

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.

Government Estimate of the Corn Crop.

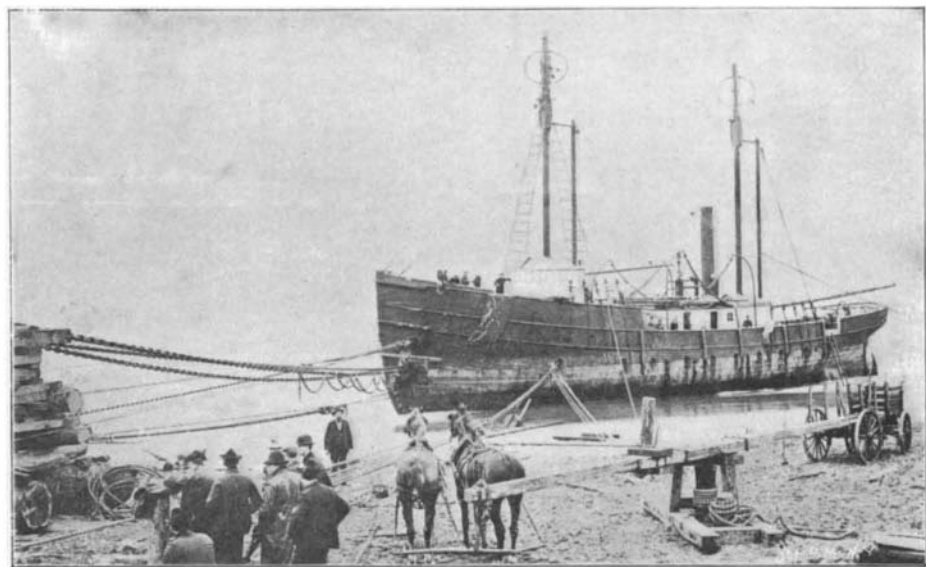
The Agricultural Department at Washington has just issued its estimate of the year's corn crop, showing a total yield for all the States of 1,250,597,000 bushels. Of this the statement shows that Nebraska, notwithstanding the dry weather which prevailed during July, will furnish 103,367,000 bushels, or more than one-tenth of the entire crop. This is interesting as showing the wonderful recuperative properties of the Nebraska soil. There is probably no other State in the Union which would, under the circumstances, make such a magnificent showing. Nebraska is a grand State and is rapidly increasing in wealth and population.

A NOVEL SALVAGE OPERATION.

BY WALDON FAWCETT.

A most noteworthy advance has been made during the past few years in the methods of conducting marine wrecking operations, and no better illustration of this could be afforded than by the recent achievement in raising the Columbia River Lightship from the sands on the beach north of Cape Hancock on the North Pacific coast, where she stranded about two years ago, and the removal of the vessel overland to the waters of Baker's Bay.

The lightship, a composite vessel which was built in 1891 and has a 12-inch steam fog-signal, broke away on November 29, 1899, from her station off the entrance to Columbia River and went ashore near McKenzie Head, Cape Disappointment, Wash., nearly eight miles distant. When the United States Lighthouse Board advertised for bids for getting the vessel off the beach a number of propositions were submitted, including one from a Portland wrecking firm, which proposed to take the vessel overland a distance of more than a third of a mile and launch her in the waters of Baker's Bay on the Columbia River. Owing



COLUMBIA RIVER LIGHTSHIP ON THE BEACH—VIEW SHOWING HAULING TACKLE AND HORSE-POWER WINCH.

to the extreme novelty of this suggestion, and considerable skepticism as to its practicability, the plan was rejected and the salvage work intrusted to wreckers who proposed to take the vessel out to sea.

After prolonged effort it was found impossible to restore the stranded ship to her native element by retracing the route which the craft had followed when coming ashore, and recourse was finally had to the ingenious plan of taking the ponderous hull overland. The difficulties of this undertaking had meanwhile, however, multiplied. Originally the ship lay head on in a position convenient for the commencement of the overland journey, but in the course of the efforts to take the vessel out to sea she was turned nearly broadside with her stern on the beach, and was in this position abandoned. It was necessary, therefore, to first raise the vessel from six or seven feet of sand surrounding her and turn her bow in the direction of the shore ere any genuine progress whatever could be made.

The methods employed were as unique and strikingly original as the general plan itself. A cribwork of logs nearly twenty feet in height was erected, and over this was passed the cables which were fastened to the bow. These chains passed over a rolling log some two and a half feet in diameter on the top of the cribwork. This was done in order to secure a lifting pull upon the bow when the power was applied. In this manner the stranded vessel was dragged a distance of more than forty yards, the bow thus being turned in the proper direction, although it was found that when the bow was finally brought to face the shore the vessel was embedded in the sands to a depth of seven feet at the bow and six feet at the stern. The turning of the vessel also sent her partially over on her beam, so that the deck was at an angle of nearly forty-five degrees.

The first task, therefore, was to straighten the ves-

sel, and this was done by placing large logs on either side, which served as a foundation for the screws with which she was lifted into a vertical position. It was also deemed wise to put chains under the vessel at the bow and stern to still further assist in lifting her out of the sand, and this was accomplished by stretching a chain parallel with the ship on one side, leading it across the bow and attaching it to a capstan capable of pulling seventy tons. Some excavation was necessary in order to get the chain down as far as possible from the surface ere the strain was applied. With the application of the power a steel bar, some thirty feet in length and sharpened chisel-fashion at one end, was utilized to loosen the sand under the keel of the bow, in order to allow the strain to gradually draw the chain under the bow and back to the desired position.

The same method was followed at the stern, and thus the work of placing chains under the vessel was accomplished in a comparatively short time, whereas under any other form of procedure an interval of at least a month would probably have been consumed in the task. The vessel rested upon a plank cradle or sled, as it might perhaps be termed. Each chain was fastened at either end to an immense log supported by a cribbing of timber upon a plank foundation formed by material four by twelve inches in dimension and two and a half feet in thickness. Before introducing the plank foundation the wreckers attempted to use logs, and had succeeded at one time in getting the vessel raised to the desired position and in readiness to start upon the journey to the bay, when a heavy storm came up, washing from under the vessel the logs which had

formed the foundation and allowing her to settle back into her former bed. Another serious inconvenience to the wreckers arose from the fact that much of the sand around the ship was of the nature of quicksand, and when stirred or walked over to any considerable extent became soft and springy, so that during a large portion of the time the men were compelled to work knee-deep in sand and water.

By using screws upon what might be called the temporary platform previously mentioned the wreckers were finally enabled to lift the lightship out of the sands to a height of twelve or thirteen feet and to place under the hull a permanent cradle made of timbers. The formation of this vehicle, in which the ship was to make the journey to her natural element, is of interest. Two timbers, each twenty-five feet in length by twelve by twenty-four inches, were placed under the bow, transversely to the length of the ship and nine feet apart. A similar arrangement was carried out at the stern. On top of these other timbers were laid, extending from the keel and higher up from the side of the vessel, out to substantially the end of the first-mentioned long timbers. These timbers, in turn, were connected by other timbers running parallel with the ship; and under the ends of the long timbers projecting from the sides of the ship were placed oak shoes, two under the end of each timber, some four feet apart, which shoes in turn, when the vessel was

lowered ready for pulling, rested upon oak rollers, which, in turn, rested upon a plank track.

By this arrangement the ship was given four bearings, and it was made possible to haul the craft over an uneven surface and along a crooked route. Heavy cables were put around the vessel's stern, extending

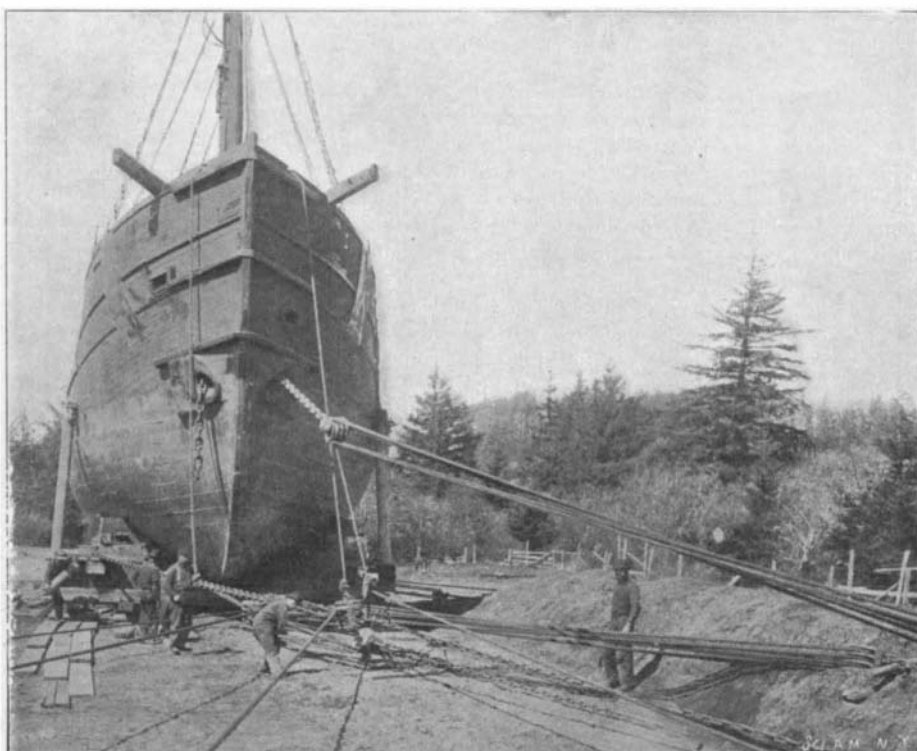


THE ROLLER WAYS ON WHICH THE LIGHTSHIP WAS MOVED.

along her side and through the hawse pipes, and to these were attached the tackle blocks, to which power was applied by means of a capstan operated by horses. In this manner the ship was taken up the beach, over the uneven ground of a peninsula, across a swamp, and finally down a grade to the beach of Baker's Bay. The rate of progress averaged about one hundred and seventy-five feet a day, and the altitude at the highest point traversed is in the neighborhood of thirty-five feet.

Repairs were made upon the vessel at the end of the overland journey, and she was launched in the waters of Baker's Bay upon rollers in the same manner that she crossed the peninsula. This method was adopted by reason of the fact that the water in the bay is shallow for a long distance out from shore, and it was thought that were the craft launched from the usual type of ways, such as are utilized for the first launching of ships, she would be pretty certain to become firmly lodged in the mud, even were the operation conducted at high tide. By the plan adopted she was taken out to a sufficient depth of water to float her without either difficulty or danger.

The foundations of the large extension to the Victoria and Albert Museum, South Kensington, London, have been completed and the work of construction is now being rapidly proceeded with. It is estimated that the building will not be completed for another four years. The late Queen Victoria laid the foundation stone in 1899. The new wing will considerably relieve the cramped condition of the exhibits in the main building. While digging deeply for the foundation of the central tower, a stone of the glacial epoch was discovered, together with a valued assortment of fossil bones, including those of an extinct species of ox, and a fragment of an elephant skeleton. These are all carefully preserved in the Natural History Museum.



BOW VIEW, SHOWING ROLLER WAYS AND HAULING TACKLE.