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THE FIFTY THOUSAND DOLLAR REWARD FOR STREET CAR PROPULSION.

In our paper for December 23, 1893, we gave the text of the offer made by the Metropolitan Traction Company of this city, to pay a reward of fifty thousand dollars to any person who should submit to the New York State Board of Railroad Commissioners, on or before March 1, 1894, an actual working system or motive power for street railway cars, demonstrated to be superior or equal to the overhead trolley, the qualities necessary to meet this requirement to be decided by the Board; but the winning system to approximate in economy of operation to the trolley, and to be free from those features of the trolley that are objectionable to the public.

As a result of this public offer the Traction Company has been overwhelmed with correspondence and with new plans for propelling street cars, insomuch that the Company was obliged to issue a circular letter to applicants, stating that all plans and matters relating to the invention called for should be submitted to the Commissioners at Albany, N. Y.; and we understand the Commissioners have also been overstocked with plans. This is rather remarkable, especially when the brevity of the time allowed to competitors is considered, namely, December to March, three months.

The Board of Commissioners, when they came to consider what form their official action should take in the premises, satisfied themselves they had no lawful power to act to decide upon the plans and make the award.

They, therefore, applied at once to the State Legislature, asking the passage of a law authorizing them to accept and act upon the Traction Company's offer. It is expected the necessary legislation will soon be granted, in which case all plans filed with the Commissioners up to March 1 will be passed upon. The result is looked forward to with much interest by all the competitors. Even if none succeed, if none of the plans are found to meet the conditions required, the stimulus produced by the offer of the reward will not be without value.

Oil Fuel.

An interesting report on the results of using oil fuel at the Chicago Exhibition has been presented to the Standard Oil Company by Mr. Charles F. Foster. This statement avers that the use of oil as fuel has been entirely satisfactory in every particular. During the period the Exhibition remained open, the main boiler plant consumed 10,614,401 gallons, or 74,300,805 pounds of oil for generating steam; developing the aggregate energy of 32,315,964 horse power hours, at a cost of 63 mills per horse power hour. The contract price for the oil delivered in the Exhibition tanks was 72 1/2 cents per barrel of 42 United States standard gallons. The boiler house force and equipment comprised 210 burners, atomizing oil beneath 52 boilers with a standard rating of about 21,000 horse power, and attended by a staff of 42 men divided into three eight hour shifts. The saving in cost of both fuel and labor for the oil fuel, as compared with coal of fair quality at market price for large quantities, is apparent. An equivalent consumption of from 500 to 600 tons of coal per day would have been necessary, so that for the duration of the Exhibition 70,000 tons of coal would have been needed; and Mr. Foster remarks that "it would be difficult to imagine how this vast amount of coal would, in the limited space available, have been handled expeditiously and without endangering life and property."

Dr. Carl Otto Weber states that in the use of liquid fuel Russia appeared to be in advance of all other countries. During the coal strike many Manchester firms had recourse to petroleum as a fuel, but the results in every instance seemed to have been discouraging. In Russia it was only the heavy petroleum residues (astatki) which were used for boilers, railway engines, and similar purposes. Astatki on combustion produced 11,000 cal. as against about 8,000 cal. obtained from first class steam coal. It appeared, therefore, that in this respect 62 pounds of astatki were equal to 100 pounds of coal. By working side by side two

boilers of the same type, firing the one with coal, the other with astatki, it was found that 1 pound of coal evaporated 8 pounds of water and 1 pound of astatki 13 pounds of water. The relation between the volume of air passing into the furnace and the quantity of water evaporated was also important; and it was found that for 1,000 cubic feet of air consumed, coal evaporates 1.5 and astatki 2 pounds of water. Consequently, besides a smaller weight of fuel, also about 20 per cent less heating surface was required for astatki fires. This was apart from the cost of the fuel, an item of considerable importance for marine boilers, as it would allow to reduce their volume very considerably without lessening their steam producing capacity.

The works in and around Moscow used in 1890 about 100,000 tons of astatki at a saving of about 30 per cent as compared with coal. The price of the residue at Moscow is \$25 per ton; at Baku no more than \$2.50.

Florida Oranges.

A correspondent, writing from Marion County, Fla., says:

"The Florida orange crop, it is thought, will be little larger than ever before. It was estimated at from 4,000,000 to 4,500,000 boxes. A storm that prevailed in October over the eastern part of the State has shortened the crop considerably. In some places the estimate of damage was as high as 25 per cent.

"The great hurricane that desolated the Louisiana and Mississippi coasts destroyed most of the Louisiana crop. A company of Florida packers had gone to Louisiana to pack the crop on the Bradish Johnson place, near the mouth of the Mississippi River. The crop on that grove was estimated at from 30,000 to 40,000 boxes. They got off 3,000 boxes before the storm came. It destroyed all that was left on the trees, and blew down several thousand of the trees. Parenthetically, I will say that Florida enjoys a happy immunity from severe storms. Cyclones are unknown and hard winds rare.

"The product of oranges has increased in the last eight years from 600,000 to 4,000,000 boxes, and that amount is about as much as can be marketed at a profit. We know this from the experience of the last two seasons. Production is increasing more rapidly than the demand. Unless some great disaster overtakes the orange groves, it will not be many years before production reaches 10,000,000 boxes. The crop is very fine. There has been no lack of rain this season, and greater pains have been taken to improve the quality of the fruit by more spraying, more fertilizing, and better cultivation. As the groves increase in age and productivity, so, it seems, with greater pace increase the diseases and parasites that infest them. In this way an effectual check to overproduction may result.

"For the blight no remedy has been found. Foot rot is amenable to treatment, but is destroying thousands of trees annually. The scale pursues the even tenor of his way. Checked he may be, but never subdued by treatment. One of my neighbors, who expects to market 30,000 boxes this season, spent this year \$3,000 for kerosene used on his trees."—The Country Gentleman.

Occluded Gases in Coal.

Mr. W. McConnell, of the Durham (England) College of Science, has been studying the gases occluded in the coal found in a number of the collieries in the Durham field. The coal is bituminous and used for gas and steam.

Mr. McConnell put the coal into a glass apparatus which was heated in a bath to a temperature of from 100° to 180°. From this the occluded gases were pumped into a holder and afterward analyzed and measured. From one colliery the coal was found to contain occluded free hydrogen, marsh gas, ethane, and other members of the paraffin series of hydrocarbons as far as pentane. Crushing the coal to powder and subjecting it to a temperature of 180° under reduced pressure, it still retained free oxygen, the higher members of the paraffin series, and a less quantity of olefines in the occluded state. The experiments seem to indicate clearly that coal dust is readily ignited because of its retention of the occluded hydrocarbons.

Theodore Billroth.

The celebrated German surgeon, Dr. Theodore Billroth, died at Abbazia, the Austrian winter resort, of heart disease on February 7. Dr. Billroth was born on the island of Rügen in 1829, and was educated at the universities of Greifswald, Göttingen and Berlin. He rendered distinguished services to the cause of science as professor in the universities of Zurich and Vienna. His most celebrated discoveries were the operation for the extirpation of the larynx, excision of cancer of the stomach, and the treatment of wounded soldiers. Dr. Billroth was very careful in his selection of students, and some of the best surgeons of Germany, Belgium, Austria and America mourn the loss of their great master. A brief biographical notice of Dr. Billroth with a portrait will be found in our SUPPLEMENT 483.

Planet Notes for March.

H. C. WILSON.

Mercury during March will be passing between the earth and the sun, as may be seen from the diagram in our last number, page 71. For the first two or three days the planet will be visible in the evening just after sunset. In order to see it one must look toward the west, just a little above the horizon. On March 14, 2 h. 18 m. A. M., Mercury will be in conjunction with the sun, and after that time it will be morning planet.

Venus will be morning star and rapidly come out from the rays of the sun. She will increase rapidly in brilliancy, so that none can mistake her, greatest brilliancy being attained on the 22d of March. Venus will be in conjunction with the waning moon, 12° 28' north, March 4, at 9 h. 38 m. P. M. central time.

Mars rises about 4 o'clock in the morning, and is at such a southern declination that there will be little opportunity for observation of this planet in northern latitudes during March. It is in the constellation Sagittarius and moving eastward. Mars will be in conjunction with the moon, 4° 44' north, March 1, at 11 h. 20 m. P. M., and again March 30, at 11 h. 38 m. P. M.

Jupiter will be in good position for observation in the early evening. His position, southwest of the Pleiades, is so well known by this time that it needs no mention. His motions during March will be eastward. Jupiter will be in conjunction with the moon, 4° 40' south, March 11, at 2 h. 40 m. P. M.

Saturn rises in the evening and will be in good position for observation after midnight. For the position of this planet in the constellation Virgo see the chart in our last number. Saturn will be in conjunction with the moon, 4° 24' north, March 23, at 3 h. 1 m. A. M.

Uranus is in the constellation Libra, southeast from Saturn (see chart, page 73), and may be observed after midnight. Uranus will be in conjunction with the moon, 3° 39' north, at 6 h. 12 m. P. M., March 24.

Neptune will be in good position for observation during the early evening in March. The position of this planet in Taurus is unchanged from last month.

The asteroid *Juno* is in the constellation Libra, about 5° northeast of the star β . It is making the turn of the loop in its apparent path, and after the middle of the month will move westward.—*Astronomy and Astrophysics.*

The Bengal Lac Industry.

Lac or gum lac is a substance produced in Bengal on the leaves and branches of certain trees by a small insect, the *Coccus ficus*. The trees selected are principally the *Ficus indica*, *Ficus religiosa*, and *Rhamnus Jujuba*. There are three kinds of lac known in commerce, distinguished by the names of stick lac, seed lac, and shellac. Stick lac is the substance in its natural state; it is of a reddish color and incrusts small twigs. When broken off and boiled in water it loses its red color, and is then termed seed lac, and when melted and reduced to the state of thin sheets it is called shellac, which has a yellowish-brown color. The French representative at Calcutta has recently reported upon the present condition of the lac industry. He states that the finest descriptions are found in Assam and Bengal, and that coming from the former is a very important article of trade. Lac from Burma, which is chiefly produced in the upper districts and the Shan States, is sent to Calcutta to be worked up. Burma, it is stated, is in a position to supply endless quantities of lac, as the vast forests there contain so many descriptions of trees well adapted to its development. The districts of the Punjab and Mysore are large producers of lac, which is chiefly used at the place of production, its inferior quality rendering it unfit for exportation. Then come Bengal, Oudh, Seinde, and the Central Provinces, which yield lac. According to quality, it is sent to Calcutta to be melted, or to certain towns of the interior, such as Hyderabad and Mirzapore, for working up into bangles and other articles. There are large numbers of factories in India, but the greater part are of little importance, and only turn out products of very secondary quality. The methods of manufacture vary according to district. Lac dye is used to a very considerable extent in dyeing. It is, however, in connection with furniture making that the largest quantity of lac is used, and this industry has of recent years made considerable progress in the provinces of Seinde and the Punjab. In making the furniture, a very light wood is used, which contains no resin and which can be easily worked. This wood is obtained from a species of poplar tree, and takes the lacquer easily. Lac is also used in making trinkets, such as bangles, rings, and other ornaments, which are worn by the women of the poorer classes. In Burma, it is used in fastening sword blades in their handles, and in certain districts it is used in making whetstones by mixing a portion of powdered lac with three parts of river sand. In hat making, a mixture of lac, mastic pounce, and other resins, dissolved in alcohol, is used to stiffen silk hats, and in lithography lac is used in connection with the preparation of the ink. Mixed with resin and certain coloring material, it makes

sealing wax. Lac also enters into the composition of numerous varnishes. In adding to a solution of lac in alcohol, a yellow clear substance such as gum gutta, saffron, etc., a liquid is obtained which gives to copper and other metals the appearance of gold, while still preserving their brightness. Lac may be adulterated by the addition of resin, and this frequently happens in the case of lac of native preparation, and the proportion of resin sometimes amounts to as much as 25 per cent. Its presence is easily recognized by the smell when a piece of lac is broken between the fingers. The quantity of lac exported in 1892-93 amounted to 125,246 cuts, valued at 7,787,583 rupees. In the preceding year the value amounted to 7,444,460 rupees. The principal customers for lac are first England, and then the United States, Germany, France, Austria, Australia, etc. The exports of lac dye appear to have entirely ceased during the last four years.

Canal Works in 1893.

The year 1893 witnessed the completion of the Corinth Canal, a work which may be said to have been in contemplation for the last 2,400 years. The *Engineer*, London, says surveys and borings were actually made, and the work partially commenced, in the reign of the Emperor Nero. The work remained in abeyance till the success of the Suez Canal led to the scheme assuming a practical shape in 1881; and after overcoming several financial difficulties, the canal was opened for traffic in August last. The length of this canal is only four miles; but the undertaking has been costly, the cutting being principally through rock.

The Manchester Ship Canal was completed during the year, and its opening for traffic was a most notable event. The weather during the year was very favorable to the progress of the works, which were hindered, as in previous years, by interruptions caused by floods and tempests. The principal works completed during the year were those for the deviation of the London and Northwestern and Great Western Railways, the opening of these deviations first for goods traffic and later on for passengers. When this was accomplished there remained the cutting through the site of the old lines. The final completion of this part of the work was considerably delayed by the settlement of the claims of the companies for compensation, which, however, in the end resulted in a favorable award to the canal company, the amount they had to pay being only about one-fourth of that claimed. Several large swing bridges and the swinging aqueduct at Barton were also completed during the year. The other principal works which have been brought to a successful termination are the embankment of the Mersey, near Runcorn, and the underpinning of Runcorn Bridge. At the end of November the water was let into the last section of the canal, and on December 7 the first steamboat passed from the Mersey at Eastham to Manchester. The canal was traversed in 6¼ hours, although there were delays, owing to several of the bridges and the Barton Aqueduct being swung by hydraulic power for the first time. The works were commenced on November 11, 1887, and thus this great undertaking has been completed in the short space of seven years. Meantime, on the lower reach of the canal, business has been rapidly growing, and Saltport, which a year ago hardly had an existence, is now a busy port. From the commencement of 1894, steamers from America will proceed direct to Manchester, and arrangements have been made by different companies for regular traders to Amsterdam, Rotterdam, Antwerp, Dunkirk, Terneuzen, Hamburg, London, Belfast, and other ports.

No further progress appears to have been made for carrying out the Sheffield and South Yorkshire Navigation scheme, and the junction of this system of canals with the Aire and Calder. The scheme, however, is not dead, as a notice has been given by the company of their intention to apply to Parliament for powers to obtain land beyond that which is to be given over by the railway company. The amount to be paid for the existing canals, which is to be determined by the railway commissioners, has not been settled.

The Panama Canal still remains in a state of ruin. An extension of the concession has been obtained from the Colombian government up to October, 1894, and attempts have been made to form a new company to go on with the work, but so far without success. The Nicaragua Canal is also in difficulties. Owing to the state of financial matters in America, it was found impossible to raise money to go on with the work, and in order to protect the works and plant, the Nicaragua Canal Construction Company was placed in charge of a receiver. The company has expended about £800,000 for property, work, labor, and materials, and has, as elsewhere mentioned, recently been reconstructed. The works of the Chignecto Ship Railway Company have been also at a standstill for more than a year, and are going to ruin for want of funds. Over a million of money has been spent, and it is estimated that it will require another half million to complete the railway.

The North Sea Baltic Canal has been making considerable progress, about 5,000 men being employed, one-half of whom are housed in barracks erected by the canal authorities. A large number of the men are

Swiss and Italians, these men being preferred on account of their sober habits. Up to the present time about 100 million cubic yards of earth have been moved. At Holtenau the locks are in working order, and some of the large bridges for carrying the roads and railways over the canal are completed. The estimated cost of this canal is £7,800,000, and it is expected it will be completed in 1894—seven years after its commencement.

Abroad several important works for improving ports and harbors have been completed during the year. At Tunis a new channel has been opened, from the gulf to the town.

At Alexandria a new straight and deep channel has been made to the port.

Several important works for the improvement of the harbor of Bilbao have also been completed; and also at the port of Lido, for improving the navigation to Venice.

In America, the works for connecting Chicago with the Mississippi by means of a canal joining Lake Michigan with the Illinois River are progressing. It is considered that this canal will, for all practical purposes, place the Mississippi cities a thousand miles nearer the Atlantic seaboard, and double the value of the Western lands. The canal on the Canadian side of St. Mary's River, for giving communication between Lakes Huron and Superior, and allowing vessels bound for the St. Lawrence to pass this way instead of through the Sault Ste. Marie Canal, is expected to be completed in July, 1894. This canal is 3,500 ft. long, and will have a lock 900 ft. long, 60 ft. wide, with 19 ft. of water on the sill. The United States at present charge 20 cents per ton on all freight passing through the Sault Ste. Marie Canal and going to any port in the Dominion of Canada, vessels going to the States passing through free. The importance of completing the works, so as to give Canada the control of the great waterway from Lake Superior to the St. Lawrence, is obvious.

At Montreal the works for the improvement of the harbor and the shipping accommodation have made good progress. These consist of a guard pier 1½ miles long, 45 ft. wide at top, and 20 ft. above low water, extending from the abutment of the Victoria Bridge down stream, for the purpose of protecting the harbor from the floods and the ice. This pier will inclose a basin of 250 acres. The material dredged and excavated from the basin is used for the construction of the pier. Inside this harbor extensive wharves are to be erected. The pier will require about a million cubic yards of materials, of which about one-third is already in place. The estimated cost of this work is £624,000, and it is expected that it will take three years to complete.

Florida Sugar Lands.

Mr. S. A. Jones, in an article in the *Tampa Times*, makes some statements in respect to sugar lands in Florida that will surprise those who have been accustomed to think of that State only in connection with oranges and early vegetables. He says that it has been shown by careful surveys that in Florida there are 4,000,000 acres of the richest land in the world, capable of producing from 4,000 to 6,000 pounds of sugar per acre, and that the whole body of this land can be brought under cultivation for \$20,000,000. In his opinion the continuance of the two cents a pound bounty on sugar or a tariff of two cents a pound would insure the reclamation of all this land by private capital and enterprise, or, if both the bounty and tariff are denied, an appropriation of \$20,000,000 by the government would prepare for cultivation an amount of land sufficient to produce four times the amount of sugar at present consumed in this country. This is a surprising statement, but there is no doubt Mr. Jones is sincere in making it.

According to his figures there are now consumed in this country 3,900,000,000 pounds of sugar. The 4,000,000 acres of Florida sugar land would average 4,000 pounds per acre, thus making an annual production of 16,000,000,000 pounds.

In support of what he says, Mr. Jones gives some figures relative to the production of sugar on the plantation of St. Cloud, Fla. It contains 1,000 acres and it averages 4,000 pounds per acre. At this time there is being made on this place 60,000 pounds of sugar every twenty-four hours. It would take a long time to reclaim Florida's sugar lands, but if reclaimed they would, according to Mr. Jones' estimate, produce much more than the entire American consumption at 3 cents a pound, and the profit at that price would be a good one.—*Savannah Morning News.*

Preserve for Binding.

The publishers of the SCIENTIFIC AMERICAN would advise all subscribers to preserve their numbers for binding. One year's issue (52 numbers) contains over 800 pages of illustrations and reading matter. The practical receipts and information contained in the Notes and Queries columns alone make the numbers worth preserving. Persons whose subscriptions have commenced since the beginning of this year can have the back numbers sent them on signifying such wish. Their subscriptions will then expire with the year.