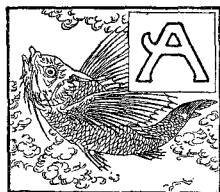


RAPID TRANSIT IN CITIES.

II.—THE SOLUTION.

By Thomas Curtis Clarke.



MEDIAEVAL CITY was a very picturesque object, with its narrow and winding streets and overhanging houses, and the tall cathedral

towering above the market-place. As nobody rode, except here and there "an abbot on an ambling pad," or a noble lady on her palfrey, its area was small, and had to be kept small, so that people could get over it on foot. Hence the strong aversion which we find expressed in the literature and history of those times to the growth of cities. Even as late as in Charles II.'s days, Sir Christopher Wren, in making a new plan for London after its great fire, proposed to move all the graveyards and arrange them in a ring around the city, for the express purpose of preventing its enlargement.

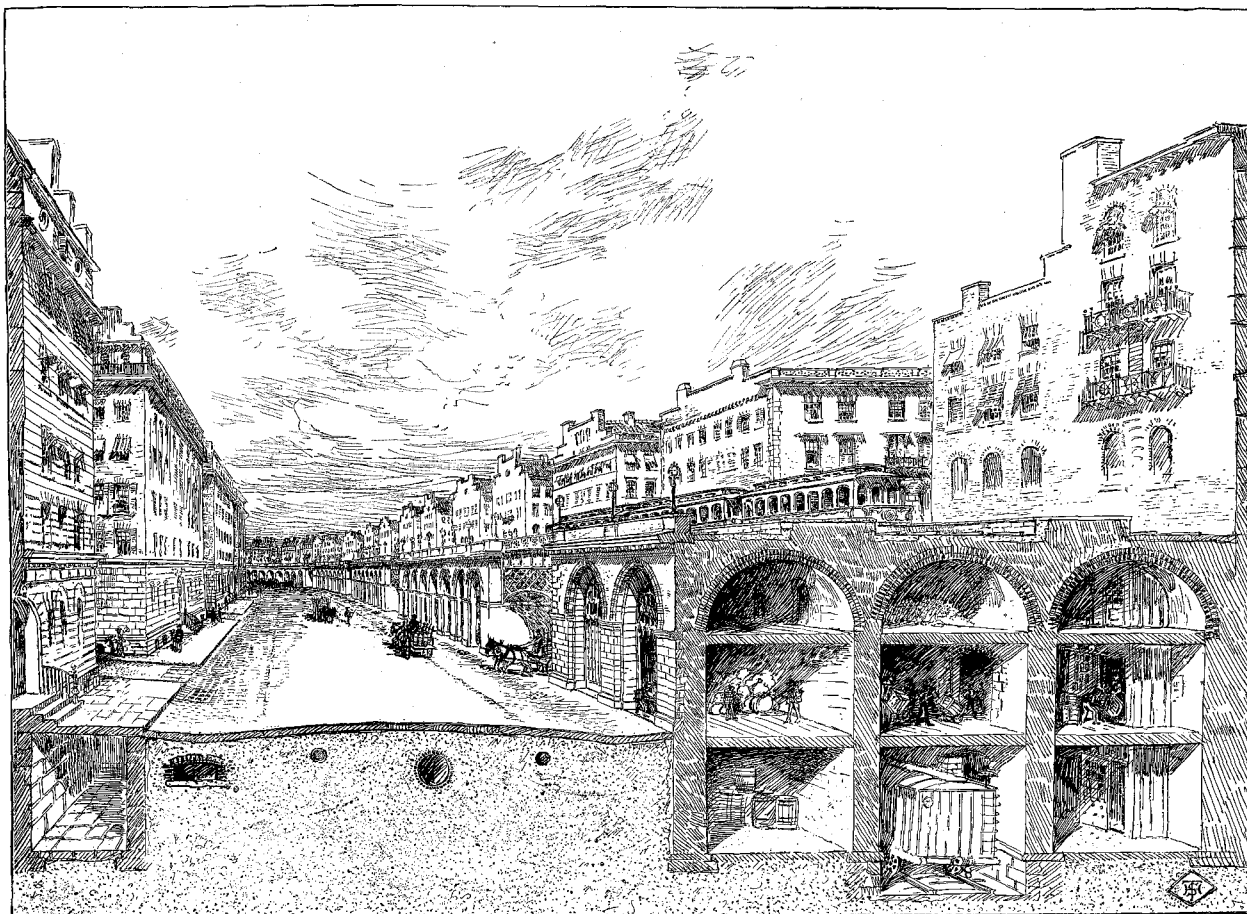
People dwelt in all parts of these cities, and carried on their trades, manufactures, and selling of goods under the same roofs where they ate and slept. There are persons still living who have heard it said that the proper place for a tradesman to live was over his shop. But with the changes caused by modern inventions the evolution of a city makes it more complex. Differentiation of parts takes place. One part becomes the financial centre; another, that of wholesale business; a third, that of manufactures; and a fourth, that of retail shops; while the residence quarters are farther and farther removed from the centre. These changes everyone must have noticed in almost all cities, but few have paused to consider that this evolution of the modern city comes from the extensive use now made of the sun's energy stored up in coal, and utilized through machinery in all the innumerable processes of manufacturing, industry, and transportation. Cities depend upon coal mines. They have grown

with their growth, and prospered with their prosperity: and if ever the mines become exhausted, the cities will dwindle with their decay; unless we learn to transform the energy of the medium which surrounds us into power.

We have shown that the growth of population and the habit of riding in cars have increased faster than capital has been able to supply the means of transit, from whence has come congestion of traffic in the larger cities, and from whence it will come in all. The evil has become serious, and is fast changing rapid transit back to slow transit.

Various remedies have been suggested. Were it confined to one or two cities, we might hesitate to advise. But the same causes will produce similar effects in all of our cities, so that the matter becomes one of universal interest. The extension of cable and electric railways in cities like San Francisco, Denver, Kansas City, Buffalo, Minneapolis, St. Paul, etc., is covering rapidly with houses great areas of outlying territory, that were lately farms and pastures. As everybody wishes to go to the heart of the city, which is small, congestion of traffic must come sooner or later to all. The question is not one of invention and engineering alone, but it is interwoven with one of the most difficult problems of modern economic science—how far shall the community control and share in the burden of serving the community? We will take up this question farther on, and will now discuss some of the engineering features of an improved rapid transit.

An inspection of the maps of cities, in this and the article in the May number, will show that the shape and contour of the town, as determined by the physical features of land and water, has much to do with the manner in which its rapid transit is developed. Thus, the steep hills of San Francisco were the



DRAWN BY H. T. SCHLADERMUND.

Section of Proposed New Street, Viaduct, and Warehouses, New York.

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cause of the invention of the cable system, which is also used in the steep streets of Kansas City. The long, level, and straight avenues of Chicago and New York, are also suitable to the cable system on account of their concentrated traffic and absence of curves. The crooked and narrow streets of Boston, with their frequent curvings and intersections, are not suited for cables, but are worked very well by the electric system. Where there is a wide extent of sparsely settled territory, the electric trolley system is the most economical of all.

The question is sometimes asked, what is the comparative cost of working street railways by horses, cables, or electric motors? The investigations of the last census throw light upon this, and I have collected some other statistics showing the cost of carrying a passenger, which is a resultant of the cost of running a car, and the number of people in that car.

Table showing cost of operating Horse, Cable, Electric, Steam, Locomotive Lines, per Car Mile run.

DESCRIPTION.	ACTUAL COST IN CENTS PER CAR MILE RUN.			Number of fares taken per car mile run.	Cost per passenger.
	Motive power.	Other expenses.	Total.		
<i>Horse Cars Lines.</i>					
Census Bulletin No. 55, average of 15 lines. . .	7.10	11.06	18.16	4.95	3.67
Chicago, Southside, 1891	12.00	6.90	18.90	5.03	4.64
West End, Boston, 1891	10.86	14.69	25.55	6.35	4.02
Bobtail cars drawn by one animal, with no conductor	7.00	8.00	15.00		
<i>Electric Lines.</i>					
West End, Boston, Trolley	7.65	14.10	21.75	6.70	3.20
Census Bulletin, average of 10 lines.	5.36	7.85	13.21	3.46	3.82
South London Subway, 1891.	5.20	8.10	13.30	5.00	2.70
<i>Cable Lines.</i>					
Census Bulletin, 10 lines Chicago, Southside Cable, 1891.	3.40	10.72	14.12	4.30	3.22
Brooklyn Bridge Cable, 1887.	3.00	6.39	9.39	3.58	2.60
Brooklyn Bridge Cable, 1891.	2.23	10.87	13.10	8.85	1.50
Brooklyn Bridge Cable, 1891.	2.24	8.44	10.68	7.83	1.364
<i>Locomotive Elevated Lines.</i>					
Manhattan, N. Y., 1890.	5.85	7.15	13.00	5.20	2.68
Brooklyn, N. Y., 1890.	5.00	4.54	9.54	3.17	3.00

Figures are misleading without explanation. Thus in the horse-car lines, there is evidently a difference between the division of cost of motive power and other expenses, in the roads given by the *Census Bulletin* and in the other three. The West End of Boston, both in its electric and horse-car statements, charges to the "other expenses" some properly due to the cost of changing from horse to electric power, which, after this is done, will disappear from the account. After making all allowances, the result remains that cable power is the least expensive to operate, then locomotives, then electric motors, and the most expensive is that of horses. But all these conclusions may be reversed when we take into account the interest charges on the cost of the systems. According to the *Census Bulletin* the total cost of road and equipment per mile of street length is for

Horse, mule railways	\$71,387
Electric trolley railways.	46,697
Cable trolley railways.	350,324

to which we may add subways, \$1,200,000 to \$1,600,000 per mile; elevated railways, \$600,000 to \$800,000 per mile. The conclusion is that each case should be considered on its own merits, and where the traffic is light and diffused over wide areas, horse or electric lines are best. Where the traffic is very concentrated cables seem to give the best results, as on the Brooklyn Bridge. If, however, electric lines with their present imperfect development can do either heavy or light business economically, it is safe to assume that in their future development they will beat all the others. In an ideally perfect system of rapid transit:

1. The lines should run from the business centre of the city in all directions to the suburbs, like the spokes of a wheel, so far as the physical features of land and water will admit.

2. The lines should follow those streets which are already business thoroughfares.

3. The system should be one upon which cars can move with equal speed in all parts of the city.

4. No changes of cars should be necessary.

5. The system should be a flexible one, capable of extension through the outlying and thinly settled districts without too much cost.

The manner of carrying out this would be as follows: Beginning in the suburbs, we should have the present electric or cable surface railways; where there is not sufficient movement of ordinary vehicles to prevent a progress of nine to ten miles per hour, or even more. As soon as that part of the city is reached where a slower speed becomes necessary, the cars should ascend upon an elevated railway and run on it until either narrower streets, or any other reason, makes this kind of line objectionable. Then the line should descend from elevated to subway and pass under that part of the city where an elevated line would be inadmissible. After passing this the line may rise again to elevated and again descend to the street level. All these changes would not always be necessary. There is no reason why this cannot be done by either cable motors drawing trailing cars after them, or by cars each carrying its own electric motor. Not only do the smaller electric cars in Boston, but the great double-deck Pullman car, carrying thirty passengers below, thirty on deck, ascend six per cent. grades with ease. If it is desirable to run electric cars in trains, each should be supplied with its own motor, and all be connected and worked by one motor-man at the end. It is true that the wheels of the old horse-cars, which have small flanges, would not allow them to run safely on an elevated structure. But safe wheels could easily be made, and as a matter of fact, the wheels of the double-deck Pullman street car are amply strong and safe enough.

Let us see the application of this suggestion to practice. Take the city of Paris for example. Here the Metropolitan Company projected by M. Eiffel does propose to run partly underground and partly on the surface. There is no physical difficulty in their running also on elevated lines, if it is necessary. We have said that, owing to the small size of its business centre, the city of Boston is probably suffering more from congestion of traffic than any other American city. The method of rapid transit

which we have just described is admirably adapted to give it relief. Through the broad suburban streets the electric cars now move at the rate of eight to ten miles an hour. The congestion of traffic extends for less than one mile, and is chiefly confined to two parallel streets, Washington and Tremont, through which the great tide of travel running north and south, and representing a population of 850,000 souls, passes all day long. The great shopping districts are about in the middle of this mile. The West End Railway Co. finding that their cars take longer to pass over this mile than over three or four miles in the suburban districts, have asked the Rapid Transit Commission to recommend to the Legislature to allow them to construct a short subway running under the Common and a part of Tremont Street, and coming out at Adams Square. The nature of the ground admits of such a subway being connected with elevated lines at each end when desired. The subway would be similar to the short subway in New York under Fourth Avenue, between Thirty-fourth and Forty-Second Streets. It would be lighted at short intervals by openings in the roof, and would be unobjectionable in every respect. Near Park Street Church, where the great crowding shown in the illustration to the article in the May number now takes place, there would be a central underground station, where passengers could take trains to and from all parts of the city and suburbs. This seems to be a simple and reasonable way of relieving the difficulty, for the cars on the new subway would make so much better time than those on the surface of the streets, that the larger part of these would be withdrawn from the streets and take this route. The plan is one that can be quickly carried out, and at a comparatively small cost. The Commission, it is understood, will recommend this, but they go a great deal farther. They follow in the footsteps of Berlin, Paris, and London, and propose a circular or ring railway connecting all the steam railroad stations. Part of the line will be elevated, and it will descend under the Common and Tremont Street as the West End line proposes to do. This ring line will have no rail

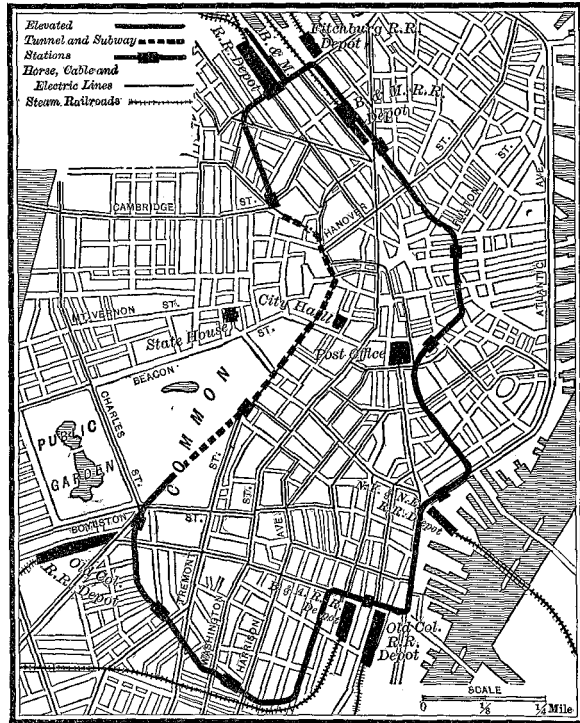
connection with either the steam railroads, or the street railways. Passengers are expected to change cars, ascend and ride around this circle.

The experience of the European cities, to which I have referred in my former article, has shown that these ring railways, in consequence of their not following the lines of the principal thoroughfares where people want to go, and of trying to induce people to take a circuitous route where they do not wish to go, have been utter failures, and are now being supplemented by lines running across the circumscribed area in all directions, but always on the lines of main streets. It does not appear as if this Boston ring scheme would attract capital, as it would cost ten times as much as the other less pretentious plan, and people would not ride on it even free of charge, for they would have to pay another fare as soon as they left it, and no time would be saved. We have criticised this plan not in a hostile spirit, but present it as an object-lesson of what should be avoided. Of all difficult tasks, there is none more difficult than to make an American take the longest way around, when he can "cut across."

The congestion of traffic, which makes the wide streets of Chicago almost impassable at certain times and places, comes from reasons which an inspection of the map on page 749 will clearly explain. The clear area shows the suburban districts; the lightly hatched area the built up part of the city; while the still darker lines show the business centre. It is separated from the north and west divisions by the rivers with their obstructive swing-bridges. This area is so small that land has become immensely valuable, and has caused the erection of those very tall buildings peculiar to Chicago.

The system which we have described adapts itself as if specially designed

for Chicago. Run in on the surface as far as you can make speed, then run up upon elevated lines, and then run down



The Congested District of Boston.

[This map occupies the space enclosed by dotted line on the Map of Boston, on page 576, in the May number.]

under the streets of the small business area, crossing under the rivers by tunnels, limiting the subways to the shortest possible lengths. Then delays from bridges and from street traffic would cease, and the large damages consequent upon running through the streets of the business area would be avoided. The map of Chicago shows one thing peculiar to that town. In no other city that we know of are there so many steam railroads running so far into the heart of the city. The numerous grade crossings of these roads are a source of delay to them, and of danger to all. No matter what the cost may be, at some future time they will all have to be separated from the street level, and the only practicable way is to elevate the level of their rails. Their right of way is so valuable that within much of the area included by the encircling parks

and boulevards, it would seem profitable to elevate the railways on structures rather than on embankments. This would give a second right of way under them, upon which electric cars could be run for local traffic passengers, interchanged with trains above, making fewer stops. The structures could carry the trolley wires necessary for supplying power to the surface electric cars. The surface lines would descend into subways which would connect all the railway stations together, cross under the rivers, and traverse the business centre in various directions. The map will show that such a plan as this, taken in connection with the present street lines and some new elevated lines, would satisfy the rapid transit requirements of Chicago for all time, and a no less comprehensive plan will do this.

A new system of carrying passengers, called "the Multiple Speed Railway," has been invented in Chicago.

One enemy of railroads is friction, and another momentum; or that stored up energy which makes trains unwilling either to stop or start. If they could be kept always moving and without stops, the motive power would be much less than now.

It has been supposed (except by horse-car conductors) that it was necessary to stop a car to let passengers get on and off, but this plan does away with all that.

Imagine a continuous line of platforms on wheels moved by electric motors at the rate of three miles an hour, at which speed persons can step on a moving platform from a station. Along side of this is another line of platforms moving six miles an hour. We step upon this. Beyond this are the cars, moving nine miles an hour, into which we step and take our seats. There being a continuous line of cars the whole length of the road, the carrying capacity of this system is enormous, being at least three times as great as that of the Brooklyn bridge cars.

It is stated that this system will be used to carry passengers about the World's Fair grounds.

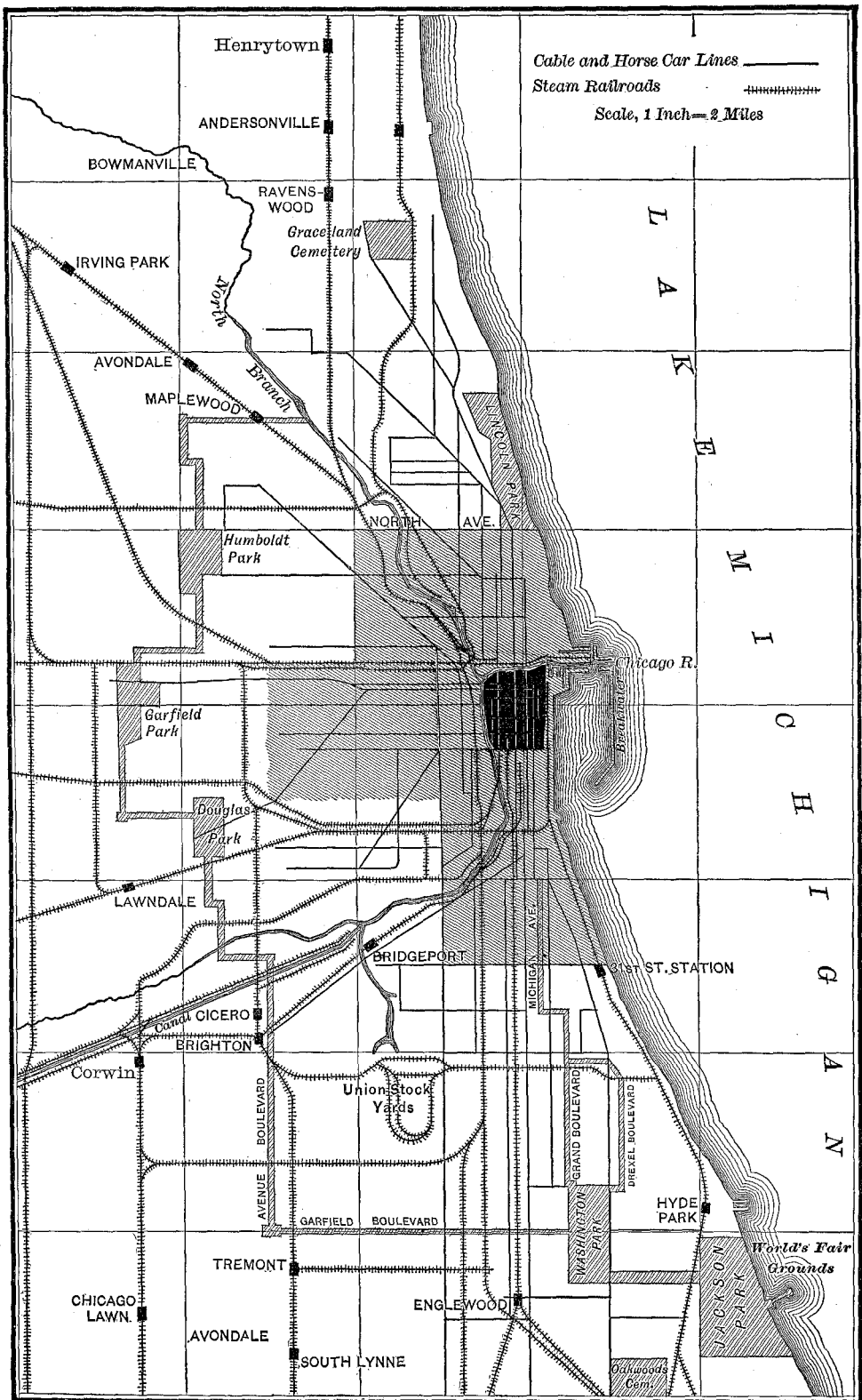
The city of New York, as everybody knows, is surrounded by water and is

long and narrow. This means a great concentration of traffic on parallel avenues and streets running north and south. From this peculiar shape, the walking distance was reached earlier than in other cities, and this led in New York to the earliest invention of horse-car lines. The same causes made New York the first city to build elevated railways, and these causes are now urging New York to undertake a still more costly system of rapid transit, either above or below ground. The official Commission on Rapid Transit has decided in favor of subway lines from the Battery to the Harlem River, and surface or elevated lines above the Harlem River, a distance of about ten miles. While street railways are unobjectionable, such a long one would not be popular in our climate. The questions of ventilation and motive power are not yet solved. Lines under ground have much less capacity than those in daylight, where trains can be run twenty to thirty seconds apart, which no sane man would dare to do in a tunnel. Mr. Depew, with equal wisdom and wit, has summed up the whole case. "Americans do not like to go under ground until they are dead."

The Commissioners themselves say, that while they appreciate that a masonry viaduct would be the most desirable means of transit, they fear that it would be too costly, and take too long to acquire the right of way. The map on page 751 shows the location of the subways proposed by the Commission; with the exception of Madison Avenue, which is not suitable, the locations seem the best possible, following as they do the lines of the crowded streets.

The vital defect of the New York Rapid Transit Commissioners' scheme is that it tries to throw all the burden on private capital, when it ought to be shared by the whole community, as the whole community is benefited in many ways. To do this, the following plan is suggested:

Let the city of New York open two new streets, one on the east, one on the west of Broadway, extending as near the southern point of the island as possible. The western street should run to the Boulevard at Fifty-Ninth Street.



Map of Chicago, showing Rapid Transit Lines.

The eastern street to the New York Central line at Forty-Second Street. These streets should each be one hundred and fifty feet wide, of which seventy feet should be set aside for a stone and iron viaduct, sixty feet for a roadway on one side of it, and twenty feet for a sidewalk, as shown in the drawing. This viaduct could carry two express and two local trains, with platforms between at the stations; and the spaces which extend from one station to another should have extra tracks for turnouts, storage of cars, etc. The viaduct should be of solid masonry through the blocks, while the streets should be crossed by structures like those of Berlin. The viaduct foundations should be carried below the level of the streets, forming subways in which freight trains could run. The viaduct would thus form a series of fire-proof storage warehouses, artificially cooled if required. They would be all connected by rail with the New York Central and other railways. The rental of such storehouses would return four per cent. on the cost over and above taxation and repairs of their construction. The city should lease this seventy feet, which is needed for the viaduct, to a private company who would build it and operate the road under proper conditions. The city would gain two new wide avenues, running north and south, for wheel traffic, which would relieve the congested condition of Broadway and other streets; and, as all will admit, are much needed. It would also gain an ideally perfect system of rapid transit.

Let us see if the cost would be an insuperable obstacle. Valuing 25 feet lots and buildings at \$50,000 each, or \$20 per square foot, there would be, exclusive of present streets, 594,000 square feet per mile, costing nearly twelve million dollars, the fixed charges on which at three and one-half per cent., the rate at which the city borrows money, would be \$415,800 per mile, from which deduct rental of 70 feet at same rate, leaves a balance of \$221,760 per mile. There would be about nine miles required, costing the city annually about two million dollars. The warehouses would be taxable property, and new buildings would be built on one side of the new streets, whose rapid transit facilities

would make them very desirable. The increase of revenue from taxation would in a few years meet the whole annual outlay. The private company would pay \$1,746,360 yearly for its right of way. Its masonry viaduct would cost it nothing, as the rentals would pay for that, leaving only street crossings to be provided for. A subway line with its stations and land damages cannot be built with four tracks for less than three million dollars per mile. The fixed charges on nine miles at five per cent., the current rate of interest, would amount to \$1,350,000. To make up the difference of \$396,360 would require but 7,927,000 more passengers yearly at five cents. Is it not probable that a line running in open air and daylight, and having double the capacity of a subway, would do as much as this? *

Above Fifty-ninth Street very much less expensive elevated lines could be run in the centre of the Boulevard. Above Forty-second Street, on the East Side, it has been suggested to run over the centre of Park Avenue, which is one hundred and forty feet wide. This would allow of making openings in the New York Central tunnel below, which would improve it very much.

As any comprehensive scheme of rapid transit for New York would require a long time to carry out, present relief can be best obtained by giving greater facilities to the elevated lines. Instead of being prevented from laying third tracks and acquiring better terminals, they should be encouraged, so far as it can be done without cost to the city. The completion of a third track on the Eighth and Ninth Avenue lines, upon which express trains with few stops are run, has reduced the time from the Harlem River to South Ferry from fifty-two to twenty-five minutes. If the East Side lines could run similar express trains the public would be greatly benefited.

New York was built up by commerce, borne in ships and canal boats on the water, and she is connected with the railway system of the country by only

* The year's rent to be paid to the city on viaduct line could be reduced one-fourth by making it for four tracks only, or 57 feet wide, except at stations. This would make yearly rental \$1,309,770, or less than the fixed charges on a four-track subway.

one line, a very great one, it is true. Passengers and freight we know are transferred from the trunk lines which end in New Jersey by ferry-boats and barges. No better way of handling freight can be devised, as the barge with its load of eight or ten cars can be towed to wharves at any part of New York or Brooklyn, just as the canal-boats that come down the North River are towed.

Ferry-boats were invented for the harbor of New York by Colonel John Stevens, not long after Fulton's successful trips by steam on the Hudson River, and are admirably adapted to their purpose. The design has been imitated all over the world. There are few better designed craft than one of the modern steel ferry-boats with twin screws at each end, and double deck accommodations. The great crowds of foot-passengers and teams that come and go to and from the lower part of New York cannot be better served than by these ferry-boats. But the through passengers who arrive at Jersey City and Hoboken by train require a better mode of crossing the river. A bridge upon which trains could run into the heart of New York would be a great convenience and saving of time, especially when the ferry-boats are detained by fogs or ice. The success of the Brooklyn Bridge has been so great that it is proposed to build three or four new bridges over the East River; two at the lower end

The New York & New Jersey Bridge Company propose to cross the North River at Seventy-first Street and connect with ten railroads that now stop at the right bank of the river. This bridge will be connected by a steel viaduct with a great union station at Forty-second Street and Broadway. Another line will give connections with the New England railroads. The grades will be easy, averaging forty feet per mile. It is intended to have a large hotel at the station, so that passengers can reach their rooms without leaving the building.

Besides this bridge, there are numerous tunnels projected under both rivers, and one is partly built. Of these tunnel projects, it may be said that the difficulties of making approaches to them and connections with railway lines are very great. Their capacity also is very much less than that of a bridge, and they are not looked on with favor by capitalists.

A few words more on the social and economical advantages of rapid transit will close this article. Let us see what has been done:

Mr. Henry M. Whitney, President of the West End Railway Co., of Boston, in his admirable argument before the Committees on Cities and Taxation of the Massachusetts Legislature, contrasts the European systems of increasing the

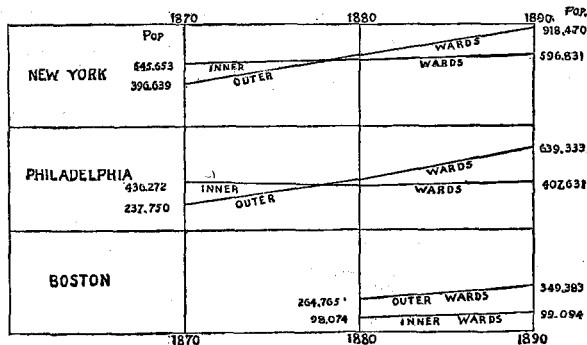


Diagram showing Relative Increase of Inner Congested City Wards and Outer Wards in Twenty Years.

[From figures by Carroll D. Wright, in *Popular Science Monthly*, February, 1892.]

of the town to connect the elevated railway systems of New York and Brooklyn; and two above Forty-second Street for steam railroads only.

fares according to distance travelled, with the American system of one fare for all distances. The American street lines lose money on their long-distance passengers, but more than make it up on their short-distance passengers. The tramway fare in Berlin is $2\frac{1}{2}$ cents, or 10 pfennigs, for each $1\frac{1}{2}$ mile. When you go beyond the line you have to pay two fares, and so on, so that to ride six miles would cost 10 cents. By the American system, which discriminates in favor of the suburbs, a man can ride ten miles or more to his home for 5 cents. Also, as Mr. Whitney well shows, the increase of speed due to



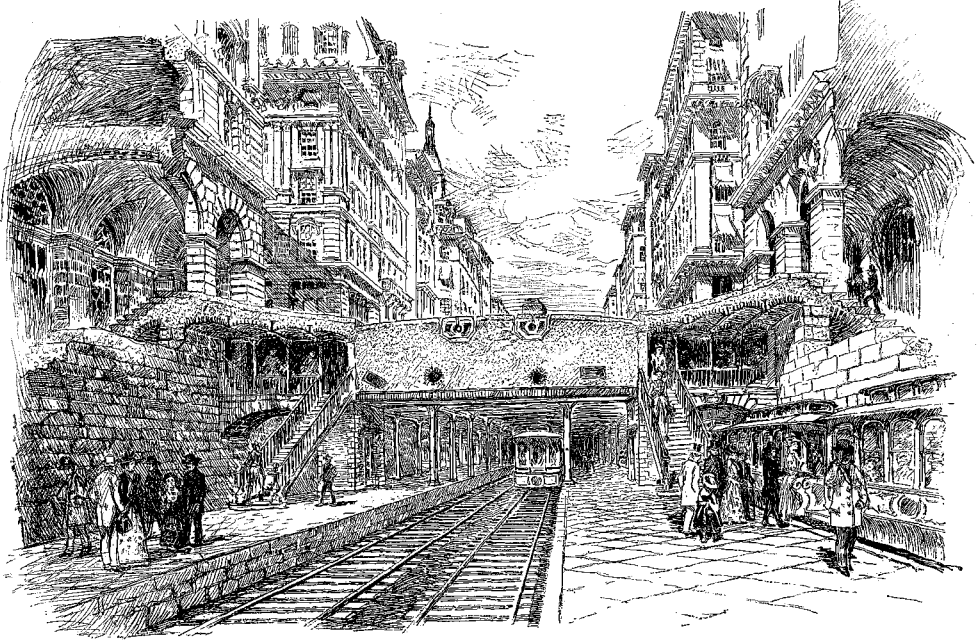
DRAWN BY OTTO H. BACHER.

Proposed Subway Station, Boston.

ENGRAVED BY W. B. WITTE.

the electric system, shortens each trip ten to twenty minutes. "While you are legislating under this roof," he says, "to reduce the hours of labor, this transportation company, by simply changing its system, has reduced the hours of labor nearly half an hour per day." The effect of the other system, where the suburbs are discriminated against, may be seen in the crowded state of the houses in Berlin. In 1885 there were but 2,820 private houses, and 900,000 out of 1,122,000 persons lived in tenements; 478,000 of whom lived in one room that could be heated, 302,000 in tenements of two rooms, and 101,000 in cellar or underground tenements. Contrasting this with Somerville, a suburb of Boston, containing about forty thousand persons, Mr. Whitney shows that there are 7,000 houses, making the number of persons to a house 5.9, which is about the

Is it any wonder that our cities and their suburbs grow at the expense of the rural districts? How fast they grow has been shown by the United States Commissioner of Labor, C. D. Wright, in an article in the *Popular Science Monthly*. I have translated his columns of figures into a diagram [p. 752], which shows the increase of population in New York, Philadelphia, and Boston, in the inner, congested wards and in the suburban wards, during the thirty years in which street railways have been in use. Other observations show that the rate of increase in the suburbs of London, over that of the older, congested parts of that city, is equally great. "Outer London is beginning to vie in population with the 'inner ring.' In a few decades hence it will have passed it." The English writer goes on to say: "If the process goes on unchecked, the Englishman



Proposed Local and Express Train Station, Broadway, New York.

same number as is found in the rural districts of our well-settled States. That is to say, people can live in a comfortable town only five miles, or half an hour's time, from Boston, paying ten cents a day to go there and return, and be no more crowded in their dwellings than are people who live in the country.

of the future will be a suburb-dweller, and the suburban type will be the most wide-spread and characteristic of all, as the rural has been in the past, and the urban may be said to be in the present."

The same thing may be said of this country by those who see the great ex-



The Berlin Viaduct Railway.

[From the *Engineering Record*, New York.]

tent of suburban area that has been annexed to all our cities since the introduction of the electric trolley system. While it is true that, without the skill and ingenuity of inventors and engineers the rapid transit of to-day would not be possible, yet it is also true that, unless the relation between these systems and the community is fixed upon a proper and just basis, trouble will always come, and neither the public nor investors will be satisfied.

Our present systems have grown up in a hap-hazard sort of way. Certain astute persons have procured from State legislatures charters for street or elevated lines, granting all the privileges that could be thought of and imposing very few obligations. All that the city, whose streets were taken, could do was to try and get as much money as possible out of these companies by taxation. If it succeeded, the company took it out of the public by diminished service. As the Legislature commanded

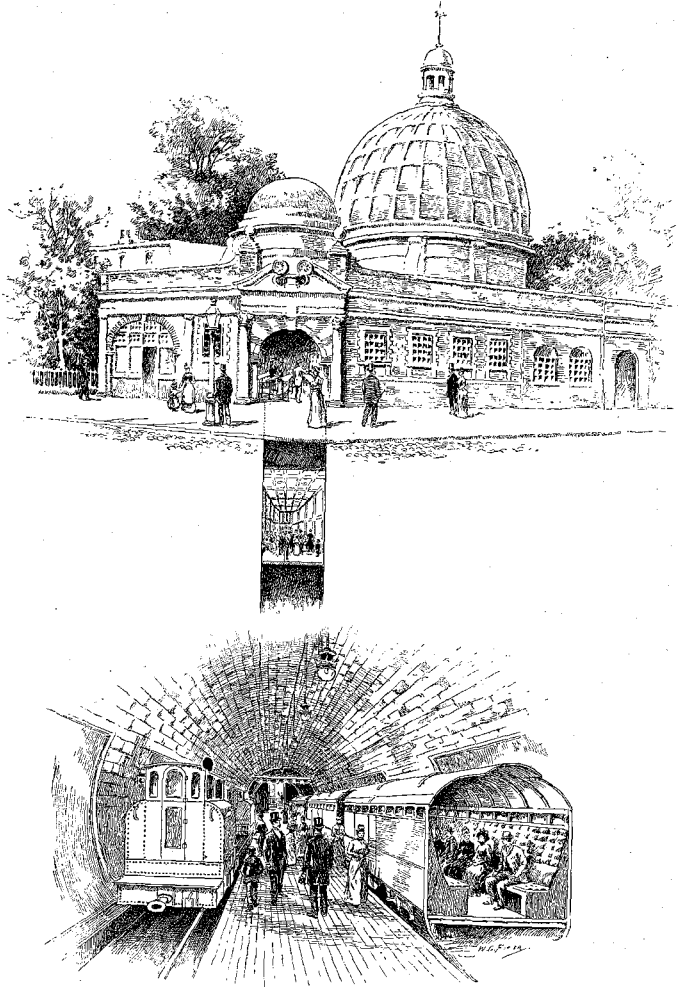
the situation, the companies were obliged to retain lobbyists to protect their interests. The effect of all this has been that the ownership and control of street lines has fallen into the hands of persons eminent rather as politicians than as capitalists.

The advent of the electric system has changed all this. Street railway shares are now sought eagerly by investors, are quoted in the money markets of the world, and have attracted the attention of the most conservative bankers. The vast amount of capital invested in these lines is shown by the following list, showing those of the United States and Canada up to September, 1891 :

Miles operated by animals.....	5,443
Miles operated by electricity.....	3,009
Miles operated by steam motors.....	1,918
Miles operated by cables.....	660
Total.....	11,030
Number of all cars.....	36,517
Number of animals in use.....	88,114

The number of animals has diminished during the last year 26,181, showing the rapid increase of the use of electric and cable power. The total capital invested is not far from nine hundred and twen-

principles and run by experts, few would wish to see their powers extended. The management of steam railways can be regulated by competition, and all that government should do is to see



The South London Subway.
(Showing Stockwell Station, the lift, platform, and carriages.)

ty millions of dollars. This shows the great importance of a proper regulation of those important properties.

There are but two ways in which public service can be performed—either directly by the paid servants of the public, or indirectly through chartered companies. In our country, public opinion has decided in favor of the latter. Until our cities are managed on business

that safety is provided for, and that all are treated fairly and alike. Competition cannot be applied to street railways except in the beginning, for when all the avenues of access to the heart of a city are occupied, no new lines can be built, and those who first get possession have a monopoly of surface travel. Charters may be given to elevated lines and to subways, but combination may take

place and the monopoly then becomes absolute. This is the justification for the exercise by the community of regulation and even interference with the management of street railways.

The community, however, should not only be just but generous in its dealings with the companies, and share with them the burden of rapid transit by furnishing the place to put the lines, either on the surface, or above, or below ground. That is to say, the city should condemn the damages caused by any of these forms of rapid transit, pay the abutting property owners before they are built; and charge the companies a rental for the same based upon the rate at which the city can borrow money, as we have suggested in the case of the proposed new viaduct streets for New York.

The companies, who are the other parties to the contract, should be strictly held to perform the following duties:

1. To run cars as often as the public service demands, and extend their lines when the public service demands. In case of disagreement the matter should be settled by arbitration.

2. To charge uniform fares for all distances, and but one single fare, all over the city or town limits. Even where there are many companies, interchanges should be free.

3. To run at agreed-on rates of speed, maintain clean and well-lighted cars, properly heated in winter, and having all modern improvements.

4. To use that form of rail which interferes least with ordinary traffic, and to keep the pavements clean and in order between the outer lines of rails.

5. To pay an annual rental for the right of way.

In return for the proper performance of these duties the community should give the companies the place to put their tracks. In case of strikes they should have the full protection of the military and police, as if they were public servants. Conductors should be special constables authorized to arrest drunken or disorderly persons. In running cars they should have the right of way, and other vehicles should not be allowed to detain the cars and their passengers.

Finally, after paying their rental they should be exempt from all taxation, ex-

cept on real estate owned by them. In lieu of taxation the payment to the community should be by lowering fares. The accounts of the companies should be subject to the inspection of public officers, and when the net earnings during a certain number of years should be found to exceed *ten* per cent. on the capital invested, a lowering of fares should take place. In case of dispute, the matter should be settled by arbitration. It may be said that fares can only be lowered a cent at a time, and that this is too much. But there is nothing to prevent the sale of tickets in bunches of twenty-five, at any fraction of a cent discount.

All these stipulations should be embodied in contracts between the cities and the companies, which should be perpetual, except in case of forfeiture by the company for neglect or non-performance of duties. All the mutual stipulations the courts should enforce. It seems to the writer that such an arrangement would place the operating of rapid transit lines in the same position as if it were done by the public directly, except that the payment to the company would be a possibility of a ten per cent. dividend to be earned by business ability, instead of payment by fixed salaries. It is a great mistake to tax transportation in any shape, for all experience has shown that the tax comes out of the public in the end, from economies which result in inefficient service. The higher the tax the company pays, the less it does for the public in other ways. Also, high taxes upon corporations are direct incentives to public extravagance. On the other hand, the lowering of fares is a positive gain in every way. When the fares on the New York elevated lines were reduced from five cents during four hours and ten cents during the rest of the day, to an uniform fare of five cents all day, the increase of travel more than repaid the Manhattan Company. The saving to the community during five years has amounted to $1\frac{3}{10}\%$ cent on \$90,824,786 fares, or a total of \$12,107,600. If the city of New York had taken this sum in taxes, what would it be now? There is no reason why, when new franchises are to be granted, that the city should

give away a safe ten per cent. investment. A rental should be fixed, based upon the cost of condemnation of damages for right of way, and the franchise should then be sold to those who would bid the highest sum for it, after agreeing to pay the rental and be bound to perform the duties we have described. The maximum allowable dividends are purposely placed high, so as to induce the companies to adopt improvements and attract custom, as private individuals do in their business. If they were restricted to a small dividend, they would not be induced to improve their service and change from horse to cable or electric motors. Under some such mutual arrangement as we have suggested, made definite and lasting, not only would street railway investments be safer and more attractive, but the complaints of slow and dirty cars and no seats would quickly disappear.

Finally, we re-state our original propositions :

The population of our cities is increasing in a greater ratio than that of the country at large. This increase is caused by the increase of industrial occupations which can best be done in a city. The growth is mainly a suburban growth, and the places once occupied by crowded tenements are being taken for purposes of business and manufacture. The steam railways can supply food and access to a city of any size. The growth of cities will never stop as long as these conditions last. The only question is, how to get in and out from the suburbs

where people live, to the heart of the cities where they work and trade. The solution is found in such methods of rapid transit as we have attempted to describe, or in other better ones yet to be invented. What shall be the relations between the community and its servants, the chartered companies, is one of the most important questions of the day.

Henry George, in his letter to His Holiness, Pope Leo XIII., says : "There is a natural law by which, as society advances, the one thing that increases in value is land—all growth of population, all advance of the arts, all general improvements of whatever kind add to a fund."—So far we all agree with him. But this is his conclusion : "Add to a fund that both the commands of justice and the dictates of expediency prompt us to take for the common uses of society."

No ! Mr. George. So long as a poor man can buy an acre of land within an hour's ride of that city where he finds constant work, and can buy everything he wants at the best rates, and do all that for ten cents a day—he will never allow Henry George to tax his little home out of existence for the good of an imaginary creature of the brain called Society. And this increase of health and comfort to the people, this strengthening of the bonds of the commonwealth, this barrier against anarchy, has all been brought about by the humble invention of "paving the roads with iron bars." Thus doth God work His changes upon this earth.

SEA - BEACHES.

By N. S. Shaler.

THERE are two great divisions of the shore-line which even the cursory observer quickly learns to recognize : these are the cliffs and the beaches. In the cliff section he easily perceives that the sea is gaining on the land. The conditions under which the ocean extends its empire afford, as we have already seen, a beautiful subject for inquiry. We have now to turn to the

parts of the coast where the sea spends its energies, not on rocky steepes, but on the softer—yet really more resisting—walls of sand. Below the frowning walls, formed where the surges are effectively assailing the land, we find generally a wide slope where the breakers are continually at work grinding the stone they have rent from the cliff into small bits. Usually, however, this