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THE TRANSPORTATION PROBLEM IN NEW YORK CITY.

There are certain elements entering into the problem of rapid transit in New York City which render its solution perplexing and difficult as compared with the same problem in other great cities, such as London, Paris, Chicago, Berlin, or Philadelphia. These difficulties arise partly from the topography of the site upon which it stands and in part from the character and tastes of its inhabitants. For it is certain that the American temperament would find any system of subterranean transportation uncongenial; and such of us as may have chanced to ride upon either the Metropolitan or the District Underground Railways in London, or the Underground Railroad in Liverpool, have set down the experience as one of the "bad dreams" of our life. The greater height, breadth, and roominess of the American as compared with the European railroad car is to be attributed to the national love of light, air, and freedom; and this same disposition will always lead the city traveler to avoid a tunnel route, if any alternative above-ground system be available.

It is true that the two underground railways above mentioned can scarcely be taken as illustrating the best possibilities of underground travel. They were both pioneer enterprises of their kind; they are worked by steam locomotives, and they are at all times badly ventilated and poorly lighted. The use of the electric locomotive would, it is true, go far to remove one objection, and electric lighting the other; but no possible refinements of modern invention can remove the prejudice which does and probably always would exist in New York against such a system of transportation, on the ground that it was located below, and not above, the surface of the city.

The objection is a purely sentimental one, but it exists; and it constitutes one of the elements that make the transit problem in New York so perplexing. For it is certain that in the underground tunnel, placed well below the level of sewers, water mains and electric wiring, free to follow the avenues of traffic, and radiating at will from the centers of business to the outlying suburbs, we have the theoretically perfect system.

In the city of London they are elaborating an underground system—driven to it by sheer necessity—and it is likely that the Southwark electrically worked tunnel will prove to be the forerunner of a vast system, which will spread like a network below the metropolis. It is probable, however, that for New York this "dernier ressort" of congested city traffic is not available.

It is to the peculiar topography of the site upon which New York is built that we must look for an explanation of the present rapid and alarming congestion of traffic. New York City proper is built upon a site which may be approximately described as a narrow parallelogram, some 14 miles in length, and of an average width of 1¾ miles. At the extreme southern end of this parallelogram is situated the heart of the city—its most important business center. During a space of two hours in the morning the flow of traffic sets in southward toward this business portion of the city. It commences in the northern suburbs, 15 to 20 miles distant, and rapidly gathers volume as it moves to the south, traveling at first over the elevated roads and later over the elevated and the cable and horse car lines combined. Many miles before the lower city is reached this stream of humanity has overflowed the available means of transportation, and both the cable cars and the elevated trains are crowded to suffocation. The same congestion takes place at night, the cars being filled to more than double their seating capacity.

There is probably no city in the world to-day which can show such a spectacle of overcrowding as may be seen daily on the Broadway cars and on the elevated roads in the lower city. And it is not that the city is ill provided with transportation facilities. It is simply that the present facilities are inadequate. Indeed, we question whether there is another section in any city of the world where there are so many trips occur per square mile in a given time as in Manhattan Island.

The overcrowding is to be traced to the fact that the bulk of the traffic to and from the city is hemmed in between the waters of the East and North Rivers. Judged from the standpoint of transportation facilities, the ideal location for a great city is that which on all sides affords uninterrupted communication by rail and car line with the outlying districts. The business center can then receive and disgorge its multitude of toilers along lines of travel which radiate from it, as the spokes from the hub of a wheel. Each radial line of travel in such a case has this advantage over parallel lines of travel, such as obtain on Manhattan Island: that the area served by such lines increases as the square of the distance traveled, and the distribution of its passengers will be proportionately rapid.

Nor can it be urged that the ferry service on the two rivers and on the bay provides a radial service similar to that of an inland city. For it is a well established fact in the economics of transportation that travel will always favor a rail in preference to a water route; and the truth of this rule is made manifest in the excessive crowding on the Brooklyn Bridge as compared with that which obtains at the various ferries. The astonishing increase of travel across the bridge is a fact whose significance must be borne in mind when we are devising some means of relief from the present intolerable congestion. The reduplication of the Brooklyn Bridge, either alongside or near the present structure, and the erection of other bridges across the East and North Rivers, would provide New York with radiating lines of travel which could land their passengers in the heart of the lower city and distribute them at night with great facility and dispatch, and in many cases without the inconvenience of a change of car.

In looking broadly at the whole question of transportation it would be consoling if we could feel assured that, bad as the case is, it has reached its worst stage. Unfortunately the statistics which we give below prove very clearly that we are going rapidly from bad to worse; and that, unless some emergency scheme of relief be quickly devised, the main avenues of traffic will soon be hopelessly paralyzed!

We are indebted for the following figures to a recent article on the bridging of the North River by Mr. Gustav Lindenthal, the author of the original and evidently the most practicable scheme for bridging the North River; the location of the crossing being in the neighborhood of Twenty-third Street and Hoboken, N. J.

BROOKLYN BRIDGE TRAFFIC.

1884	8,823,000
1894	43,000,000
In 1882, total ferry passengers	41,000,000
In 1895, total ferry and bridge passengers	135,000,000

NORTH RIVER FERRY TRAFFIC.

1886	58,894,000
1894	85,000,000

ELEVATED RAILROAD TRAFFIC.

1879	46,045,000
1884	96,703,000
1890	185,883,000
1893	*221,407,000

* The last available figures.

It will be noticed that whereas during equal intervals of time the ferry traffic has doubled itself, that of the elevated roads has multiplied itself two and one-half times, and that across the bridge no less than five times; a fact which establishes the statement we have made above, to the effect that travel will always seek a rail in preference to a water route. It should also be noted that the number of people that travel is gaining upon the means provided for their transportation at a rapidly increasing ratio; and, furthermore, that the increase is most rapid along those lines of travel which are already most seriously encumbered.

The total street railroad traffic in 1887 amounted to 164,000,000; and this, distributed among a population of 1,107,000, gave 148 trips per capita.

The same class of traffic in 1894 amounted to 460,000,000, which shows a per capita rate of 250 trips among a population of 1,840,000.

Here we are confronted with another fact which must affect any scheme for the relief of the present congestion; for it is evident that not only must provision be made for an increase of population, but also for an increased per capita travel.

It will be evident from the considerations which we have advanced in this brief review of the present state of the rapid transit problem that we are face to face with a crisis, which in the near future will beget an intolerable amount of delay and discomfort. In a subsequent issue we shall indicate the lines along which a temporary relief may be realized—a relief which shall last during such time as may be necessary for the bridging of both rivers; and, if it should prove to be an ultimate necessity, the construction of an underground railway.

THE OVER-SUPPLY OF ELECTRICAL ENGINEERS.

It is characteristic of the alertness and restless activity of the age in which we live that no sooner is a promising field of enterprise opened than it is quickly flooded with a surplus of labor and capital. The old time conservatism, which baffled the early efforts of Fulton, Howe and Morse, has been succeeded by a lavish expenditure of wealth and toil in the promoting of new inventions, as they from time to time appear.

In the choice of his calling the son no longer treads in the footsteps of the father; but, impelled by the keen competition of the hour, he rather seeks out that line of work in which he will meet with least competitors and command the highest possible remuneration for his labor.

Shortly after the opening up of any new industry there will be found at its doors a large and increasing army of more or less qualified applicants, who have been attracted by the high scale of wages that is paid at the outset for skilled labor. The supply soon exceeds the demand. There is a simul-

taneous fall in the rate of wages proportional to the amount of surplus labor available.

Of all the great industries which have had their birth and development in recent years, there are none that have promised richer prizes, or drawn into their service a larger and more enthusiastic army of workers, than those which have grown out of modern discoveries in electricity. Rapid as has been the growth of electrical engineering, however, it already appears that the supply of trained electrical engineers in much in excess of the demand; and that the rate of pay in electrical engineering is already some twenty per cent less than it is in civil or mechanical engineering.

The current number of the Engineering Magazine contains an article by Mr. Henry Floy on the question as to whether we are not educating too many electrical engineers. In order to verify the fact of over-production, he sent 260 personal letters to the present year's graduates of Cornell and Lehigh Universities and the Massachusetts Institute of Technology. The larger part of the graduates made reply.

Subjoined is an extract from the letter of an electrical graduate: "I have made application by letter to about one hundred of the leading manufacturers and railway companies. The letters received kind attention, yet I cannot but think that most of the positions secured must have been created through the influence of relatives and friends." Another graduate received a number of discouraging replies to his application for an electrical position. He then wrote "two more letters, in which, among other things, I mentioned my knowledge of shorthand and German. Both of these letters brought answers asking an interview. As a result, I have my present position."

The results of the replies are shown in tabulated form below:

	Electrical. Per cent.	Mechanical. Per cent.	Civil. Per cent.
Replies received	48·1	39·4	48·1
Of those who replied, the following secured employment	78·8	75·0	71·8
Secured employment in the line of work in which they studied	65·0	71·4	87·1
Secured employment through influence of relatives	21·1	10·7	11·1
Secured employment through influence of friends	15·3	32·1	35·8
Average pay per week	$10.70	$13.52	$13.27

Two significant facts in this table should be noted by those who contemplate entering the electrical engineer's profession: First, that the fewest electrical engineering graduates, relatively, secured work in the particular line in which they had studied; and, secondly, that the electrical graduate is paid from 20 to 23 per cent less than the mechanical or the civil graduate.

Professor Routgen's Wonderful Discovery.

There have been received from Europe by cable very insufficient accounts of a discovery attributed to Professor Routgen, of Wurzburg University. By the use of a radiant state of matter tube, a Crookes tube, it is stated that he has succeeded in obtaining photographic effects through opaque objects. It has long been known that ether waves of long period would pass through matter opaque to short waves, and that such a screen as is afforded by a plate of blackened rock salt will sift out short waves, while long waves pass through it. In some unexplained way Professor Routgen, it is claimed, has succeeded in affecting the sensitive plate with waves which had passed through an opaque body. Metals cutting off all rays alike would produce a shadow, so that a metallic object in a box or embedded in the human system could be made to give some kind of an image. The operations are said to have been conducted without a lens, entirely by shadow.

This is about the substance of the reports. It is yet too soon to indulge in the wild possibilities that have been suggested for the process. When the details reach us, the process will probably prove to be of scientific rather than of practical interest.

A New Horseless Carriage Race in France.

The Automobile Club, of Paris, have arranged a race which is to take place in June, the course being from Paris to Marseilles and return. One of the conditions laid down for the race is that the contestants are to proceed only in the daytime. The carriages are to be divided into two classes, the first having two to four places, and the second series is for carriages having greater passenger accommodation. This club has decided to secure a villa in the Bois du Boulogne, Paris, as a branch of the Automobile Club for use during the summer.

A gentleman was recently summoned in England for using a horseless carriage without causing a person to rpoceed it with a flag. It was contended for the defense that the carriage was not a locomotive, but the presiding magistrate considered that the apparatus could be converted into a locomotive, as it was capable of drawing another vehicle. The magistrates decided that the motocycle was a locomotive, but as this was the first case of the kind, they imposed a nominal fine of one shilling and costs. The lawyer for the defendant says that a special act of Parliament will be required to render the use of such vehicles legal.

The Meeting of the American Society of Civil Engineers.

The forty-third annual meeting of the American Society of Civil Engineers began January 15, in the Church Building at Twenty-third Street and Lexington Avenue, New York City, a few doors from the club house. There were about one hundred delegates present and George S. Morison, of Chicago, who presided, called the meeting to order. The report of the committee on time reckoning at sea was taken up and fully discussed. A resolution was adopted asking the President of the Senate and the House of Representatives to accept and approve the resolutions of the International Conference which assembled in 1884, and to act in conference with other nations to cause the Nautical Almanac of the United States to be brought into harmony with these resolutions at the beginning of the twentieth century. Various addresses were made and visits were paid to the central station of the United Electric Light and Power Company, to the works of the Crocker-Wheeler Electric Company, at Ampere, N. J., to the Brooklyn Bridge and elsewhere. A reception was given at Delmonico's on the evening of January 16. It was announced that the society has purchased two lots at the junction of Broadway and Eighth Avenue, where they will erect a beautiful structure as the headquarters of the society. About $400,000 will be spent on the building.

The society has now an active membership of 2,000, so that its present quarters are much too small.

The following was the result of the election of officers for 1896: President, Thomas Curtis Clarke, New York; vice presidents, William R. Hutton, New York, and P. A. Peterson, of Montreal; treasurer, John Thompson, New York; directors to serve three years, First District, George Alexander, New York; William Barclay Parsons, New York, and Horace Lee, New York; Third District, John R. Freeman, Boston; Sixth District, T. W. Symons, Portland, Ore.

Sea Water for London.

A bill has been prepared to lay before Parliament and estimates made for the work necessary to bring sea water to London, for use in public and private baths, and for road watering and sewer flushing, should the authorities deem it best to make such use of it. The company to undertake the work is arranging to supply ten million gallons daily, taking the water from the ocean at a point near Brighton, about fifty miles almost directly south of London. The intake pipe would run some distance out to sea, and near the pumping station would be a reservoir to serve as a settling tank, from which the water would be pumped to a near-by reservoir on a hill 500 feet high. No more pumping would then be necessary, the water flowing thence by gravity to London, but there would also be a storage reservoir at Epsom, 240 feet above the sea level, and water flowing from there to London would have sufficient pressure to carry it to the top stories of high buildings. It is said that in several English towns, as Plymouth, Yarmouth, Portsmouth, Torquay, Birkenhead, and others, sea water is now used for sewer flushing, and the Lancet speaks favorably of such use of sea water, claiming it to be a piece of extravagance that water sufficiently pure for drinking purposes, and obtained at high cost, should be employed for the mere conveyance away of sewage. But it will be remembered that a similar employment of sea water in New York City, which has unrivaled advantages for its most efficient use at a low cost, has been adversely decided upon, although it was for many years strongly urged by some of our leading citizens. The Board of Health, in particular, took strong ground against it as detrimental to the public health and likely to cause and promote the spread of diphtheria. Such reasons, however, are not applicable to the use of sea water in bathing lakes and swimming baths, and the luxury of a sea water bath in private houses, which such a system would afford, would probably be largely availed of. For such uses alone it is probable that the supply the new company proposes to bring to London will find ample use. Ten millions of gallons of water per day is not much for a city like London, with its four to five millions of inhabitants, when it is remembered that in New York City our average daily consumption of water supplied by the Croton system is now 200 millions of gallons.

Automobile Carriages in Paris.

M. Roger, the inventor and manufacturer of automobile carriages, has made application to the police authorities of Paris for permits to run a number of horseless carriages on the streets; for hire at the regular legal rate of 30 cents a drive or 40 cents an hour when hired on the street; when hired from a cab stand the charge is slightly greater. That horseless carriages can be run cheaply enough to compete with the regular fiacres is thus shown.

Polarization Investigations.

The polarization of the light emitted by incandescent bodies has not yet been fully investigated. Arago, indeed, made some experiments on incandescent iron, platinum, and glass, but these were only qualitative, and did not extend to liquids. Mr. R. A. Millikan publishes, in the Physical Review, an account of some careful tests of light emitted by glowing solids and liquids with a view to discover the laws of its polarization. This phenomenon is exhibited strongly by incandescent platinum, silver, and gold, and by molten iron and bronze. A somewhat feebler polarization is shown by copper, brass, lead, zinc, and solid iron. The most significant result is that polarization is minimum with rays emitted normally to the surface and maximum at a grazing emission. This indicates that the vibrations take place in a plane at right angles to the emitting surface. To show the phenomenon at its best a smooth surface is essential. Glass and porcelain also emit polarized light, but to a lesser amount. Fluorescent bodies do the same, so that evidently a high temperature is not necessary. In the case of uranium glass it is the green reflected light which is polarized, and not the blue incident light diffused from the surface.

New Cavalry Weapon.

Captain George H. Paddock, of the Fifth United States Cavalry, is the inventor of a new gun for that branch of the service, which should prove both handy and effective. This weapon, suggested by Captain Paddock, is to be built on the same general plan as the new gun being constructed for express guards, and resembles a sawed-off repeating shotgun, with barrels 22 inches long and bored to target a charge of buckshot inside a circle 50 inches in diameter at 50 yards.

Cavalry armed with Captain Paddock's weapons would, on hearing the command "Charge!" draw their guns from the scabbards and, cocking them, bear down upon the foe. When within range each gun would discharge a cone of scattering buckshot, spreading from the muzzles of their pieces to circles 50 inches or more in diameter. Thus, both in height and length, the line of the enemy would be completely covered with missiles.

Lately, in a gun built especially for sheriffs, Captain Paddock has found a breech and reloading action which, applied to his "charge pistol," answers all requirements. This gun has all its mechanism about the breech. To reload it, the trigger guard is drawn backward along the grip, and the old shell is ejected and a new load inserted with a minimum of movement, and with no projection of arms or levers up or down from the piece. Its reloading also can be accomplished with one hand; a firm hold of the trigger guard and a jerk or throw are all that is necessary; the weight or inertia of the piece "does the rest."

The weight of the gun is just five pounds, while the mechanism, being in the butt or back of the breech, like the heavy hilt of the saber, gives balance to the weapon, so that it can be raised, lowered, and aimed in one hand with facility. Another advantage possessed by the new action is ease in reloading on a restive horse. The jerking of the bridle rein was apt to interfere with working the ordinary reloading grip that slides on the magazine, when grasped by the bridle hand, as it must be when used in a cavalry charge. With the improved "charge pistol," however, such jerking is actually a help to the soldier, facilitating the operation of reloading this new gun by aiding the weight or inertia of the piece in sliding it forward from the reloading grip, which alone is grasped by the right hand when working the breech action.

Progress with the Chicago Drainage Canal.

Reports recently submitted to the trustees of the Sanitary District of Chicago show that work on the big drainage canal to date amounts to 75 per cent of the whole. During the months of August, September and October last there were over 8,700 men at work on the canal. The report of Chief of Engineers Randolph shows that the value of the regular and collateral work done in the period between January 1 and December 1, 1895, eleven months, is $6,036,400. The volume of work done in this period is as follows: Glacial drift, 7,187,600 cubic yards; solid rock, 4,824,000 cubic yards; retaining wall, 95,000 cubic yards.

The total volume of work accomplished since the inception of the project is as follows: Glacial drift, 20,172,686 cubic yards; solid rock, 10,212,751 cubic yards; retaining wall, 97,600 cubic yards. The value of this work on regular and collateral contracts is $14,456,600, or 76·20 per cent of the entire work done upon a basis of existing contracts. The percentage of work done on January 1, 1895, was 44·38, so the percentage of work done in the first eleven months of 1895 amounts to 31·52, or within 12·56 per cent of the total work done in 1892, 1893, and 1894.—Marine Record.

A CHICAGO lawyer of a cynical disposition thus defines a promoter: "One who sells nothing for something to a man who thinks he is getting something for nothing."