversy of the equipment of one of the London underground railways, to the adoption of the low-pressure, direct-current system, as almost universally used in this country. Two or three months ago, however, reports reached us from Germany of a new single-phase electric railway which was stated to be showing very satisfactory results. The single-phase traction motor, unless it develops some unforeseen difficulties, should enable us to secure all the advantages of transmission of the alternating system with the advantages of convenience and flexibility of operation of the direct-current motor. We shall watch the performance of this new road with the greatest interest; for if they have produced in Germany a really reliable single-phase traction motor, they have taken a long step toward the practical application, the commercial application, of the high speeds which have recently been developed on the Berlin-Zossen line.

THE CUNARD COMMISSION TURBINE TEST.

The Cunard Turbine Commission has lost no time in prosecuting its work of gathering reliable data concerning the performance of the turbine as compared with the reciprocating type of steam engine. Although the commission is examining each type of turbine whose design or performance renders it worthy of their consideration, their chief attention is naturally being directed to the work of the turbine afloat. Because of the difficulty of securing, in the case of marine engines, an exact measure of the work done, it has been decided to choose as a basis of comparison the actual performance of two sister ships, one equipped with the turbine, the other with the reciprocating engine. Accordingly, two steamboats of the London, Brighton and South Coast Railway are to be chartered and subjected to a highly scientific comparative test in service. The two boats were built at the same yard, and the lines of both were drawn upon data furnished by experiments in the model tank. One of them, the "Arundel," is a twin-screw vessel driven by reciprocating engines; the other, the "Brighton," is equipped with the Parsons turbine. The expert character of the commission, and the great care that will be exercised to exclude any disturbing factors from the comparison, will render their report one of the most valuable of its kind that have been rendered in recent years.

A NEW STEAM MOTOR CAR FOR RAILROADS.

Another development of the motor-car system for operation upon the local sections of a trunk railroad line, has been inaugurated in Great Britain upon the Great Western Railroad. The section selected for this new service is a distance of seven miles in length, extending through the Stroud Valley between Chalford and Stonehouse. The Great Western is the second railroad in England to adopt this system of catering to the traveling public in connection with short-distance traffic, the pioneer railroad being the London & South-Western, which introduced a similar service upon the Flatton local line of its system, and which we fully described at the time in the SCIENTIFIC AMERICAN.

Steam has also been adopted upon the Great Western vehicle as the propelling power, but the design of the vehicle is very dissimilar to that of the rival company, while furthermore its functions are different.

The cars have been constructed from the designs of Mr. C. J. Churchward, the locomotive superintendent of the Great Western Railroad, and each vehicle is self-contained. The coach measures 57 feet ¾ inch from end to end, by 8 feet 6¾ inches wide, and 8 feet 2 inches in height (inside measurement). It is carried on steel underframes, supported upon two four-wheeled bogie trucks, one at either end. The forward bogie truck carries the engine and boiler. The wheel base of the coach is 45½ feet, and the motor bogie is 8 feet long, and the carriage bogie has a length of 8½ feet.

The car is divided into the passenger compartment and a small cab forward for the engineer or driver. The former is 39 feet in length and has accommodation for 52 passengers. The structural framing of the vehicle is of Baltic and Canadian oak, with paneling of Honduras mahogany on the upper part of the outside, while the lower part is incased with narrow match boarding.

The compartment is well appointed. The finishing work is in polished oak, and the roof is painted white with blue lines. The passenger seats are arranged longitudinally on either side of the vehicle near the ends, with cross seats in the center, the former having space for 36 passengers and the latter for 16 passengers. The seats are composed of woven wire with plaited rattan cane. The longitudinal seats are arranged in groups of three, each capable of seating three passengers. Depending from the roof on either side are brass rails attached to pendants, carrying leather hand loops to assist the passengers in walking through the coach while in motion. The car is entered at the rear end through a vestibule, 4 feet long, fitted with steps to facilitate passage to the car. Sliding doors of polished oak with glass panels allow communication between the vestibule and the passenger compartment. The cars are illuminated with 14 candle power gas lamps, the gas for which is stored in cylinders carried on the underframe.

The motor is placed underneath the vehicle upon the leading bogie truck. Steam is supplied from a vertical boiler with cone top, 9 feet 6 inches in height by 4 feet 6 inches in diameter, fitted with 477 fire tubes of 1⅛ inches diameter. The working pressure is 180 pounds per square inch. The motor has 12 x 16-inch cylinders. It is attached horizontally to the bogie frame, and it drives the trailing pair of wheels, which are coupled to the leading pair of wheels. The diameter of the wheels is 3 feet 8 inches. The cylinders have balanced slide valves on top, and the valve motion is of the Walschaert type. With the boiler working at 180 pounds pressure to the square inch, the tractive force is 8,483 pounds. The water for the boiler is contained in a tank having a capacity of 450 gallons, carried under the car. Steam is generated by coal fuel. Although the engineer's compartment, which is 12 feet 9 inches in length, is placed at the forefront of the vehicle, the car can be driven from either end. Hand and vacuum brakes are fitted to each bogie, and these also can be operated from either end. For the convenience of the conductor and engineer, electrical communication between the two is provided. Altogether, the coach, as may be realized from our illustration, resembles an ordinary street railroad vehicle.

The functions of this car are different from those of the ordinary railroad train. In addition to stopping at the scheduled stations, it will also stop at intermediate level crossings for the convenience of passengers. The passengers will pay their fares on the car, and receive tickets. This arrangement has been adopted to meet the requirements of the passengers residing in the valley through which the track extends. Altogether, some 40,000 people live along the seven miles between Chalford and Stonehouse, and the existing stations in some instances are located at long distances from the homes of the passengers, so that the stoppages at intermediate points will prove very convenient. Although the district through which the track runs is, comparatively speaking, densely populated, yet the demands are not sufficient to render an ordinary train service remunerative, and this motor-coach system has been adopted as a more economical and satisfactory means of cheap and rapid transit. At present it is only intended to maintain an hourly service in either direction, but this will be accelerated as the traffic demands increase.

The trial trip was made with a full load, and the vehicle was always under the complete control of the engineer. Even when stopping at the level crossings on steep gradients, the coach was readily restarted, and the brakes proved highly efficient in holding the car stationary under such conditions. This innovation is purely an experiment, but should it prove successful in coping with the traffic demands upon this short section, it will be developed upon other local lines of the system, where an ordinary train service is maintained in many instances only at a heavy loss to the railroad company. These motor coaches will also prove valuable feeders to the trunk roads of the system.

THE NEXT CONGRESS OF AMERICANISTS.

The Fourteenth Annual Congress of Americanists will be held at Stuttgart from Thursday, August 18, to Tuesday, August 23, 1904. The matter of arranging the Congress has been intrusted to Count von Linden, Prof. von den Steinen, and Prof. Seler. The subjects to be discussed by the Congress relate to the native races of America, their origin, distribution, history, physical characteristics, languages, inventions, customs, and religions; the monuments and archæology of America; the history of the discovery and occupation of the new world. Special correspondence relating to anthropology and ethnography is to be addressed to Prof. Karl von den Steinen, Berlin-Charlottenburg, Hardenbergstrasse 24. Correspondence relating to archæology, to the history of the discovery of the new world, and to Central American subjects should be addressed to Prof. Eduard Seler, Steglitz, near Berlin, Kaiser-Wilhelmstrasse 3. The meetings of the Congress will be held at the Festiv Hall of the Koenigsbau.

A native fuel that is largely used for steam raising in India is Seebpore coal. The following are the results of tests which have been carried out by Mr. Fredk. Grover, A.M.Inst.C.E., with this fuel: Duration of test, six hours nine minutes; number of boilers in use, six; type and dimensions of boilers, two-flued Lancashire, 8 feet by 30 feet; draft at base of chimney, 1 inch of water; draft in the main of flues, ¾ inch; total number of pounds of water evaporated, 180,000; total number of pounds of coal used, 22,570.5; actual evaporation per pound of coal, 7.97 pounds water; evaporation from and at 212 deg. F.—equivalent—9.15 pounds water; maximum possible evaporation by calorimeter, 12.5 pounds water; percentage of ash drawn from boilers, 16.7; percentage of ash from calorimeter, 11.5; original feed temperature, 100 deg. F.; feed temperature after heating by exhaust steam, 138 deg. F.; feed temperature leaving economizers, 240 deg. F.; coal fired per square foot of grate area, 19.1; total efficiency of the plant, 73 per cent; pressure of steam in boilers, 125 pounds per square inch; percentage of CO_2 in main flues. 8.4 per cent.