

ENGINEERING.

The total length of railway under construction or immediately projected in India is 3,222 miles, of which about one-third is by the British government and the rest by private companies. The estimated cost is over twelve million dollars.

The replica of the "Half Moon," built to the plans of the late Heer C. L. Loder of the Dutch navy and recently brought over for the Hudson-Fulton Celebration, is now being rigged at the Brooklyn navy yard under the supervision of Heer E. J. Bentham, constructor to the royal navy, who built her.

The torpedo-boat destroyer "Flusser," built by the Bath Iron Works of Bath, Me., for the U. S. navy, has recently completed the first of her official acceptance trials over the measured knot course off Rockland, Me. The average of her five top-speed runs was 32.7 knots, while one run was made in 1 minute 46 4/5 seconds, or at the rate of 33.7 miles an hour. The latter is nearly three knots faster than the best speed of any boat in the American navy.

The Montreux-Berne-Oberland electric railway in Switzerland has installed automatic gates at its grade crossings. When the bow trolley of the car comes in contact with an auxiliary wire run close and parallel to the main trolley wire, the current passes through the auxiliary and operates a motor mounted on brackets on the iron gate post, swinging down the gate and at the same time lighting lamps and ringing a bell. When the car has passed, the gate automatically returns to the vertical position.

The Panama Canal authorities have approved the purchase of a 20-inch pipe-line suction dredge, made to order for use elsewhere by the Ellicott Machine Company of Baltimore, but never used. This is expected to be in use before the end of the present year on the hydraulic fill for the Gatun dam, making the fourth suction dredger engaged in that work, while a fifth will probably be added next year. When the dam is nearly complete, some of the dredges will be removed to the central division, as the water in Gatun Lake rises sufficiently to permit dredging. It is estimated that some 4,000,000 tons of material can be more economically removed than by steam shovels.

Except for a few short distances, totaling 127 miles, automatic block signals now extend from the Atlantic to the Pacific Ocean. According to the Railroad Age Gazette, of the distance unprotected by this system, 93.4 miles on the Southern Pacific in the Sierra Nevada Mountains uses the electric train staff. The next longest gap, 20 miles in length, occurs where a change of line is about to be made. The remaining gaps are due to bridges and points where changes are in progress. The line thus operated by the block system extends from Jersey City on the Atlantic to Oakland on the Pacific, over a total distance of 3,245 miles; and it includes the Lehigh Valley Railway to Buffalo, the Lake Shore & Michigan Southern to Chicago, the Chicago & Northwestern to Council Bluffs, the Union Pacific Railway to Ogden, and the Southern Pacific Railway to Oakland.

A very remarkable demonstration of the possibilities of producer-gas engines for small boats requiring less than 500 horse-power has recently been made by Mr. H. L. Aldrich in a boat built for the purpose, the results being described in International Marine Engineering for August. The boat is 40 feet long over all, 9 feet beam, and 3.5 feet mean draft, and is driven by a four-cylinder four-stroke cycle engine of 35 horse-power, and can cover between 800 and 900 miles at an average speed of 8 to 9 miles an hour on one ton of pea anthracite. Such a plant can be conveniently and safely installed on coastwise schooners in the lumber and coal trades, fishing and oyster boats, and the like; and in addition to the greater safety, with anthracite at \$4 a ton the cost of operation is about one-tenth that of a gasoline engine of equivalent power with gasoline at 15 cents a gallon.

A train ferry service between Sassnitz in Germany and Trelleborg in Sweden has recently been opened, conveying trains across 65 miles of open sea, by means of which through train service from Berlin to Stockholm is now possible. The ferryboats, two of which are owned by the German government and two by the Swedish State Railways, are superior in size, speed, and accommodations to any in the world, and carry a full train of eight cars on two parallel tracks, the balance being maintained while loading and unloading by special trimming tanks. There is almost no tide at that part of the Baltic, but the height of the water varies with the wind, so a double-jointed steel ferry bridge is provided, 160 feet long, with a large bolt in the seaward end fitting a hole in the stern of the ferryboat, to insure alignment of the tracks. When the cars are on the ferry, they are bolted down to the deck by special shackles, the car springs being relieved by screw jacks. Provision is also made for bracing them in heavy weather from the overhead girders of the vessel. The boats have complete and luxurious restaurant and sleeping accommodation for 150 passengers, in addition to the car space.

ELECTRICITY.

Conversation by a wireless telephone, the invention of two lieutenants of the French navy, is said to have been carried on between Toulon and Port Vendres, a distance of 155 miles.

The electric process iron smelter at Herould on the Pitt River has recently delivered a carload of pig iron, produced by the electric process, at \$25 a ton—cheaper than it could be bought at tidewater. It is pronounced to be of the finest quality for casting purposes.

The electric power station of the government buildings at Washington is nearing completion. It is located in Garfield Park, near the Capitol, and connected with the legislative buildings by 7,000 feet of tunnels through which cables and steam pipes run. The tunnels are large enough for a man to walk through comfortably, so that breaks and other troubles can be quickly located and repaired.

A transformer was short-circuited by lightning during a terrific storm at the village of Olginate, near Lecco, in northern Italy, on August 18th, subjecting the low-pressure distribution system to a voltage of 3,000. Attempts to switch off the current by the residents, alarmed by the blowing of fuses, caused the death of several persons and a number of serious burns.

At the Winnipeg meeting of the British Association for the Advancement of Science a model was exhibited by Mr. S. H. Schneider, which he claims will revolutionize the generation of electricity. It consists of a collapsible airtight box, which when closed sinks in water by its own weight. On reaching the bottom it is expanded by a magnet, when, being lighter than the water displaced, it rises to the surface, where it again folds up and sinks. The inventor states that a full-sized "generator," weighing 600,000 pounds and displacing 10,000 cubic feet, would generate 50,000 horse-power at practically no cost of operation.

Electric-car motormen in Berlin are subjected to three weeks' training, comprising 20 hours in the classroom and 40 on the cars in each week. The course comprises the usual practice on a dummy platform, and study of every detail of car equipment, as well as sufficient instruction in overhead and track equipment to enable the motormen intelligently to report accidents. After the recruit has completed the course, he must pass separate examinations by the car engineer and the district traffic inspector. Candidates receive half pay during instruction, but to cover the cost of training each must deposit \$16, which is refunded in full after one year's employment.

Judgment has just been rendered in two suits of the Union Carbide Company against the American Carbide Company for infringements of the Willson product patent of 1895 and process patent of 1896. The patents are upheld as valid, but no infringement is found. Since the defendant company is exculpated of infringement partly on the ground that it manufactures carbide by means of what is strictly a resistance furnace, and not an arc, and the complainant company has also long relinquished the arc for resistance heating of the carbide materials, it will be interesting to see what further steps are taken by the latter.

The economical importance of maintaining uniform load factor is well shown by comparison of the records of the Appleton, Minn., Electric Company for last year and for 1905, prior to the installation of storage batteries. In the latter part of 1905 it was found desirable to maintain a 24-hour service, but cost of continuous operation of the generating unit appeared to be prohibitive. Chloride accumulators were therefore installed, to store the surplus power when the plant was run at maximum capacity during the night, and capable of giving out a third of that maximum for eight hours during the day. The gross receipts of the company increased by 14 per cent in the following year, in spite of which the fuel consumption for 1906 was actually less than for 1905; and making due allowance for interest and depreciation, the net return on the storage battery investment was 14 per cent.

The diary of a traveler from New York to Chicago by interurban "trolley" lines, published in the Electric Railway Journal of August 28th, shows that the limitation of electric-car lines to cities and suburban districts is a thing of the past, and that such systems are no longer installed to supply purely local needs or to feed railways. The first 115 miles was covered not strictly speaking on a trolley car, although most of it could have been, but by the electrified New York Central Railroad to Hudson, N. Y., as a matter of convenience. Thence to Chicago all but 72 of the 1,143 miles was traveled on trolley lines, in a running time of 45 hours and 24 minutes at a cost of \$19.67. The author describes his journey as most pleasant and comfortable, revealing many attractive parts of the country unseen by the steam-railway travelers, and intends to repeat the trip, finding that the running time can be reduced by over 10 hours.

SCIENCE.

Gréhan has studied the disturbances of respiration of various animals confined in an atmosphere in which acetylene was substituted for nitrogen, the mixture containing 79 volumes of acetylene and 21 volumes of oxygen. A pigeon died in 30 minutes, a rabbit in 40 minutes, while no effect was produced on a tortoise. The respiration of frogs was arrested, but when the asphyxiated frogs were brought into the open air they soon recovered their normal condition. It appears from these experiments that acetylene is far less poisonous than carbon monoxide, but it should be remembered that poisonous gases act very differently on different animals.

In a recent number of the Scottish Geographical Magazine a claim is made on behalf of the British government to the island groups of South Georgia, South Orkney, South Shetland, South Sandwich, and Graham Land, all in that part of the Antarctic continent nearest to America. These islands are declared to be a dependency of the Falkland Islands. Hereafter no whalers will be allowed to fish in those coastal waters or to make use of the harbors, without buying an annual license at the Falkland Islands. This is the first serious attempt to take possession of any considerable Antarctic area. The Antarctic country is now the scene of a large reviving whaling trade.

Time is a curious freak at the earth's poles, and when Dr. Cook says that he reached there at 7 o'clock in the morning of Tuesday, April 21st, 1908, his statement is without certain meaning. Presumably he carried Greenwich time, in which tables for navigation are calculated. So at the time of his discovery it was 2 in the morning at New York. As this meridian runs to the North Pole as well as that of Greenwich its time also applies. So does the time of every other meridian, and in consequence at the same instant it was also 7 o'clock Monday afternoon and every hour, minute, and second in between until 7 o'clock Tuesday afternoon. At both the North and the South Pole it is always two days at once, and every day lasts for forty-eight hours.

The observed acceleration of the mean motion of Encke's comet was at first attributed to the effect of a resisting medium, but subsequent changes in the comet's motion have made this hypothesis untenable. Prof. Hackenberg has made a preliminary research which appears to indicate that the observed changes may be produced by the action of dense swarms of large meteors. Biela's comet is known to have been affected by a swarm or current of meteors, which doubtless caused the division of the comet into two parts. In 1906, Charlier published an elaborate investigation of the accelerations of the motions of comets which is in harmony with Hackenberg's theory. Hackenberg promises soon to apply Charlier's results to the motion of Encke's comet.

A German inventor, Otto Nicolai, claims to have invented a new method of welding aluminium, using a specially-prepared metal paste with different ingredients. At a certain heat there is formed a mixture of aluminium oxide and the paste which gives rise to a chemical compound whose nature is not yet determined. Excellent welding is obtained for the metal or nearly all of its alloys, without any special precautions. For aluminium bronzes such as are used for German torpedo manufacture, which contain 90 per cent copper and 10 per cent aluminium, it is required to add finely divided aluminium powder to the paste. This latter must be used in all cases in presence of a great excess of the metal so as to form the above-mentioned compound, to secure the proper welding. He also solders aluminium to other metals such as copper, iron, nickel, etc. In this work he uses large pieces of metal or again thin sheet metal or wires, with good results.

More than once it has been asserted, in good faith but erroneously, that diamonds had been produced in blast furnaces. In 1896 J. Frank treated various products of the blast furnace with acids and obtained a residue composed of titanium cyano-nitride, mixed with brilliant crystals, all of which, except one, were very minute. The crystals were not affected by mixed nitric and hydrofluoric acids, which dissolved the titanium. They showed no facets and were very fragile, but as they were not attacked by any acid, Frank assumed them to be diamonds. Nothing further was heard of these crystals until recently, when the subject was re-examined by Johanssen in the course of a study of the incrustations formed in two blast furnaces, of which one had been in operation 14 years and the other 4 years. Johanssen endeavored to obtain titanium cyano-nitride, and he succeeded, but found that compound mixed with fine sandy particles, which were not attacked by hydrofluoric acid and were altogether similar to Frank's crystals. But the particles refused to burn in oxygen, fused to an opaque mass in the oxyhydrogen flame and dissolved completely in fused borax. Analysis proved them to consist almost entirely of alumina.