

ENGINEERING.

State Forest Commissioner Whipple estimates the forest fire losses in New York State alone, during the past year, at nearly \$800,000. Of 700 fires reported, 90 are attributed to hunters, and nearly 400 to railroad locomotives. A total area of 177,476 acres was burned over, of which over 50,000 acres were State lands.

It is estimated that in the Borough of Manhattan there are about 10,000 passenger elevators and 12,000 elevators for freight service. In twenty-six office buildings of eighteen stories and over, with a rentable area of 116 acres, there are 231 elevators, which travel between 4,000 and 5,000 miles of vertical distance each day, and carry 615,000 passengers. There are 8,000 elevators in office buildings alone.

In the closing days of last year an actual start was made in the manufacture of steel at the new city of Gary, Ind., which has been built by the United States Steel Corporation on the shores of Lake Michigan, a few miles to the east of Chicago. This important step was signalized when blast furnace No. 12 was blown in. The mills embody the very latest practice in the art of steel making; and the estimated cost of the plant as projected is \$25,000,000. If the plans of the company are carried out, Gary must become one of the greatest centers of the iron and steel industry in the world.

The New York, New Haven & Hartford Company have asked permission from the Public Service Commission to electrify the branch line of their system from New Rochelle to the Harlem River. This line has recently been equipped with six tracks; and it is believed that the proposal to electrify the road is part of a scheme on the part of the New Haven Company to obtain an independent line into New York city by way of the new bridge of the Connecting Railroad at Hell Gate, a line through Long Island City, and a tunnel beneath the East River.

Those naval specialists who are perturbed at the growth of what they are pleased to call the "speed mania," will be startled to learn that the latest battleship cruiser to be laid down for the British navy is designed for a contract speed of 28 knots. The sister ships were designed for 25 knots and made, on trial, from 27 to 28 knots. Therefore, it is not improbable that, in two or three years' time, we shall be confronted with the spectacle of an 18,000-ton warship that is able to transport her battery of eight 12-inch guns at a speed, for a short dash, of 30 knots and a sustained speed of over 27 knots.

The German auxiliary sailing ship "R. C. Rickmers," the largest sailing ship afloat, has proved that the days of the profitable square-rigger, if she only have an auxiliary to help her through the calms, are by no means over. During her two and a half years of active service, she has covered over 100,000 miles, and her earnings have been about \$2.25 for every mile of that distance. This noble ship, 441 feet in length, formed the subject of a front-page illustration in our issue of October 6, 1906.

All the vessels of our battleship fleet are to be equipped with the new spiral latticework military mast of the kind illustrated in our issue of November 14, 1908. Before this work is commenced, the government intends to make a seagoing test, to determine how much vibration this type of mast will be subjected to under ordinary conditions at sea. The test will be carried out on the new battleships "Idaho" and "Mississippi," and will be in charge of Naval Constructor Robinson, who was chosen to accompany the Atlantic fleet on its cruise from Hampton Roads to San Francisco.

According to the United States consul at Chemnitz, the German government is offering prizes for an effective method of combating the destructive effects of factory gases upon vegetation. Damage to agriculture and to the extensive forests by the smoke of the numerous factories is becoming every year more marked. Hence the Saxon Ministry of Finance is offering a prize of \$2,400 to the inventor who provides the best preventive of the injuries now due to sulphurous acid and other acid vapors in factory smoke, and to the effect of the harmful products of the combustion of bituminous coal. An additional prize of \$500 will be given for the best compendium of the literature on the subject.

In spite of the serious depression of the past year, the figures for new railroad construction show that in 1908 there was built a total of 3,214 miles of new road. This is a considerable falling off from 1907, when 5,212 miles were constructed; but it is only 600 miles less than the total for 1904, and exceeds by over 100 per cent the figures for 1895, when only 1,428 miles of new road were constructed. The statistics of new car construction show that as compared with 1907, when over 284,000 freight cars were built, and 5,457 passenger cars, there is an enormous falling off, the totals for 1908 being respectively 76,555 freight and 1,716 passenger cars.

ELECTRICITY.

An international electrical exhibition will be held at Brescia, Italy. The exhibits will be divided into fourteen groups covering all classes of electrical application.

It is reported that the Pennsylvania Railroad, which is now investigating the results attained by the use of telephones on western railroads, is favorably impressed, and may adopt this system of train dispatching in place of the telegraph.

One of the latest electrical novelties for household use is the electrical razor. The form of the razor is similar to the well-known safety type; but the razor is given a vibratory movement by means of a rotary eccentric in the handle of the device. This motion is sufficient to cut the beard as the razor is drawn across the face.

A new material has recently been produced in the electric furnace to take the place of platinum in electric cooking and heating devices. The new product is called *silundum*, and is produced by subjecting carbon to the vapor of silicon. The result is a silicified carbon which is similar to silicon carbide and has many of the same properties. It resists temperatures of 1,600 deg. C. and does not oxidize, nor is it affected by acids. As a conductor of electricity its resistance is several times that of carbon.

A sensitive mono-telephone has been described by Henry Abraham before the French Academy of Science. In place of the ordinary diaphragm an armature of sheet iron is supported on two steel wires stretched tightly across the magnet of the telephone. The armature is of such size that it barely covers the magnet. The tone produced by the armature may be varied by adjusting the tension of the wire. The instrument is thus made as sensitive as the ordinary receiver, but is particularly sensitive to frequencies corresponding to the natural sound period of the armature. The instrument is particularly designed for use in wireless telegraphy on systems tuned to a certain wave length.

The town of St. Albans, near London, is using a novel system for generating electricity. The generating station which has just been completed uses no fuel except the town refuse. The refuse is burnt in a destructor plant capable of consuming from 50 to 60 tons per day of eighteen hours. The combustion chambers are provided with large furnace doors to permit of the introduction of large articles, such as mattresses, animal carcasses, and the like. The plant is equipped with two engines each operating two 75-kilowatt direct-current generators. The current is generated at 230 volts on either side of a 460-volt three-wire system. The battery room of the plant contains 268 cells with a capacity of over 1,000 ampere hours at a 10-hour discharge rate.

A novel single-truck electric car is being used on a small Pennsylvania road in which the monitor roof is eliminated, giving the car a very peculiar squat appearance. The advantages gained by eliminating the monitor roof are that more head-room is provided inside the car and the sashes of the windows may be raised much higher than usual. A special ventilating system is provided which does away with the ordinary ventilators of monitor roofs. The truck of the car is peculiar, in that it supports the car body at each end by means of bolsters. The bolsters are made up of heavy elliptical springs which do away with side sway and are stiff enough to prevent the car from lurching and lunging with every little irregularity in the track. The car is equipped with a hydraulic brake. The motorman applies the brake by oscillating a lever back and forth several times to pump water into the brake cylinders. The brakes are released by pressing the lever against a valve.

The following record of the energy of a sal-ammoniac battery has been sent us by the Rev. William F. Rigge, S. J., of Creighton University: Two ordinary sal-ammoniac cells operate an electric dial from a master clock. The cells are quart size. The carbons are cylindrical, with a zinc rod in the middle. Half a pint of loosely-packed powdered sal-ammoniac is supplied to each cell with as much water as the jar will hold. The circuit is closed one second every minute. Under these conditions it was found that the zincs lasted about a year, and the solution required renewal after an average period of two years and two months. The resistance of the dial magnet is 16 ohms, of the line 2 ohms, and of the battery 1 ohm. The electro-motive force of the two cells in series is 3 volts, thus furnishing 3/19 of an ampere. As the circuit was closed one second every minute, the battery was in operation for 24 minutes each day, and for 316 hours in the two years and two months. This would mean an active duration of 13 1/6 days, or nearly two weeks, if the current could be supplied continuously. The life of these sal-ammoniac cells was therefore $316 \times 3/19 =$ very nearly 50 ampere hours.

SCIENCE.

J. Bouma and S. Berend produce a sugar-free milk preparation according to a German patent by precipitating the casein with carbon dioxide in the presence of monosodium phosphate. This salt has an acid reaction, and the product is amphoteric in reaction. Hitherto by precipitation with carbon dioxide it was impossible to produce a neutral preparation; the product was invariably alkaline.

Genuine Jamaica rum can be distinguished from its imitations and all other spirits by means of the absolutely characteristic ingredient which is the chief source of its peculiar odor. This ingredient is not an ester, an aldehyde, or a ketone. It possesses the character of an essential oil and is probably related to the terpenes. Jamaica rum contains a second characteristic ingredient, which smells somewhat like turpentine, but this is less conspicuous than the first, by means of which the chemist can often detect even the adulteration of genuine Jamaica with imitation rum.

From experiments on dogs Faust had concluded that the comparative immunity against morphine which follows from its habitual use, is not due to the tissues becoming accustomed to the drug, but to an increasing capacity of the organism for destroying the poison. This view has recently been confirmed by Rübamen, who showed that immune rats actually do break down the morphine in their system more rapidly than the normal rats. However, it appears that the immunity must be due to two causes: first, as stated above, to an increased capacity for destroying the poison in the system, and secondly, to a cellular immunity, for within the first hour after injection a large amount of the poison still circulates in the body, without affecting the individual.

The Carnegie Institution of Washington has awarded a contract for the construction of a craft for the magnetic survey. She is to be constructed without the use of iron or steel or any other magnetic metal. The purpose of the Institution is to make with her an accurate magnetic study of all the oceans. The propelling engines, machinery, and other parts of metal on the craft will be chiefly bronze. Manganese metal and gun metal will also be employed. Every bolt, nail, bar, and brace in the vessel will be of this material. All the machinery will be of bronze, and the anchors as well. There is some doubt as to whether the crank shaft of the engine can be constructed of bronze. The SCIENTIFIC AMERICAN hopes to publish an exhaustive account of this non-magnetic craft in the coming spring.

The astronomers of antiquity knew how to predict eclipses of the moon, which follow one another in regular succession and are visible at one time to all the inhabitants of one hemisphere. Solar eclipses also occur in regular order; in 223 lunar months there are in general 29 eclipses of the moon and 41 of the sun. But the latter are in each case visible only over a restricted portion of the globe, and their occurrence at any particular point is subject to somewhat complicated laws, with which the ancients were not familiar. From a study of eclipses which occurred in past ages, P. H. Cowell has reached the conclusion that the period of revolution of the earth, in other words the length of the year, has decreased within historical times. This result has been confirmed by Crommelin. The determination of the time of eclipses in the past is a valuable tool in historical research, in fixing the date of important events and epochs. Thus Mr. King has calculated that a total eclipse took place at Babylon in 1062 B. C. Another date thus fixed is October 6, 1241, on which Mr. Crommelin has shown that a total eclipse took place.

When the Japanese army evacuated Manchuria it became necessary to disinfect very rapidly a great number of garments, many of which were made of fur, while the troops were taking a bath preparatory to embarking on the transports, which were to convey them to Japan. The ordinary processes were rejected as too slow and the following expeditious method was substituted, with excellent results: The garments were hung, or placed on racks in rooms, into which steam at the pressure of six atmospheres was forced until the temperature rose to 100 deg. F. At the same time the air of the room was pumped out through an aperture near the floor, in order to produce a lively circulation of steam and a rapid saturation of the garments. After twenty minutes' steaming, a spray of formic aldehyde was thrown into the entering current of steam, and the steaming was continued for ten minutes longer. The walls of the disinfecting rooms were only six or seven feet high, and were so constructed as to minimize loss of heat by conduction. The capacities of the rooms ranged from 1,000 to 1,600 cubic feet. About one fluid ounce of the commercial 40 per cent formol solution was used for each 50 cubic feet of space, the solution being reduced to spray and vapor in about one minute. The efficacy of the process, even when applied to five layers of fabric piled together, was proved by numerous bacteriological tests.