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The editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE ECONOMY OF ELECTRIC TRACTION.

It is not often in the development of a comparatively new invention or industry, that we have such a rare opportunity to test the new against the old as has been afforded by the substitution of electric for steam traction on the Manhattan Elevated Railroad system in this city. Here was the case of a long-established railroad that had been operated for several decades under the same management upon practically the same lines, that suddenly made a complete change in the character of its motive power, the other conditions, such as track, rolling stock, character of traffic, etc., remaining precisely the same. Hence the comparison is devoid of those complications arising from incidental and outlying influences, which are too often overlooked, but nevertheless exert a powerful modifying effect upon the ultimate result. It is, indeed, impossible to lay too much stress upon the significance of the results shown in the first months of the electrical operation of this railroad; and it is conceded by electrical engineers that in the present case the relative merits, in point of convenience to the public and economy for the company, have been proved to absolute and final demonstration.

Now, let us consider the official statement of the earnings and expenses of the system for a period of three months in two successive years, namely, the quarter ending June, 1902, and the same quarter in 1903, it being borne in mind that during the first quarter the Manhattan Elevated Railroads were operated entirely by steam, and in the second quarter entirely by electricity. During the quarter ending June, 1902, the gross earnings under steam operation amounted to $2,857,250. In the same quarter in 1903, the gross earnings under electrical operation were $3,271,787, an increase of $414,537. The expenses for the quarter in 1902 were $1,401,106, and for the same quarter in 1903 they fell to $1,302,089, a decrease of $99,017. The net earnings, therefore, showed for the quarter an increase due to the introduction of electrical traction of $513,534. These are most surprising and gratifying results, better probably than even the most sanguine advocates of electric traction would have predicted; and they are particularly gratifying when we remember that both the company and the public have reaped the benefit; for while the company's earnings have been largely increased, the public are being carried at greater speeds, with less crowding, and on a more frequent service than they ever knew or dreamed of in the days of the steam locomotive. The great increase in the capacity of the road is to be attributed primarily to the greater tractive power which can be applied to trains under electric than under steam traction, particularly on a structure like the Manhattan Elevated, which has a very limited carrying capacity, and will not admit of wheel loads above a certain limit. The old steam engines, built to carry the maximum amount of load on their axles that the structure would permit, exerted a maximum drawbar pull of 7,000 pounds, and the longest trains that could be hauled at the slower speeds that prevailed under the old system, consisted of five cars. With motors carried on the axles of the cars, however, the power was raised to the equivalent of a 20,000-pound drawbar pull, or the equivalent of about three of the steam locomotives. This resulted in an acceleration of the speed of from 20 to 30 per cent. At the same time, the old vacuum brake was replaced by the Westinghouse air brake. Moreover, it became possible to run six-car instead of five-car trains, and thus it will be seen that with an increase of twenty-five per cent in train speed and twenty per cent in the size of the trains, the capacity of the road was vastly augmented. The immediate effect has been an increase in the capacity and number of the trains, a marked decrease in the crowding of the trains, and an all-around improvement in the service. As showing the distance covered by the trains, it may be mentioned that, although there is a total of only 110 miles of track, the train service has reached under electric traction an average of 165,000 car-miles per day. Now just what this means can be best understood by a comparison with one of the trunk lines, say, for instance, the New York Central between New York and Albany. Taking as a basis the Empire State Express, which is a four-car train, we find, by a little calculation, that in order to maintain a service of these trains that would make in a single day a car mileage of 165,000 miles, it would be necessary to start an Empire State Express at intervals of ten minutes, both from Albany and New York, throughout the whole twenty-four hours. Summing up the results of the change from steam to electricity, we find that it has reduced the operating expenses at the rate of about $400,000 per annum, and increased the earnings at the rate of over $2,000,000 per annum. To have done this with the added convenience to the public of higher speed and more frequent and more comfortable service, as a feat upon which the electrical engineers are to be most warmly congratulated.

Public attention will now turn naturally to that other great work of electrifying steam railroads, namely, the change of the New York Central lines, involving the whole of the suburban traffic for from twenty-five to forty miles out of New York. While it is too much to expect that on these roads, with their heavier trains and less frequent service, equally remarkable economies will be effected, we have not the slightest doubt that the advantages both to the operating companies and to the traveling public will be so great, as to bring the date of the complete electrical operation of all-steam railroads, long-haul and short-haul alike, within measurable distance.

THE STORAGE RESERVOIR AS A PREVENTIVE OF FLOODS.

Although the suggestion to use storage dams as a preventive of excessive floods has been carried to somewhat extravagant lengths of late, there is no question that there are many rivers in the United States subjected to disastrous overflow which might be kept within their bounds by this very practicable method of control. As a case in point we might mention the turbulent Passaic River, which has played such havoc upon that twice-stricken town of Passaic, N. J. Here is a case where the loss of several lives and several million dollars has twice occurred within a few months, because of the inability of the river to carry off the surplus waters of a heavy rainfall. The magnitude of the recent precipitation, when in the course of two days there was a fall of 10½ inches of water, proves that in a case like this the only possible method of control would be the temporary storage of the excess waters during the rainstorm, and their subsequent gradual release into the ordinary river channel. In commenting on the possibilities of such control, our contemporary, the Passaic Daily News, quotes from the report of C. C. Vermeule, of the New Jersey State Geological Survey. The report, which was called for by the State after the disastrous flood of last year, proposes to create storage reservoirs converting certain flats in the Passaic Valley into artificial lakes. This remedy would be a sanitary measure; would serve the purpose of draining these flats; would render heavy freshets harmless; and would have the great advantage of maintaining the normal flow of the river at four times its ordinary amount. At the same time the provision of these reservoirs would mitigate the sewage evil, keeping the river well flushed, while incidentally it would afford at Little Falls and Passaic an extra provision of over 10,000 continuous hydraulic horse power. Consequently, not only would the city be safeguarded against the recurrence of these most disastrous floods, but the very works by which this security was obtained would prove a valuable asset to the city as a source of light and power. On the face of it, the report calls for the most serious consideration on the part of the authorities, and if the proposal is carried through, its operation will be watched with close interest in other communities that are subjected to similar disastrous overflows.

THE FIRST TURBINE ATLANTIC LINER.

The steam turbine having proved highly successful in its adaptation to steam yachts and the smaller types of passenger steamships engaged in the Clyde and the English Channel traffic, it has been decided to construct an Atlantic liner equipped with this engine in place of the ordinary reciprocating engines. The Allan Steamship Line have been closely following the developments of the turbine-propelled vessels at present in operation, their behavior under all conditions of weather, their speed, economy, and steadiness in travel, and proportion of coal consumption in relation to the speed developed. They have now decided to build a ship equipped with the turbine for traffic between the Clyde and Canada. This liner when completed will be the largest and heaviest, as well as the fastest vessel in the Allan fleet.

The contract for the construction of the vessel has been placed with the shipbuilding firm of Workman & Clark, of Belfast, Ireland, and the turbines will be built by the Parsons Company, of Newcastle-on-Tyne. The vessel will be 500 feet in length over all, with a gross tonnage of 12,000 tons; a horse power of 10,000 indicated, and a contract speed of 17 knots.

It may be urged that the speed is very low in comparison with that of some of the vessels driven by reciprocating engines plying between New York and Europe; but it is a noteworthy increase in speed of vessels plying between Canada and Great Britain. As a matter of fact, this latest ship will be two knots faster than any other Allan liner running to the Dominion ports, while it marks an increase in tonnage of about 1,400 tons upon the last-constructed vessel, the "Tunisian," of the Allan fleet. It is anticipated, however, that when the vessel is in commission, the contract speed will be exceeded. There is no doubt that had the British or the Canadian government seen the way to grant a subsidy to the Allan line in regard to this vessel, a greater speed would have been arranged; but it is conceded that 17 knots is the fastest speed which the promoters can hope to maintain at a profit in a vessel engaged in this class of traffic. At all events, it will satisfactorily meet all the requirements of the St. Lawrence trade.

To the Allan line will consequently pertain the honor of having introduced the turbine in a transatlantic liner, and the results of the experiment will be followed with keen interest by the various shipping companies engaged in ocean traffic. It also partially realizes the ambition of Parsons, the inventor of the turbine, who from the first has maintained that his invention was the most satisfactory system of propulsion for deep sea trade.

THE TELEPHONE AND THE RAILWAY.

Some interesting tests have recently been made on a number of American railway lines with the telegraphone, which should not be confused with the Poulsen telegraphone recently described in these columns. Trials have been made on the Rome, Watertown & Ogdensburg division of the New York Central system, the Buffalo, Rochester & Pittsburg, as well as the Atchison, Topeka & Santa Fé.

One object of the telegraphone is, in case a train is halted between stations, to enable the trainmen to communicate at once by telephone with the dispatcher at either end of the line, without interrupting the telegraphic business on the wire so utilized. One of its functions also is to establish communication at will between a station where there is no telegraph operator or a siding with the dispatching officers of the division. In order to accomplish these results, a telegraph wire, which may be the wire used by the dispatcher or any commercial wire, is equipped especially for the purpose. In equipping a train, a special telephone is installed in one of the cars. This telephone is provided with a reel, an insulated wire, and a portable extension rod to which connection from the train telephone is made. The extension rod is provided with a file-surfaced clamp, which is placed on the telegraph wire, thus establishing electric communication between the train instrument and the wire, without cutting into the line.

If a train, equipped with the telephone appliances, is halted between two stations, and it is desired to get into immediate communication with the dispatcher, by means of a special magnet, a direct pulsating signal is made, which gives the telephone call to all of the Morse instruments on the line on the side of the temporary connection with which it is desired to communicate, neglecting the Morse instruments on the other side of the temporary connection. This call is a signal for the dispatcher to go to the telephone installed in his office. Having done so, he is in direct communication with the halted train by telephone. While communication with the train is maintained, as has been said, the business of the Morse circuit on the same wire is not interrupted, nor is the telephone communication interrupted by the operation of the Morse circuit instruments. If it is desired to communicate with the dispatcher at the other end of the division, a plug is placed in another "jack" in the train instrument, and the initial signals affect only the relays on that side of the temporary connection. Wherever instruments are placed in stations, and when it is desired to communicate with the dispatcher from a station, the operator at the station calls the dispatcher to the telephone, by signal over the wire. When a track instrument is placed at a siding, all that is necessary to summon the dispatcher to the telephone is to give the emergency ring on the telephone.

The method of equipping a wire for telephone pur-