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## RECONSTRUCTION OF NEW YORK STREET RAILWAYS.

In view of the deadlock which has occurred in the matter of providing New York city with a system of underground rapid transit, it is satisfactory to note the remarkable energy and ability with which the Metropolitan Street Railway Company is improving the vast network of surface railways which is included in its system. It is largely and almost entirely owing to the enterprise of this company that the New York traveling public has been able to travel to and fro on Manhattan Island with any approach to comfort or dispatch, at least during the past few years of the city's growth. In proof of this we merely to consider what would be the present state of the transportation problem if those six great arteries of travel, Second Avenue, Lexington Avenue, Madison Avenue, Fourth Avenue, Sixth Avenue, and Eighth Avenue, were still served by the tedious horse car. It is safe to say that the Broadway cable line would have had to face an actual deadlock and that the elevated roads would have been congested to a degree that would have rendered travel upon them well nigh intolerable.

The system of the Metropolitan Street Railway Company has grown to its present proportions in the brief space of a dozen years, the expansion dating from the time when the first of the many smaller lines were added to the original Broadway road. At present the system includes 228½ miles of road of all kinds, of which, when the present changes are completed, about 90 miles will be mechanically operated.

The peculiar shape of New York city, which stretches out over an island 13 miles in length by only 1½ to 2 miles in width, renders the transportation problem peculiarly difficult. The business portion of the city lies at the southern end and the residence districts are located in the center and the northern half of the island. As a consequence the travel to the business portion gathers volume as it moves "down town," in the morning, converging toward the main thoroughfare known as Broadway. As Broadway was a cable road and the adjacent and parallel lines were operated by horse cars, the bulk of the travel sought the former road. To meet the demand the headway of the cable cars was reduced in the lower part of the city until in 1895 it was only six seconds. In order to relieve Broadway and confine the east and west side traffic to its proper avenues, the company last year abolished the horse car from Second, Fourth, and Madison Avenues, and installed in its place the underground trolley system, and this year a similar change is being carried out on Sixth and Eighth Avenues, while at the same time electric conduits are being laid on Broadway and the necessary equipment put in for the electric operation of this road.

When these improvements are completed, there will be over fifty miles of road under electric operation. With improved transportation on the parallel roads there will be no tendency on the part of the public to flock to the Broadway line. Instead of the down town traffic concentrating upon Broadway at Twenty-third Street, the Second and Fourth Avenue lines now tap the main thoroughfare at the Post Office and Astor Place, and the Sixth and Eighth Avenue lines make connection at the City Hall Park and Canal Street. The effect upon the Broadway road and the elevated roads (as far as the traveling public is concerned) has been excellent. While the overcrowding is still at certain hours of the day excessive, it is not nearly so marked as it was two years ago, and when the Sixth and Eighth Avenue improvements are completed, the improvements will be yet more marked.

Looked at from the engineering standpoint, the work of reconstruction now nearing completion on these two thoroughfares is of the highest merit, both for the magnitude of the work and the speed with which the change was accomplished without materially interfering with the city's traffic. The work to be done included the taking up and removal of fourteen miles of double track in two of the busiest thoroughfares in the world, replacing them with the heavy 107-pound rails, yokes, and equipment of the underground trol-

ley system, and making the necessary changes in the various systems of electric light, telephone and telegraph subways, and in the gas and water pipes and sewers of the city. It was decided to do the work by paid labor under the company's engineers, in place of letting the work, as before, by contract. The old material taken out and the new material to be put in were distributed in the side streets, street crossings were boarded over (the work being done under cover), and every care was taken to interfere as little as possible with the city traffic. The vast array of mechanics and laborers was distributed along the works, and a simultaneous attack commenced at all points. In a few months, and with remarkably little interruption to traffic (considering the magnitude of the work), the change has been made. The cars ceased running on July 21, and the electric cars will be running on both roads by November 1 of this year.

The work of reconstruction has involved the removal of 3,600,000 cubic feet of earth and 1,130,000 superficial feet of paving. In each mile of the new track 275,962 separate pieces had to be handled and fastened in place, and the completed structure contains 50,000 cubic yards of concrete and a total weight of 8,500,000 tons of material. In the first two months of reconstruction 6,287 men and 460 carts were employed daily on the work, and latterly the force was increased to 812 carts and 9,000 men.

It will interest the public to know that this system of roads alone took in last year 60 per cent as many fares as all the combined steam railroads of the United States, that is to say, over half as many fares were taken in on 228½ miles as on 180,000 miles. This comparison surely establishes the claim of New York city that its street railway traffic is the densest in the world. The introduction of the transfer system reduced the car fare per passenger in 1887-88, when 1,996,871 transfers were issued, from 5 cents to 4.75 cents, and in 1897-98, when 90,000,000 transfers were given out, the average car fare was reduced to 3.48 cents, and for this sum a passenger, if he is so disposed, can make a continuous trip of over 20 miles.

The managers of this system are well disposed toward the proposed underground rapid transit scheme, as they consider that its construction would increase their own receipts by relieving their cars of the long-distance travel and leaving them to take care of the short-distance passengers. It is more profitable to carry three separate passengers for three trips of three miles each than to carry one passenger for the whole nine miles, and it is considered that the tunnel road would secure chiefly the long-distance travel.

This is the proper view to take of the proposed underground road, and the relief which it will afford to every form of transportation in the city will be in the nature of a surprise when the road is eventually built.

## A NEW PROFESSION FOR YOUNG MEN.

The search for foreign markets may be justly said to have developed in recent times into an exact, specialized science, in which not only individual exporters and associations, but expert government commissions, elaborately organized, equipped and maintained, each play with constant increasing efficiency their co-ordinate roles. The United States has now reached a position which recognizes the usefulness of the export associations and bureaus of information, though the complaint is made sometimes that these organizations are too much in the hands of theorists and unsuccessful men. Some of the European nations have now advanced further in the science of export than we have, and have called into service an expert commission, organized for a specific inquiry, and sent out under government authority to gather precise technical information for the education of the manufacturers and merchants in special lines of production and trade. The efforts of Germany and France in this direction have established new systems to which the attention of American manufacturers and exporters cannot be too soon and too seriously directed. The German Export Commission was sent out February, 1896, to study the markets of China, Korea, and Japan, and returned after a year of thorough and carefully systematized work, bringing a vast collection of not only the art products or other merchandise ordinarily exported from those countries, but also of ordinary textile and other goods made in those countries for the use of their own people or for export to neighboring countries and in the production of which it is thought that German manufacturers, equipped with exact information as to size, quality, price, and extent of demand, might be able to compete. Neither the samples nor special reports made by the commission have been, or probably will be, made public, as they were obtained solely for the benefit of the German manufacturers. The samples were arranged in a suite of rooms at the Palace of the Imperial Diet, Berlin. Admission was only granted by card and had "to be obtained from a discreet official," says Consul-General F. H. Mason, of Frankfurt. The collection was subsequently broken up or distributed at points where similar goods were or could be made in Germany, as for example at Cre-

feld, where the textile samples are in the possession of the Chamber of Commerce. The reports have not been printed as yet, and if they are, they will probably be reserved for confidential distribution among the German manufacturers and merchants who are specially interested in knowing the wants of these Eastern peoples, their ability to purchase goods to meet those wants and the prices they are able to pay for them.

Similarly in France, the commercial commission sent out by the Chambers of Commerce of five manufacturing cities, Marseilles, Roubaix, Lille, Bordeaux, and Lyons, has returned after an absence of nearly two years, and has presented its collection and reports to the Chambers of Commerce directly interested. Although none of these technical reports have yet been, or probably will be, published, it is known that they number more than one hundred, each prepared by an expert committee or individual. The general conclusion reached by the commission is that France's export trade with China, Tonkin, etc., has opened up a great future, provided the manufacturing exporters will make the best use of the specialized information that is now placed in their hands. While the direct and immediate fruits of these well designed and scientific quests for foreign markets will naturally, and justly so, fall to the lot of Germany and France, which organized the expeditions, still there are certain general facts and propositions which are suggested by these proceedings which, if rightly interpreted, may be of value to the exporters of the United States, who, as a class, have much to learn of the science of the export trade.

There is in all the specialized work of the commissions a broad recognition of the fact that in foreign trade it is the buyer, not the seller, who determines the kind of article he wants and the form in which he wants it turned out, labeled, and packed for shipment to him. It is the business of the seller not to force upon the consumer something he has never heard of and does not want, but to ascertain exactly what he has used and what has been sold to him hitherto, and then furnish him with something of the same kind—but better for his money—than he has ever had before. After this has been achieved, there may possibly be some field for the introduction of a new variety of goods and the gradual education of the consumer. At present the Germans are perhaps the ablest masters of this theory of the export trade, and the English are thought to have lost much for want of it, and America will undoubtedly excel in it when once manufacturers realize its importance.

Secondly, the goods must, as a principle, be sold not at home, but abroad. The seller must go to the buyer with samples, prices, and conditions which the latter can see and readily understand. Museums or other collections for sample merchandise are useful as far as they go, but they cannot attract more than a limited number of buyers to the United States, especially while other countries are sending merchants to the spot with a stock of goods, duty paid, and furnish salesmen to show and explain them. The need of our export trade is a class of competent, well trained young men, with good manners, a practical command of French, German, and Spanish, or at least some of these languages, combined with an intimate practical knowledge of a certain class of manufactured goods and commercial methods, currency, weights, measures, and customs of foreign countries. The education of such men requires certain specialized courses of study, which the commercial schools of Germany, and to some extent Belgium and England, furnish. The all-round education provided by American colleges and high schools turns out young men more or less fairly equipped for successful careers at home, but the competition for export trade has now become so sharp as to require the work of experts, which only a special education, supplemented by a practical experience, can provide. It will, henceforth, be necessary for a largely increased class of young men to prepare themselves for and accept definitely, as many thousands do in Great Britain and Germany, the career of mercantile employes in foreign lands, in which social sacrifice, the dangers of alien climates, are balanced by the material advantages which such a career offers to men of perseverance and trained capacity.

Salesmen frequently go to Germany with no knowledge of any language but English, and the commercial traveler puts himself too often in the character of a peddler by attempting to sell goods of wholly different classes and character. The commercial traveler in foreign countries should confine himself solely to one line of goods and should be an expert in that line.

American circulars and catalogues are often very faulty, and they should be printed in the language of the country to which they are sent, the values and weights and measures should be translated to those in vogue in whatever country they are sent to, and above all, the catalogue should state clearly the net price for which the machine or other article will be delivered at a prominent seaport of that country. The subject of discounts should be also clearly set forth. If this is not done, the buyer is forced to spend three or four weeks in writing to the American seller to ascertain his best discount, etc., and the chances are, in the meantime, that his order will go to a European manu-

facturer who either sends a salesman to take it or who has given the net price in his advertisements.

The unprecedented merchandise exports of the past fiscal year have given to the world a new and convincing proof of the power of the United States in the vast and varied field of manufacture. It will now be greatly to our advantage to understand at once, as the field of American commercial activity broadens and grows more complex and difficult, that the attainments and enterprise of the exporters and their agents must keep abreast of the new and more exacting requirements. The merchant of the present and coming generations must be like the diplomatic, the consular, or executive officer, a more highly trained and educated man than his father or grandfather had need to be.

#### THE REVIVAL OF AMERICAN SHIPBUILDING.

Unless the present signs are misleading, the war with Spain is likely to start, if it has not already started, that revival of American shipbuilding for which we have all looked so anxiously, and which, at the opening of the present year, appeared to be farther off than ever. The creation of an auxiliary fleet led to the purchase of a large number of the vessels engaged in our coastwise and West Indian trade. Several of these have been converted into such valuable auxiliary cruisers that the government has decided to retain them permanently in the service. As a consequence, the transportation companies have given orders for new ships to take their place, and it is very gratifying to note that, whereas many of the original vessels were built abroad, the new ships are being constructed in American yards. No better indication could be desired of the approach of the day when not only first-class liners, like the "St. Louis" and "St. Paul," but the cheaper vessels of the "tramp" class, can be constructed in American yards as cheaply as they can in Belfast or on the Clyde.

The effect of the purchase of merchant steamers by the government is seen in the fact that our leading shipyards are crowded with orders which will keep them in full swing for many months to come. Among others are four screw steamers for the American Mail Steamship Company and a twin-screw vessel for the New York and Cuba Mail Steamship Company. Two large steamers are being built at Chester, Pa., to take the place of the ships of the Old Dominion Line which were acquired by the navy and transformed into auxiliary cruisers. The great yard at Newport News, which recently witnessed the launch of the "Illinois," has on the stocks three new liners for the Morgan Line, two for the Cromwell Line, and two for the Pacific Mail. The fact that these orders are being placed at home proves that the cost of construction must have been greatly reduced of late years, and this, no doubt, is due to the great progress which we have made in the iron and steel industry. Not a little commotion was caused recently on the other side of the Atlantic by the announcement that an order had been given to an American firm to supply ship plates to an English shipyard. The cheap production of plates and frames, coupled with the lower wages that are paid for labor, and the fact that labor-saving methods and machinery enable us to turn out more work per man than is possible in foreign yards, are hastening the day when we can successfully compete with the world in the art of shipbuilding.

If history repeats itself we shall not only successfully compete with the world as shipbuilders, but actually lead it in the superiority of our productions; for in the days of our maritime prosperity, in the age of wooden shipbuilding, our sailing clippers were the most famous in the world. They not only carried more than two-thirds of our inward and outward trade, but they were successful in securing a large share of the trade of the old world. They were conspicuous in the tea trade between China and London, where their admirable sailing qualities were in great demand, and so great was their renown that several British shipowners purchased vessels that had been built in American yards.

In 1859 sixty-seven per cent of a total trade of \$695,557,592 was carried in American bottoms; but since that time there has been an almost unbroken decline, which has been attributable to the change in the materials of shipbuilding from wood to iron and steel, while in its earlier stages it was, of course, hastened by the depredations of the Confederate commerce-destroyers. The change from wood to iron came too early for our undeveloped iron industries to enable us to cope with the new problem successfully; and while the wooden clippers made a gallant fight to maintain their old prestige, they were doomed to give way before the advance of steam as a method of propulsion. At the close of the civil war the proportion of our trade carried in American ships was only 27 per cent. It rose to 35.6 per cent in 1870, since which date there has been a steady decline.

The upbuilding of our merchant marine has been handicapped by a law which forbids the registration of foreign-built ships in the United States, to protect themselves from which, American owners have em-

ployed European steamers under long time charters. A striking instance of this is the West Indian fruit trade with the United States, which, although it is in American hands and backed by American capital, is carried on in foreign bottoms and under a foreign flag.

There is no denying the fact that with an era of "free ships" and some form of bounties for home-built vessels, a large number of ships now flying a foreign flag would hoist the American colors, and a large number of orders would be given for both home and foreign built vessels. The result would be that our merchant marine would begin to assume something of its old proportions. Just how far we have sunk in the matter of over-sea commerce is shown by the following comparison: In the decade 1850 to 1860 the yearly average of shipping launched was 276,000 tons, fifty per cent of which was for deep sea service, whereas last year the total tonnage launched was only 232,000 tons, in which was included not so much as one ship for the deep sea foreign trade.

#### CORRELATIVE THOUGHT IN THE MONKEY AND THE ELEPHANT.

BY JAMES WEIR, JR., M.D.

It is true that the lower animals very frequently, so it seems to us, find themselves in difficulties which could be easily overcome by a slight amount of logical ratiocination, which effort of reason they seemingly fail to employ; yet in this respect are we really superior to them? Does our own ideation differ so very materially when we are placed amid kindred or like environments? I think not.

Place man amid unknown and unfamiliar surroundings, and he at once, to a certain extent, becomes lost. Many things appear to us abstruse, occult, and beyond the powers of the human mind; many situations seem difficult, inexplicable, unavoidable. And yet, when these things are explained to us and we come to understand them, we wonder at our own stupidity, so simple do they become. It is a lack of *understanding*, and not an absence of ideation, in animals which makes them appear to us to be, on certain occasions, without ratiocinative power.

Ideation, to some extent, is present in all of the lower animals, and correlative, interdependent, commutual *thought* is unquestionably present in the mental operations both of the monkey and of the elephant, as I will now endeavor to show.

Several years ago, a capuchin monkey at the Fair Grounds in St. Louis, Mo., received an injury to one of his forepaws and I was asked to dress it. While convalescing, this little creature learned to know me intimately, and would always cry out with pleasure whenever he saw me. His attendant would let him out, whereupon he would caress my face with his paws, uttering meanwhile many low-voiced ejaculations of endearment.

One day, in order to see what he would do, the keeper refused to take him from the cage. The monkey appeared completely nonplussed and sat down, seemingly in deep thought. Suddenly he uttered a loud shriek, as though in great pain, and began to pace up and down his cage. He held the hand which had been injured, but which had now been well for several weeks, in his other hand, and appeared to be examining it with great solicitude. His object was at once apparent both to the keeper and to myself: he was feigning an injury in order to be let out!

This monkey remembered that when he had hurt his hand I was called and dressed the wounded member. He thought that, if he made it appear that he was again injured, he would be placed in my hands at once. The cunning little malingering ceased to moan as soon as he was placed in my arms, and at once began to search my pockets for the dainties which he knew were there. Beyond question of doubt in this instance there was true correlative ideation. Thought followed thought in orderly and logical sequence until the full concept was formulated.

In the same monkey house there lived an ateles which also gave unmistakable evidences of being able to think correlatively. This monkey became the proud and jealous owner of a small, round, metal-backed mirror, which she kept securely grasped in one of her hands. She seemed to regard it as a great treasure, and was immensely afraid that the other monkeys would steal it from her. Wishing to see how she would dispose of it during feeding time, I suggested to the keeper that he prepare a basin of milk and bread and place it in the cage. (The ateles conveys its food to its mouth with its hands; consequently, the monkey was handicapped by having one hand already occupied.) She made a dash for the basin, but immediately recognized the fact that with only one hand free she was no match for the other monkeys. She ran about the cage for a moment or two, then, pausing, seemed to think over the matter. Suddenly she darted to the front of the cage, thrust her hand through the bars, and pressed the precious mirror into one of the keeper's hands! Then, free and untrammelled, she rushed to the bread basin, and began to shovel food into her pouches with both hands.

In a recent issue of *La Nature* M. Paul Méguin has an interesting article on the intelligence of monkeys. The following excerpt is taken from a paraphrase of the above-mentioned paper:

"At Hagenbeck's establishment, in Hamburg, where two hundred monkeys enjoy complete liberty at play in the great rotunda, they are given multitudes of children's toys, balls, hoops, wheelbarrows, joiner's benches, etc., and learn to manage them all without anyone showing them how. In the center of the rotunda is an immense grain-hopper, from which the seeds, corn, walnuts, chestnuts, apple-quarters, etc., run into a trough when a wheel at the top is turned. The management of this hopper did not have to be explained to our friends the monkeys. While one of them turns the wheel, the others, sitting around the trough, enjoy the delicacies as they come down, till the one at the wheel, thinking his turn has come, stops, gives the signal for some one to take his place, and comes down to get his share."

Here is an instance of complex ideation. These animals know that their food is procurable only by turning a certain wheel, a mechanism wholly unknown to their ancestors, hence completely outside the realm of instinctive or inherited knowledge. They know also that, unless some one is self-denying for the time being and will turn the wheel, they will get no food. Therefore, that unselfish individual always presents himself. Furthermore, this individual, after he has labored some time for the good of the community, has only to make known his wishes to be relieved, when another will take his place. Here there is a knowledge of cause and effect in which complex correlative ideation is clearly evinced. Moreover, the factor of unselfishness which is present points to an ethical element as well.

An elephant's skin is exceedingly sensitive, notwithstanding its great thickness. Flies, gnats, mosquitoes, etc., cause it considerable annoyance, especially when it is confined to a house and cannot procure dust to sprinkle over its body as a protection against their attacks.

In 1882, while standing in the carnivora house at the St. Louis Fair Grounds, I saw an elephant which was there stabled seize a mop broom with its trunk and skillfully brush away some flies which were biting its back at a place not to be reached by its tail or proboscis. It used the broom with as much dexterity as a man would evince under like circumstances.

Romanes gives an account of an elephant which was seen to break a bamboo picket from a fence. Then, manipulating the bamboo with its trunk, it splintered it beneath one of its fore feet. Apparently not satisfied, it again broke a bamboo picket from the fence and splintered it as before. Then, holding the splinter in its proboscis, it scraped with its point between one of its forelegs and its belly. In a few moments it dislodged a large elephant-leech, which fell to the ground and which was immediately crushed into a shapeless mass beneath the horny toes of the elephant! The animal deliberately manufactured an instrument through whose agency it was enabled to rid itself of an annoying parasite. Moreover, it was not satisfied with its first scraper, but threw it away and made another, thus showing interdependent, correlative thought as well as discriminating judgment.

One winter, at St. Louis, two elephants were stabled in an outhouse near my rooms. One warm, bright day early in the spring one of these creatures was brought out into the alley behind the stable, in order that it might be given a bath. A horse attached to a loaded coal cart became frightened and ran at full speed down the alley toward the elephant. The latter heard the noise and saw the horse rushing toward him. He seemed to take in the situation at once; for, dropping to his knees, he drew in his trunk beneath his body, drew in his legs, and bowed his head. The horse, in his mad rush, ran completely over the elephant, dragging the heavy cart with him. Beyond a few slight scratches and bruises, the elephant was uninjured. Had it not been for his wise foresight and his quick formulation and adoption of his efficient method of self-protection, he might have been severely injured, perhaps killed, by impact of the maddened horse and heavy cart. In this instance there was an undoubted manifestation of correlative ideation. The immediate adoption of the only efficient means of avoiding injury clearly demonstrates the truthfulness of this assertion, especially so since there was nothing instinctive in the action of the elephant. In a state of nature, elephants are not confined in narrow alleys, neither are they charged by runaway horses.

THE United States consul-general at Berlin says that the area of carriage pavements in that city is 6,500,405 square yards. Of this area a little less than 74 per cent has stone pavements, about 25 per cent asphalt, and a fraction over 1 per cent wood pavement. The proportion of asphalt is steadily increasing. The soil consists of coarse, gritty sand, forming apparently an excellent foundation for the heavy 8-inch layer of gravel and cement, over which the 2-inch covering of asphalt is spread.