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NEW YORK, SATURDAY, JANUARY 27, 1900.

A NEW ERA IN CITY TRANSPORTATION.

The gentlemen comprising the Board of Rapid Transit Commissioners of the city of New York have at length achieved the formidable task of devising a suitable plan of rapid transit and securing a contractor who was able and willing to undertake the construction for a sum that would not exceed the constitutional limit of the city's indebtedness.

The amount of the successful bid, $35,000,000, is a vindication of the estimates of William B. Parsons, the chief engineer of the commission, whose estimate of $35,000,000 was made before the present rise in the price of steel and the passage of the eight-hour labor law,—modifying factors which must have entered largely into the estimates of the successful bidder.

The fact that the road is to be built by John B. McDonald has given general satisfaction, mainly for the reason that he has already had wide experience in the construction of heavy engineering works which are more or less of the character of the Rapid Transit Tunnel. He constructed the celebrated Belt Line Tunnel in Baltimore, and is now engaged in building to the north of this city the large artificial basin known as Jerome Park Reservoir, a task involving the excavation of over six million cubic yards of material, of which the greater proportion is rock. It is the intention of the contractor to sublet the tunnel in several sections and open up work simultaneously along the whole length of the line. If this is done, we see no reason why the contract, great as it is, should not be completed in the estimated time of three years.

When the road is opened, New York city will possess an entirely new system of transportation, with a capacity second only to that of the elevated roads, and superior to all existing systems in the number and speed of its express trains. It will furnish an essentially long-distance service, the bulk of its trains making stops only at the more important stations. It will thus assist in effecting a much needed separation of the enormous volume of passenger traffic that flows up and down Manhattan Island into two distinct classes—the short-distance and the long-distance, the former gravitating to the local trains of the elevated roads and to the surface trolley roads, and the latter to the elevated express trains and to the rapid transit tunnel.

Starting with a loop at the City Hall Park, the first seven miles of the tunnel will contain four tracks—two for express and two for local trains. This portion will lie either beneath or close to the main arteries of street traffic, following the route of Elm Street, Fourth Avenue, Forty-second Street, and Broadway to One Hundred and Fourth Street, where the system will divide into two two-track lines. One of these will bear to the right beneath the northwest corner of Central Park, and will extend beneath Lenox Avenue and the Harlem River to Westchester Avenue and the Bronx Park. The other will be carried beneath Eleventh Avenue and by way of the Kingsbridge Road to a terminus on the Harlem River near Spuyten Duyvil.

The route as thus laid out and forthwith to be built will be extended, no doubt, in the near future. As it stands, the most serious defect is that it stops short of the important section of the city lying between the City Hall and the Battery. The original plans of the commission contemplated a terminus at the latter place; but the bitter opposition of the owners of property in lower Broadway, coupled with the desire of the commission to keep the estimated cost within the debt limit of the city, led to the abandonment of this important section of the original plans. We think that steps should be taken at once looking to the construction of this portion of the tunnel, the removal of the loop from the City Hall Park to the Battery, and the ultimate extension of the road to Brooklyn by means of a tunnel beneath the East River.

The outlook for future transportation facilities in this city is certainly very bright. By the time the tunnel is completed the elevated roads will be electrically operated, and the main lines of the Metropolitan and Third Avenue surface roads will be similarly equipped. To this must be added the undoubted effect of the large service of automobile cabs and buses that is promised in the near future.

THE AGRICULTURAL OUTLOOK IN PUERTO RICO.

At present very little in the way of plant products is exported from Puerto Rico outside of coffee, sugar, and tobacco. All other crops are considered unworthy of the serious attention of the planters, their cultivation being generally left to the desultory efforts of the most ignorant of the population. There has been little attempt at the improvement of varieties, either by selection or by the introduction of superior seed. Much of the fruit and vegetables sold is of a very inferior quality, quite unsuitable for export. Notwithstanding the numerous books and magazine articles which have been published, there is very little definite information available concerning the agricultural conditions and economic plants of that island.

It having been decided that our Department of Agriculture should assist the more enterprising farmers, both Americans and Puerto Ricans, in experiments, which many of them have already undertaken, in order to find out what new crops suitable for our markets can be grown there, Mr. O. F. Cook was sent, as a Special Agent, by Secretary Wilson to ascertain what species and varieties are now to be found there, in order that the department might be able to secure others likely to be of use in improving and extending the agricultural industries. Mr. Cook has just made his preliminary report.

We are paying over $200,000,000 for tropical plant products, a large part of which could be furnished by Puerto Rico and the Philippines. For bananas, for instance, we paid in 1898 over $5,500,000, mostly to Jamaica and Central America. In Puerto Rico the banana has scarcely been considered as an article of export. It has been planted principally for shade in the coffee plantations, and is of unsalable quality. The variety almost exclusively imported into the United States is not generally cultivated. As the conditions for commercial banana growing are very favorable, it may be expected that attempts in this direction will soon be made.

The soil and climatic conditions are exceedingly diverse; it is probable that a wide range of products can be secured, at least for local consumption. Oranges, limes, and other citrus fruits, European grapes, and other semi-tropical fruits and vegetables can be produced in the drier parts of the island; while from the moister parts vanilla, cacao, mangoes, and other more strictly tropical plants can be exported. In the meantime it is of great importance that the existing industries be improved. Sugar lands are receiving attention from American capitalists, and large modern factories are being built. Coffee, the chief product of the island, is perhaps that in which the greatest expansion is possible. Over $13,000,000 worth of coffee has been exported in a single season from Puerto Rico in spite of methods of cultivation of the most primitive character. Instead of seedlings grown in nurseries, those which spring up by chance, already weak and spindling, are used. This, together with the overcrowding and lack of proper care, brings the average crop down to one-third or less of what might be obtained through better methods. There is a large amount of land suitable for coffee culture, not now planted. If this industry were properly developed, Puerto Rico might supply quite half of the enormous quantity consumed by the United States, our imports in 1898 being valued at over $65,000,000.

The fact that Puerto Rico contains no large unoccupied areas has led some observers to represent the entire island as thickly populated. This is not the case; while a large part of the available land has been at some time under cultivation, there are many districts in which not more than 10 per cent of it is now in use, except for stock raising, which may properly be called the most popular agricultural industry at the present time. For men without capital or experience in the industries of tropical countries, there are no openings in Puerto Rico. Puerto Rico is unique among the West Indies in the possession of a large white population capable of furnishing labor for carrying out local improvements and of taking part in advancing civilization. This is because of the delightful climate, where the European can live, work, and thrive. A more advantageous point of contact with the tropics could scarcely have been selected.

"TIME IS MONEY."

The meetings held in connection with the recent International Commercial Congress at Philadelphia, dealt very freely with the questions of the methods employed by manufacturers in Europe and in the United States, and one of the most practical and useful among the many papers bearing more or less directly on this question was read by Mr. W. C. Barker, of New York. While it is impossible to review at any length the whole paper, we draw attention to an important distinction made by Mr. Barker between American and European methods in striving to arrive at the same ultimate economy. It seemed to the speaker, as the result of his observations abroad, that the European manufacturers lay it down as a cardinal principle that "time" is of no value, sacrificing "time" to save outlay in new and improved plant. They employ old machines, tools, etc., and speed their machines to suit the movement of the poorly paid workmen. The American manufacturers proceed on the principle that "time is money," and, therefore, they spend money freely to save time. They do not hesitate to buy the most improved machines to replace their existing plant from time to time, and they speed up their machines so as to turn out the greatest possible amount of work, and employ the best men that money can buy to operate them.

As a concrete illustration of these two diverse methods, the speaker told of a visit he made to a large manufactory of agricultural machinery in Europe, where he saw "the old single-spindle boring machinery and the single-chisel mortise, boring one hole and cutting one side of a mortise at a time." The manager of the works was "greatly surprised to learn that American manufacturers used gang boring-machines, boring all parallel holes through a piece at one movement, and gang mortisers cutting all parallel mortises at one stroke." In the floor room of the same factory he found them using a rope and pulley attached to a drop-hammer running in upright guides, the machine being worked by hauling the hammer up by hand and allowing it to fall. This was their trip-hammer. The statement that in America power hammers were used, striking 100 to 150 blows per minute, produced positive astonishment.

At the same time the manager of the works seems to have been perfectly well aware of the true key to the difference between methods in the old and in the new worlds, attributing the conservatism of the European manufacturer and his workmen to the influence of tradition and environment, whereas the invention and mechanical genius of the average American was considered to be the outcome of the fact that his ancestors found themselves surrounded with new conditions that required new methods of thought and action, while "their descendants have each kept on thinking out new ways and methods of doing things ever since."

A WISE DECISION.

At the last meeting of the Naval Board of Construction the various plans which have been drawn up for the armament of the new battleships of the "New Jersey" type were under consideration, and the main question debated was that of the installation on these ships of the double-decked or superposed turret. The SCIENTIFIC AMERICAN has always urged the wisdom of awaiting the results of the forthcoming gunnery trials of the "Kearsarge" and "Kentucky," both of which carry the superposed turrets, before deciding to use this much debated form of construction on the new battleships. We are glad to note that at the meeting referred to it was decided to await the tests of the "Kearsarge," and only adopt the double-decked turret in case the results were satisfactory.

Of the several alternative plans for distributing the armament of the new ships presented by Rear-Admiral O'Neil, most of which have been described in this journal, it was decided to adopt that one known as type A, which was illustrated in the SCIENTIFIC AMERICAN of September 9, 1899; this plan of armament to be followed only in the event of the tests of the "Kearsarge" being unsatisfactory. The type A scheme of redistribution removes the 8-inch guns from the 13-inch turrets and places them in two turrets amidship, one on either beam. The secondary battery consists of ten 6-inch rifles in broadside on the main deck and four 6-inch rifles on the superstructure.

COMPARATIVE COST OF HORSE AND AUTOMOBILE.

A village resident in one of the English counties has communicated to a local journal an estimate of the relative cost of keeping an automobile and horse and carriage. He arrives at an economy in favor of the motor of $47.75 on the total expenses for the year, and he does it thuswise: The cost of the horse is $115, and of the dog-cart $135; the interest on which outlay, at 4½ per cent for one year, is $11.25; the keep of the horse, at $2.50 a week (it must be remembered that these prices are for keep in a country village), and license and shoeing, bring up the total expense for the year to $159. This he compares with a five-horse power automobile costing $850, the interest on which, at 4½ per cent for the year, is $38.25. Adding to this a tax of $21 and expense of $52 for fuel (petrol in this case), at the rate of 75 cents for 35 miles, and 25 cents for the same distance for lubrication, he reaches a total annual expense of $111.25.

It will be noticed that in the above estimate there is no repairs account, an item which we think the average unskilled automobilist of the future will find to be, perhaps, the most serious of all, outside of fuel. In this case, however, the automobilist was something of a mechanic, possessing a lathe, a vise, etc., and he was equal to making all ordinary repairs himself; moreover, he argues that in any case the accidents that

may happen to a horse, and the more or less frequent visits of the veterinary, will fairly well offset repairs to the automobile.

Just here we would suggest that in view of the fact that the mechanism of the automobile is necessarily complex, and in many forms of motor susceptible to easy disarrangement, it would be well for all intending purchasers to acquire some elementary knowledge of the simpler tools of the mechanic; and we think it is not unlikely that the coming rage for automobilism, which, unlike that for the bicycle, will prove to be lasting, will give an added impetus to the study of practical mechanics in our schools and colleges. In any case the business of automobile repairing will be one of the most important and profitable of the new industries of the future.

INJECTION OF WOOD.

According to the Russian savant, M. Philopoff, the product used for the injection of wood should fulfill the following conditions: It should be an energetic antiseptic and should not cause a deterioration of the wood. It should be easily injected, fixing itself in the pores of the wood, so that it will not be driven out by humidity. It should form in the wood stable chemical compounds, and should be dialyzable, so as to easily penetrate the tissues. A great number of substances have been proposed for the injection of wood, but none of these have as yet responded completely to the above conditions and given results which are entirely satisfactory. Naphtha, among others, has not realized the hopes which were expected. It does not penetrate the wood entirely, however great the pressure, and besides it has been demonstrated that it does not prevent the development of the bacillus amylobacter. A number of Russian chemists have experimented in this direction, as naphtha and its derivatives are abundant in the petroleum regions of the Caucasus. One of these, M. Karitchkoff, appears to have arrived at a solution of the problem by using the organic acids which are found in the crude naphtha, and which, after the rectification of petroleum by caustic soda, remain in combination with the latter, forming various salts of these acids. It has been found that these substances act as a powerful preservative of wood against putrefaction. In 1862, in fact, Wagner had observed the antiseptic nature of several of the fatty acids and made experiments with oleate of aluminium, of copper, etc., for the preservation of wood. In these he was quite successful, but the cost of the method prevented it from coming into practical use. The process of M. Karitchkoff has been received with favor, as the price of the acids derived from naphtha is very low. They may be considered as deriving from the hydrocarbons of the naphthene group, and are yellow, oily liquids, insoluble in water, and form acid or neutral salts. Of these, the acid salts and the neutral salts of the heavy metals are soluble in hydrocarbon liquids. The experimenter has studied in detail the antiseptic properties of these products, and from certain observations concludes that the acids are more powerful than the salts. Of the latter, the copper salts are the most energetic. In experiments upon organisms which attack the wood and cause decomposition, such as the polyporus sulfureus, the injected pieces of wood, kept in water, were still intact at the end of eight months, while the samples not injected were attacked by the parasites in a few days. Thus their antiseptic properties are beyond question. But as the pure acids do not fix so well in the wood, the use of the salts is, on the whole, preferable. The copper salt may be prepared in two different operations; first, by the reaction of the organic acid upon pieces of the metal, or, secondly, by double decomposition of the sodium salt with copper sulphate; the latter process is the most rapid.

It remained, however, to find a solvent for the naphthenic salts, as they are insoluble in water. The experimenter has found a good solvent in another product of the distillation of naphtha, namely, ligroine; this product dissolves easily the naphthenic acid and salts. Its great inflammability is the only objection to its use. The operation of injecting railroad ties, as carried out by M. Karitchkoff, is as follows: The ties are dried in special driers, then the injection is made in cylinders adapted for the purpose. As the ligroine penetrates easily, a pressure of four atmospheres is sufficient. The solvent is then eliminated by evaporation in a current of hot air. Each tie requires about 1½ pounds of antiseptic, and the cost of injecting a tie is estimated at $0.10.

THE PAN-AMERICAN EXPOSITION OF 1901.

It is now eighteen months before the Pan-American Exposition at Buffalo will open its gates to the coming flow of visitors, and all will surely be surprised to see what has been accomplished in so short a time. Within a few months the Pan-American Exposition Company has secured large appropriations and subscriptions, which have enabled the fair to be put upon a solid basis. New York State has appropriated $800,000. It is now assured that the countries of South and Central America will make large appropriations and will erect splendid buildings. It was first proposed to have the Exposition in 1899, but the Spanish-American war caused a change in plan, with the result that the whole scheme has greatly broadened and increased. The selected tract of land which the buildings will occupy embraces about 335 acres of the finest section of the city, 180 acres being the show portion of Delaware Park, the handsomest subdivision of Buffalo's very complete and handsome park system. To reach this ideal spot it is necessary to traverse the finest residential section of the city, which is noted far and wide for the beauty of its homes and the magnificence of its avenues and boulevards. Some idea of what is being done can be obtained by reference to the current number of the SUPPLEMENT, which contains four large illustrations showing Machinery and Transportation, Graphic Arts and Forestry Buildings, and also the Plaza. For architectural splendor it will bear favorable comparison with the Chicago Exposition of 1893.

THE RISKS OF WAR.

England's losses in South Africa are large compared with very recent wars, because there has been no great struggle between two civilized nations since the Franco-German war, and in fighting with half civilized peoples the percentages of loss have invariably been all one way—in favor of the modern equipped armies. Even in our short war with Spain, which was not a stubbornly-contested conflict, the importance of modern military tactics and scientific inventions could not be fairly estimated. The equipment of the English army with all modern destructive agencies to meet a stubborn foe almost equally well provided with powerful weapons will furnish sufficient data for some very interesting military literature when the battles have all been fought.

The risks of war have never been quite so great as the inventors of the weapons would lead us to believe. The climate in many wars has been a far greater enemy than the bullets and cold steel of the soldiers. Recent statistics show that the number of our soldiers killed in battle in the Philippines in the last four months of the old year was only 361, and the number who died from wounds and accidents 200, while those who died of disease were 762. In the Cuban campaign the deadly work of the climate was even more effective in its results. The large life insurance companies recognize the risks of the climate as equal to those of exposure to the bullets of the enemy, and special clauses are attached to many policies which specify that officers sent to Cuba or the Philippine Islands must have their policies reconsidered, and an extra fee paid.

An interesting item of fact is gleaned from the Crimean war literature, that is further verified by some of the naval battles of our recent war. The Russian forces fired 45,000,000 rounds of shots and killed 48,000 men, or one soldier to every 910 shots fired. It was estimated that only a few shots in every hundred of our naval guns hit the mark, and this fact was used as an argument in favor of discarding the heavier guns and substituting smaller and rapid-firing guns.

Since the Crimean war the rapid-firing guns have greatly increased the efficiency of the artillery and infantry, and the number of shots that can be fired in a given time has multiplied several times over. But the number of fatal wounds inflicted by the modern small bullets has decreased. In the Cuban war about 99 out of every 118 American soldiers shot made complete recoveries. The employment of the modern high-power rifles with their small bullets tends to put more soldiers out of the fight temporarily, but actually decreases the mortality. A queer aspect of the investigation was that a majority of the bullets found lodgment, not in the trunk of the body, but in the arms, legs, and head. The proportion in the Spanish-American war was forty in the legs, thirty in the arms, twenty in the body, and ten in the head and neck, out of every hundred bullets that hit a human target.

The percentages of loss in the South African battles have not been very great, as statistics tend to show. In the fierce battles of the War of the Rebellion the percentage of loss of either side approached in some instances one-half the total strength of the contending armies. General Hancock's loss at Fredericksburg was estimated at about 50 per cent, General Longstreet's at Gaines Mill at 50 per cent, and in some half a hundred other battles the percentage of loss ranged between 16 and 18 per cent. Few battles in the world's history can show heavier losses or more stubbornly contested conflicts than the leading engagements of the Rebellion. Even at famous Balaklava the immortalized Light Brigade lost only 37 per cent, and at Metz the famous Gardeschützen lost 46 per cent. Even in the loss of officers the English in South Africa have not made new history. In the Franco-German war, the Germans lost at Spicheren, when they had stormed the French positions, 223 officers and 4,871 men. In the Peninsular war, at the siege of Ciudad Rodrigo, the loss in one desperate charge was 1,200 men and 90 officers, and when the British assaulted Badajoz over 60 officers were lost and a large number wounded, out of a total fighting force of 18,000. At San Sebastian the British lost in the final assault on the fortress 1,716 men and officers, the latter numbering over 150. In one battalion at Salamanca 24 officers were killed and wounded, leaving only three officers untouched by the bullets of the enemy after the fight.

DEATH OF PROFESSOR EGLESTON.

Thomas Egleston, LL.D., founder of the School of Mines of Columbia University, and for thirty-three years professor of mineralogy and metallurgy in this school, died January 15, at his residence in New York city. He came of New England stock, and was born in 1832. He graduated from Yale University in 1854, after taking a course in chemistry. He then went abroad and studied geology and chemistry in Paris, and graduated from the French School of Mines with honor in 1860. In 1861 he returned to the United States, and was appointed director of the mineralogical collections and laboratory at the Smithsonian Institution, Washington. There was at that time no institution in the country in which mining and metallurgy was taught as a main subject. He aroused the interest of the president of Columbia College, and a short time afterward the school was started in the old college building in Forty-ninth Street, Mr. Egleston being made professor.

The influence of the school has been felt in all parts of the country and it is one of the best scientific schools of the world. He was also one of the founders of the American Institute of Mining Engineers, and was one of its presidents. He was a member of many learned societies and has occupied important positions of trust. He was an officer of the French Legion of Honor. He was a prolific writer upon his chosen specialty, and he withdrew from the active work of the school some two years ago. He was held in high esteem by his old students, and we are sure there will be much grief experienced over his death.

POSSIBLE FEDERAL PROTECTION OF BIRDS.

Senator Hoar of Massachusetts has introduced a bill into the Senate of the United States, which, if it becomes a law, will prohibit the importation into the United States of birds, feathers or parts of birds for ornamental purposes, but birds for food and for museums, zoological gardens or scientific collections, are permitted to be imported, as well as living birds, whose feathers can be removed, or feathers taken from living birds, without injury to the same. The second section of the bill provides that there shall be no transportation of birds, feathers or parts of birds to be used or sold except as mentioned in the first section of the act from any State or Territory of the United States, to or through any State or Territory of the United States. The bill in many respects is a good one. The destruction of birds solely in order to procure their feathers for ornamental purposes has become so great that if it continues many years longer at the rate at which it is now going on, many of the species will soon become extinct. There are some weak features in the bill, as, for instance, the non-importation into the country of feathers, wings, etc., for ornamental purposes, even when they are obtained from game birds, which are killed each year by the million for food. When birds are killed for food, there is certainly no objection to utilizing the feathers, and there should be no reason why they cannot be legally sold.

TRAVEL TO PARIS.

The Paris Exposition is only a few months away and orders for transportation are pouring into the steamship companies in great volume. If the war in South Africa is not terminated within a very short time, it will seriously affect the passenger capacity of several of the principal lines, and the result will be that the facilities for trans-Atlantic travel will be totally inadequate to the demands which will be made upon it. The approximate monthly capacity of eight principal lines running to New York is 23,200. This amount would be larger if so many boats had not been taken away for use as transports. The Cunard line now has six of its steamers in the service, and the White Star line has three. One line has arranged with a large number of Paris hotels for special rates and will sell tickets at the New York office, including transportation to and from Paris, hotel expenses and admission to the grounds. The extra price will be about $30 per week, which includes an adequate number of admissions to the Exposition.

CIVIL ENGINEERS IN SESSION.

The Forty-seventh Annual Meeting of the American Society of Civil Engineers began January 17 at the building of the Society. After a business meeting the members listened to a lecture by Mr. William Barclay Parsons on the surveys he recently made in the Province of Hunan, China. In the evening a reception for the members and their families was held, and the next day the members of the Society took a trip around Manhattan Island, visiting the new power stations, the new viaduct over the Manhattan valley, the New York Central Railroad bridge and other points of interest. John Finley Wallace, of Chicago, was elected president; Rudolph Hering, vice-president.