

roads, not a little, it is true, has been written. Nevertheless, it has never been definitely determined at what speeds the electric car is more efficient than the steam locomotive. It will therefore be the object of the engineers in charge of this novel enterprise to collect such accurate data as will enable the future constructor of railways to know what are the motor-efficiencies for various speeds and for various wind-resistances, what must be the power capacity of the central station, and what is the profitable speed limit of the electric car. In the current SUPPLEMENT will be found an exhaustive article by Mr. A. Lasche on the preparations which have been made for the speed trials, and an interesting description of the car to be used.

For American engineers this investigation, which will probably be carried out with characteristic German thoroughness, will be of peculiar importance. The directors of the London Underground Road, despite American protests, have declared themselves strongly in favor of the three-phase system of electrical traction. The Berlin-Zossen road will be operated on a three-phase system, which differs only in the use of transformers on the cars from the system advocated for London. For that reason the results will be looked for with no little interest. If the truth must be told, we know but little of high-tension, polyphase railway systems in the United States. For industrial purposes, it is true, the alternating current of great voltage is now widely employed; but for electric railways we still cling to the direct-current system. The Germans and Austrians have proved, to their own satisfaction at least, that for railways of standard size the three-phase system presents immense advantages over the direct-current method. The Valtellina road, built by an Austrian firm in Italy, certainly proves that in the main the polyphase current is better than the direct current. Whether the Berlin-Zossen trials will furnish convincing proof of the greater efficiency of the three-phase system of electric traction is a question that is of more weight than may at present be appreciated. For its answer may mean the complete abandonment of a system which was invented in America, and the substitution of a distinctly European method of transmitting electrical energy for railways.

PARIS EXHIBITION OF ALCOHOL-CONSUMING DEVICES.

The enormous production of alcohol in France has led M. Jean Dupuy, Minister of Agriculture, to offer a series of prizes for any kind of apparatus or machinery that will open a way for its greater consumption. An exhibition of inventions for the use of alcohol for illuminating or heating purposes or for motor power will be given in Paris in the grand palace of the exposition, Champs Elysées, from November 16 to 24. It is proposed to apply motor power to agricultural implements, under the direction of the Department of Agriculture. The prizes awarded will consist of a series of medals.

The exhibition and experiments will be divided into three classes:

First. Stationary motors; motors for navigation; locomobiles and motors for working pumps; automobiles under 25 horse power; insulated carburetors.

Second. Incandescent lighting, divided in two classes: (1) Apparatus using pure medicated alcohol; (2) apparatus using carbureted alcohol.

Third. Heating apartments; bath houses and hot-houses for flowers; chafing dishes, dish warmers, flat-iron heaters, curling irons, lamps, etc.

The minister does not state whether the citizens of other countries will be permitted to compete for the prizes, but, in any case, the presence of Americans in Paris with their apparatus for the consumption of alcohol would furnish a good opportunity for introducing their goods into the French market.

A recent law has entirely removed from wine and beer the high tax formerly levied upon those drinks when they were brought into a city. One of the means adopted to make up for the deficit caused by the abolition of the gate tax was the imposition of a tax of 220 francs (\$42.46) per hectoliter (26.417 gallons) of alcohol, in place of the old tax of 56 francs (\$10.80) per hectoliter. There is also an additional tax in the cities, according to their population. In Lyons it is 100 francs (\$19.30) per hectoliter, making 250 francs (\$48.25), which goes to the State. Besides this, there is a gate tax in Lyons of 30 francs (\$5.79) per hectoliter, which goes to the municipality, making a tax of 280 francs (\$54) on every hectoliter of alcohol.

It is declared that this new tax on alcohol has caused a diminution of 50 per cent in the consumption of rum, and a smaller falling off in the consumption of other alcoholic liquors. But the output of alcohol augments, and it is contended that the increased volume is the work of fraudulent producers, what we would call "moonshiners," who declare but a small part of what they produce. They are here called "boilers of growths." They have a license from the government to produce alcohol, but their production invariably exceeds the quantity reported and upon which they

pay the tax. The market is in some way or other flooded with medicated and other alcohol, for all of which it is desired to find a means of consumption.

A report on this subject, presented to the French Parliament and published in the *Journal Officiel* two years ago, gave a tabulated statement of the quantity of alcohol produced in France and Germany in 1897. The production in France was reported to be 2,022,000 hectoliters (53,415,174 gallons) of legal alcohol. It stated that the illegal product of the boilers of growths could not even be approximated. For the year 1899, the production for all of France was 2,241,382 hectoliters (59,210,580 gallons). When I applied to the office of the internal-revenue collector, he could only give me data for the two years here mentioned. He assured me that the excess of stock consisted largely of the unreported production of the boilers of growths. Of 250 distilleries, 50 produced nearly the entire quantity reported as given above.

The production of alcohol in Germany in the year 1897 was 3,616,319 hectoliters (95,532,300 gallons), two-thirds of which was derived from potatoes of domestic origin. It was produced in country distilleries, which number about 12,500, of which 5,226 produce only from 10 to 100 hectoliters (264 to 2,642 gallons).

The report submitted to the French Parliament says that France's best customer for sugar, the United States, will soon become an exporter on account of its relation to Cuba, and it therefore urges the enactment of a law that will encourage the manufacture of alcohol as a consumer of the supposed future surplus in the beet crop. The present annual sugar product of France is 850,000 tons, of which the United States buys more than any other country. Should American purchasers fall off, the beets now worked up into sugar would go to increase the output of alcohol, for which there is now no means of consumption in sight. In connection with the projected exhibition, it is observed that alcohol enters but very little into use for lighting, while in Germany it is the great illuminant for parks and public places.

I would suggest to Americans who may attend the coming exhibition that lighting, heating, and cooking apparatus are likely to receive favorable attention here, says United States Consul John C. Covert, of Lyons, where coal is dear and oil pays a high customs duty, as well as freight over 3,000 or 4,000 miles of land and sea. It is possible that a small handy cooking apparatus, heated by alcohol, would fill a want. All over France there are thousands of people who lead an isolated existence in one room, up four or six flights of stairs, who would prepare their first meal of coffee or chocolate and their evening soup on such a contrivance. The national custom, especially among the poor and middle class, is to take these two meals in a cheap restaurant; but customs change, and the effort to introduce new uses for alcohol may be a means of breaking up this habit—above all, if it is in harmony with ideas of strict economy.

END OF THE PAN-AMERICAN.

The Pan-American Exposition ended November 2 at midnight, when President John G. Milburn pressed an electric button and the lights in the electric tower grew dim for the last time. A corps of buglers standing in the tower sounded "taps," and one of the glories of the exposition, the electrical illumination, passed away, and the exposition was ended, says *The New York Times*.

The exposition has not been a financial success, but the benefits derived from it will be of great value to the commercial interests of the country. The primary object of the exposition was to advance the friendly relations and commercial intercourse between the United States and the other countries of the two Americas. In this respect it has been a decided success. The republics of Central and South America, Mexico, and the Dominion of Canada responded heartily to the suggestion of an all-American exposition, and sent to Buffalo a collection of exhibits seldom if ever before equaled.

The financial loss will be in the neighborhood of \$3,000,000. The statement to be issued by the officers of the exposition setting forth the expenditures and receipts will be made public some time this month.

The loss will fall upon the holders of the common stock, the holders of second mortgage bonds, and the contractors who erected the buildings. Two hundred and ten thousand shares of common stock were sold at \$10 a share. The stock was subscribed for by the citizens of Buffalo and the Niagara frontier in small lots of from one share to one hundred, so that this loss of \$2,100,000 will not be seriously felt. The first mortgage bonds amounting to \$2,500,000 will be paid in full. An issue of \$500,000 second mortgage bonds is unprovided for, but the revenue from salvage on the buildings and from other sources will probably cover a part of this indebtedness. The balance due to contractors is not definitely known, but it is said that it represents their profits for the work done and no one will be seriously embarrassed by the loss.

The total number of admissions for the six months was close to 8,000,000. The great snowstorm of last April was a severe blow to the exposition, and the formal opening of the exposition was postponed until May 20. The death of the President was another blow to the Pan-American. The attendance had been increasing steadily up to the date of the assassination of President McKinley. The gates were closed for two days, and when they reopened there was a drop of 12 per cent in the attendance and no improvement followed.

The government exhibit will be at once shipped to Charleston.

PRIZES COVERING OVER \$11,000 FOR A TRACTOR FOR MILITARY PURPOSES.

It is essential that tractors for military purposes should be capable of a much greater radius of action, without the replenishment of fuel or water, than is at present obtained by any engines constructed for either military or commercial purposes. The Secretary of State for War of the British government offers three prizes for the best tractor meeting the requirements. The first prize is 1,000 pounds sterling; the second, 750 pounds sterling; and the third prize, 500 pounds. To each prize will be added a bonus of 10 pounds for every complete mile beyond the minimum of 40 miles. The total amount of this bonus shall not exceed the sum of the particular prize to which it may be added. The trials will be conducted by the War Office Committee on Mechanical Transport, and will commence in the spring of 1903, and the exact nature of the trials will be determined upon by this committee. The general scheme will be drawn up and issued to all competitors. Forms of entry will be supplied on application to the Secretary of Mechanical Transport Committee, War Office, Horse Guards, Whitehall, London, England. Those who intend to enter the competition must send in these forms to the Secretary not later than January, 1903. A full set of drawings giving dimensions and a specification giving complete details, together with a statement of the prize, must be lodged with the Secretary before the commencement of the trials. Any of the competing tractors may be purchased at the price stated by the competitor, and all designs will be considered confidential, and even the tractors which are retained by the government will not prejudice the patent rights. Full details of the qualifications may be obtained of the Secretary.

SCIENCE NOTES.

The new English coin bearing the head of King Edward VII. will shortly be ready for circulation. The designs have been prepared by Mr. G. W. De Saulles of the Royal Mint, a special audience for the accomplishment of which was granted him by the King. There will be but slight alterations from the designs on the existing Victoria coins. The Latin inscription will be the same, the name King Edward the Seventh being substituted for that of Queen Victoria, and such additions carried out as are rendered necessary by the change in the royal title recently sanctioned by Parliament. With respect to the reverse side no alteration will be made on any of the coins, with the exception of the bronze money. In this instance the familiar figure of Britannia will be displayed, but without the ship and lighthouse.

The British Association has made the following grants for scientific purposes: Mathematics and physics: Electrical standards, £40; seismological observations, £30; investigation of the upper atmosphere by means of kites, £75; magnetic observations at Falmouth, £80. Chemistry: Relation between absorption spectra and constitution of organic substances, £20; wave length tables, £5; properties of metals and alloys affected by dissolved gases, £40. Geology: Photographs of geological interest, £5; life zones in British carboniferous rocks, £10; exploration of Irish caves, £45. Zoology: Table at the Zoological Station, Naples, £100; index generum et specierum animalium, £100; migration of birds, £15; structure of coral reefs of Indian region, £50; compound Ascidiens of the Clyde area, £25. Geography: Terrestrial surface waves, £15. Economic Science and Statistics: Legislation regulating women's labor, £30. Mechanical science: Small screw-gage, £20; resistance of road vehicles to traction, £50. Anthropology: Silchester excavation, £5; ethnological survey of Canada, £15; age of stone circles, £30; anthropological teaching, £3; exploration in Crete, £100; anthropometric investigations of native Egyptian soldiers, £15; excavations on the Roman site at Gelligaer, £5. Physiology: Changes in hæmoglobin, £15; work of mammalian heart under influence of drugs, £20. Botany: Investigations of the cyanophycene, £10; the respiration of plants, £15. Educational Science: Reciprocal influence of universities and schools, £5; conditions of health essential to carrying on work in schools, £2. Corresponding societies: Preparation of report, £15. Total, without grant to corresponding societies, £1,000.