

ity of their steam ejectors to recharge them, and to continue pumping in case of stoppage, or their losing the water at any point, when the level of the water was below the centre of the runner.

"The trial was had in the case of the main pump with the water in the suction tunnel on a level with the fifth altar of the dock; with the small drainage pump it was recharged when the water had entirely left the floor of the dock, and was not more than two feet above the floor of the well.

"Finally, the board have to report that, the obligation of the contract in the mean capacity of discharge per minute of each of the main pumps and of the drainage pump, after a fair and thorough test, has been fulfilled, and that the general efficiency of each and all of these pumps is highly satisfactory."

4724 SPRINGFIELD AVENUE, PHILADELPHIA, PA., SEPTEMBER, 1894.

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## ELECTRICITY IN THE MODERN CITY.\*

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BY THOMAS COMMERFORD MARTIN.

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[*Concluded from p. 211.*]

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If you are not familiar with the statistics of electric railway work, I may commend them to your observation as another striking instance of the manner in which, in America, the visionary schemes of the inventor soon become the solid realization of the public. They show, I think, that in this respect, as in so many others, electricity is worthy of the graceful compliment that Florizel paid to Perdita: "What you do, still betters what is done."

For the vast majority of our cities and towns, electricity becomes the sole means by which they can enjoy that which counts for so much in the sum of comfort and convenience—swift, cheap, frequent and profitable transportation. Moreover, as Captain Eugene Griffin once put it: "The public was realizing that a good street railway security is bet-

ter than a Western railway bond or stock. Electric railways will pay where no one would dream of building a horse road, and when the public taste is whetted for electrical securities we shall see a marvellous increase in the number of roads." That saying has already come to pass, and to-day, where you will find one new horse road or cable road projected, you will find at least 100 electric. That is near the actual proportion, with such results that the *Philadelphia Stockholder*, in a recent issue, published a diagram showing graphically that the dividends on all the street railways of the country are three times as large as those on the steam railways. It need not be wondered at, therefore, that local capital, which has hitherto been the mainstay of street railway enterprises, will have to compete with the investors of our centers of finance.

But I am not so much concerned with that, for a question of greater interest is that as to the effect of this change on the husbanding of other resources—I mean the vital, physical, moral and social elements of our city life. I look upon electric roads as a beneficial agency in the more uniform distribution of a happier population around any center, thus increasing the value of outlying property, and, by the stimulation of local trade, enhancing the profit earned in the area lying within the region thereafter more legitimately restricted to business occupancy. If a man is compelled to live in a city and pay high rent because rapid transit facilities are bad, he takes Irish views on the landlord question. If he lives far out and wastes his time and strength on a tiresome journey, he is an active sympathizer with the eight-hour movement. We all know that the value of real estate is affected by the concentration of population, and this is true of both office and dwelling property. But it is a singular fact that the discontent as to high rents does not apply to the occupancy of offices, and I think that one of the reasons of that has been that the majority of the workers in offices are either able to dwell nearer the scene of their labors, or, if living further out, are less restricted as to regular hours of service. But for the great bulk of any community the matter of dwellings is a most serious one, touching the deepest problems of life and conduct. Mr. Carroll D. Wright, the United States

Commissioner of Labor, put the case in a nutshell in a recent *Popular Science Monthly*, when he said : " By the old methods of transit from suburbs to the heart of the city, a workingman going into the city of Boston was practically obliged, while working ten hours at his occupation, to spend an hour on the horse railway, where now, by the use of the electric car, he can go and return from his place of work in half that time, thereby actually adding to his own time half an hour each day, practically reducing his working time from eleven hours to ten and a half hours, without reduction of wages and without increased expenses for transportation. The question of rapid transit, therefore, as seen by this simple illustration, becomes an ethical consideration ; for if there is anything to be gained by adding to the time which men have at their disposal for their own purposes, for intercourse with their families, for social improvement, for everything for which leisure is supposed to be used, then the question of rapid transit is of far greater importance than that of saving money, either to the man who uses the transportation or to the company that secures dividends upon its stock."

To make such toiling men owners of their little homes seems to me infinitely more important than making them stalwart Republicans or Jefferson Democrats, and I would ten times rather see them sitting quietly and free in the shade of their rural fig trees than parading through the city mud and waving the banner of a ward boss, whose prosperity depends on their being under his thumb or heel, while they live in garret or cellar. No modern city anywhere has anything like adequate means of travel ; and yet, when the time comes for a great city to exert itself, how the facilities of rapid transit make for a pure city government ! Old London is herself an instance of this, for so long as her swarms hived within narrow limits she was municipally as corrupt as any city could well be ; but to-day, with her population spread over a vast suburban area, and with multiplied means of communication, she governs herself as I believe no other community in the world can claim to do.

I am fully satisfied that much of the modern lack of indi-

vidual interest in city life on its municipal side has arisen from these two things—the crowding together of the poor, and the living in remote suburbs of another part of the population, which, when it gets home, is too tired to come back even to resent public robbery and jobbery. But the evil has been a deeper one than this. Throughout this great country of ours there are about 11,500,000 dwellings, with nearly one family to each, that family being just a fraction short of five persons. But in New York City we have only 81,828 dwellings with an average of nearly four families per dwelling. As a matter of fact, only about twelve per cent. of all the families in New York have homes to themselves, and eighty-two per cent. live in tenements. Does anyone doubt that with more homes—or better rapid transit, which means the same thing—New York would be a better city? Does anyone doubt that if in better touch with her outlying suburbs, full of houseowners, Philadelphia would have a higher type of popular government than it now enjoys?

That electric roads do stimulate and vivify city life, is apparent to all who study the subject. We find at once that levelling up of values and that distribution of prosperity which is the aim and sum of all political economy. It is not at all an infrequent thing to see the adoption of electricity doubling and trebling the traffic of a street railway, while a permanent addition of thirty per cent. to the traffic is now taken as an absolutely safe minimum. It is unnecessary to point out what that means. Cambridge, Mass., with a population of about 70,000, pays the West End Company, of Boston, 50,000 to 60,000 fares daily, corresponding to five-sixths of the population on a single fare basis, and giving a total average of nearly 250 trips per year per inhabitant, or five times the general average for twenty-two other Massachusetts communities. As to the increased value of property, we may take the case of Brookline, Mass., where, owing to the service of the West End road, running at a suburban speed of twelve or fifteen miles an hour, the real estate valuation has risen far above \$30,000,000 from about \$17,000,000 in 1885. Every member of the community is

the richer for that change, and the same assertion might be made for scores and scores of other communities. The little electric road, that has cost, perhaps, \$100,000, has added ten times that value to the property; it has brought the price of land within the means of the people, to whom the ownership of house and home, even in this boundless America of ours, began to be as improbable as the possession of an Atlantic steamship.

Moreover, look at many of the additional uses to which these electric roads are being put. In some cities they carry the mails regularly. In others, their extension of the express system has given an entirely new development to the freight business. In many cities there are funeral cars that simplify and cheapen the heavy burdens of decent burial. Several roads have been built as links between steam roads, while others give the people access in the summer time to breathing spaces that were previously beyond reach. I have even heard of hotels whose peculiar feature of excellence is, that they have electric cars running to and from the depots for the particular benefit of their patrons.

It may be said that I am very much alive to the advantages of electric traction and not a little blind to their defects. Perhaps that is true, but it has seemed to me that the assailants of electricity did not need any help. I am not talking about a perfect thing. Few of our electrical applications have seen their best days. I am free to confess, however, that it does disgust me to hear people complaining about the ugliness of the overhead wires or the dangers of the trolley, while they complacently tolerate evils that really have an existence. I echo the remark of Mr. Fred-eric Harrison, that "To decry steam and electricity, inventions and products, is hardly more foolish than to deny the price which civilization itself has to pay for the use of them." When I hear people in New York abusing overhead wires and almost in the same breath advocating an extension of the elevated railway system, I pray God to spare me from any such obliquity of vision.

Not long ago, a fellow-citizen of mine, who was railing

against overhead wires along a certain street, was unable to say on which side of the street the wires were. Now, I will take second place to no man in civic pride or in admiration of fine thoroughfares, but I fail utterly to see that a good piece of overhead trolley construction is inferior in comeliness to the architecture of most of the streets it occupies. On the contrary, I have seen many a street, whose whole air of thrift, and whose only pretence to trimness and symmetry, was due to the wires that ran above it. Another point is the accusation of danger brought against electric cars. Now, as a matter of fact, electric cars in this country have already carried more passengers than would equal the entire population of the globe, and I defy anyone to point to a single instance in which a passenger has been killed or even injured by the current. Other accidents you will have, of course. Electric and cable cars travel faster than horse cars, and hence, there is, upon their introduction, an increased number of accidents from the unfamiliarity of pedestrians and drivers with their speed. But, even if this higher number should be maintained, I must insist that against it shall be put the saving of life and the increase of health that come from the adoption of a method which gives back to the dweller in the city his birthright in the country.

One more point, and I will refrain from the discussion of a topic that has so many aspects. It is commonly and truly understood that the resort to electricity, while accompanied generally by large investment, leads to a saving in operating expenses. For example, the Rochester Street Railway, for June, 1891, showed earnings with electric cars 22'77 cents per mile, and expenses 11'07 cents; while their cars with horses earned 14'37 cents and cost 12'06 cents to run. In other words, the net earnings with electricity were 11'70 cents, and with horses 3'31 cents. The assumption generally is that the city granting the franchise should share directly from this saving, as well as indirectly from the increment in the taxable value of property, and from taxation of the road in the ordinary way. In many respects the theory is right, but as our old friend, Captain Cuttle, would

say: "The bearings of this observation lies in the application of it."

This very desire to exact a share in the benefits of a new thing, so beset and burdened the electric light in England, that, even to-day, though now encouraged by less grasping legislation, it is still scarcely known. In New York our experience in putting up street railway franchises to the highest bidder has taught a painful lesson in the repression of new enterprises that are badly needed.

The question very often resolves itself into the balancing of advantages. It may, on the one hand, be well to get a few thousand dollars in extra taxes; but if this exaction, well meant though it be, compels the company to use old and inferior rolling stock, or to curtail the service on lines it would like to build up, then the city would be richer in the long run if its citizens could ride about in new cars and did not have to linger about street corners on bleak nights waiting for the car that seems as though it would never come. There is open the alternative of city ownership, a plan which appears feasible only when the city owns the road and leases it. This practice obtains in Glasgow and Liverpool, and, as might have been expected, the double responsibility leads to no end of trouble. Our American cities may, perhaps, be in shape to try the experiment, after they have learned how to keep their existing highways in decent condition.

I hope soon to see overhead trolley cars supplemented by storage battery cars, and by conduit trolley cars, and, more particularly in large cities, by elevated and underground electric roads. Evidently it is only with tracks above or below the surface that we can ever attain the high speed to which the phrase "rapid transit" will justly apply; and I think that by-and-by, in our largest cities, travel will be wholly by electricity, above or below the street surface. It is for that reason, but in no other sense, that I regard the trolley system as a make-shift. On the contrary, it is worthy the praise and support of every American proud of American inventive genius, and of the quick American appreciation of new methods and ideas.

There remain many branches of electrical work that I have not touched upon, which are really of vast importance to the dweller in the modern city, but I have devoted the hour to the leading three—the communication of news and intelligence, the use of electricity for light, heat and power, and the employment of the electric motor as a means of traction—thus affecting the three greatest elements in our daily city life.

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## AËRIAL NAVIGATION.

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BY. A. F. ZAHM, Johns Hopkins University.\*

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In his lecture on aërial navigation delivered before the students of Cornell University in 1890, Mr. Chanute began his remarks with a hesitancy amounting almost to reluctance, seeming to entreat the young men not to believe that the study of such a subject was a more than probable indication of failing mental vigor. If he could appear before you this evening it would doubtless be very gratifying to him to realize that an audience of sober scientists and engineers were willing to listen for an hour to hear something of the venturesome art of flying through the air.

It is indeed a source of pleasure to all earnest students of aërial navigation to observe the general awakening of public interest in their efforts within recent years; for it lends, as it were, a dignity and reasonableness to their pursuits which is at all times comforting. It almost inspires them with the courage to experiment in the broad light of day, to forsake the garret and the lone watches of the moon, to come out from behind the hedge rows and to look the inquiring world frankly in the face. Let us hope that their achievements may justify the public attention and that the present sympathy of engineers may but prove one of the earlier manifestations of

“The prophetic soul  
Of the wide world dreaming on things to come.”

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\* A lecture delivered before the Franklin Institute, January 5, 1894.