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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.

IS THE MOTOR BUS PROFITABLE?

The development of the motor bus in the United States has been slow and its use is at present decidedly limited. In England, on the contrary, and particularly in the city of London, this type of conveyance has experienced a really phenomenal growth, both in numbers and the amount of traffic handled. The traffic conditions in London are particularly favorable to the development of this form of travel. The horse-drawn bus has for many decades been one of the most popular means of travel in that city, particularly for short distances; and when the motor bus entered the field, it found the traffic already developed on an enormous scale. Furthermore, it is stated that the English laws regulating the grant and the usage of franchises have been as favorable to the bus companies as they have been stringent in their application to steam and other railroads. Moreover, the best of mechanical skill has been applied to the perfecting of the motor bus. So successful, in point of numbers carried, have been the motor bus companies, that the various other lines of transportation, both surface and underground, have suffered severely from the competition. Nevertheless, according to recent dispatches, it would seem that in spite of the favorable auspices under which the motor bus traffic has been operated, most of the companies find that they are steadily losing money, the chief cause of loss being the high rate of depreciation of the engines and running gear—a drawback which in the early years of the development of the automobile made itself painfully felt to all owners that were not favored with a generous bank account.

PROPOSED TEST OF FULL-SIZED BLACKWELL'S ISLAND BRIDGE CHORD.

Capt. Eads, whose great arched bridge at St. Louis and whose valuable work in the control of the Mississippi River have won for him a distinguished place in the field of engineering, possessed in an eminent degree that distinctive quality of the truly great engineer, of being ready at any time to break completely away from tradition, even to the extent of adopting methods, apparently crude, to secure his results. The merit of his great bridge across the Mississippi lies in the fact that he had but little precedent to go upon, and that, when he flung these huge 520-foot steel arches across the river, he struck out on bold, original, and largely untried lines. He realized at once that the most vital part of any framed structure, subjected to great stress, is its compression members—a fact which our later engineers seem somehow to have forgotten, or whose importance, at least, they have ceased to realize. These compression members in the Eads bridge were of circular cross section, and built up of steel plates. Although Capt. Eads had designed them after a thorough study of the comparatively meager literature on the subject, he did not trust either to theory or the analogy of such existing structures as included large compression members, but determined that the only way to turn a seeming certainty into an assured fact was to take one of these full-sized sections and crush it to destruction in a testing machine. Unfortunately there was at that early day no testing plant that was of sufficient capacity to do the work; and because of the difficulty of putting up a machine that would provide abutments of sufficient reactive strength, it would have been a matter of great expense to build one of the usual type. Capt. Eads decided, therefore, to extemporize a testing plant, and he did so in a very simple, cheap, and highly efficient manner. He selected a stone quarry, in which were two opposed vertical walls, the distance between which was a few feet greater than the over-all length of his compression member. The latter was placed horizontally between the walls, and at one end a hydraulic cylinder of short length, but large diameter, was interposed between the member and the wall of the quarry. All that was then necessary was to attach a small hydraulic pump to the cylinder, and a gage to record the pressure. This very cheap and simple device worked admirably, and the exact crushing strength of the column was determined. It was suggested to the writer several months ago by former Bridge Commissioner Lindenthal, that a similar test of the much larger and stronger bottom chord of the Blackwell's Island Bridge could be made at a comparatively small expenditure of money, and the question of its safety, or otherwise, be at once put beyond all doubt. We now note that the suggestion has recently appeared over Mr. Lindenthal's signature in our esteemed contemporary Engineering News, and that the editor of that journal has given it his strong indorsement. At the present writing the strength of the bridge is under investigation by Prof. Burr, of Columbia University, on behalf of the City Bridge Department, and by Messrs. Boller & Hodge, who are acting under instructions from City Comptroller Metz, who declared some months ago that he would sanction no further payments upon the bridge until the question of its security had been amply demonstrated. Mr. Boller has assured us that, if his investigation leaves the question of the strength of the bottom chord in any doubt, he will recommend a test, either of a model built to scale, or of a full-sized member. We think that if any test be made, it should be of the full-sized piece, not only because of the greater certainty thereby obtained, but because such a test would afford a most valuable reference in the design of future long-span bridges. If the tests were carried out by the simple methods adopted in the case of the Eads bridge, the expense would be insignificant in comparison with the important interests involved.

THE PNEUMATIC TIRE AND THE HEAVY COMMERCIAL AUTOMOBILE.

In a paper recently read before the French Society of Civil Engineers the well-known tire expert, M. A. Michelin, offered some valuable suggestions on the proper design of tires for heavy commercial vehicles.

The pneumatic tire has hitherto been found useless for heavy weights, for two reasons: The largest pneumatic tire cannot safely carry more than fifteen hundred pounds and the pneumatic is inferior in economy, owing to a fact which many experiments have permitted M. Michelin to express in the following empirical law:

"The total travel of which a tire is capable is inversely proportional to the cube of the weight which it carries." For example: If the load is doubled the average wear and tear will be multiplied by eight, and an increase in weight of 5 per cent will cause an increase in wear and tear of 15 per cent.

So, every attempt to increase the load has been followed by such rapid wear of the tires that their employment had to be abandoned.

Hence, it has been found necessary to retain the solid rubber tire in order to lessen noise and soften shock; but India rubber, although very elastic and easily deformable, is almost incompressible, at least far less compressible than most solid bodies. This curious fact is not generally known. The solid rubber tire may be compared to a hollow tire filled with water, instead of air. It diminishes noise, but for deadening shock it is little more satisfactory than an iron tire. It permits, furthermore, only a slight increase in speed, so that some of the best constructors of heavy vehicles are now recommending the employment of iron tires together with speeds not exceeding 11 miles per hour. This limitation of speed is absolutely opposed to the chief object of the employment of the explosive motor. If there is to be no increase in speed, traction by horse power is far more economical.

At present the situation of the heavy weight vehicles is precisely the position occupied by the touring car before the adoption of pneumatic tires. The vibrations and shocks transmitted to the chassis and to all the mechanism rapidly wear out the motor and gearing. Of 162 vehicles possessed by the Paris Autobus Company, not more than 97 are ever in service at once, although the repair and maintenance shops employ a force of 200 mechanics. Yet the oldest of the vehicles has been in service only eighteen months.

The problem of tires for heavy vehicles is therefore still unsolved. To prove how unsatisfactory is the solid rubber tire, M. Michelin cites the following experiment: A wheel was caused to rotate with the tire velocity of 15½ miles an hour while carrying a load of 1,100 pounds, and furnished alternately with a pneumatic and a solid rubber tire 2⅓ inches thick, which was in contact with the broad tire of another and larger wheel upon which different small obstacles could be fastened. The displacements of the hub of the small wheel were inscribed in their true dimensions by a style upon a rotating cylinder. Vibrations amounting to ¼ inch for the solid, but only 1/50 inch for the pneumatic were recorded, even when no obstacle was present. These vibrations are caused by a slight eccentricity of the large wheel. They give an idea of the inferiority of a solid tire, which is confirmed by the passage of the wheel over obstacles. The first obstacle was a semi-cylinder about 4/5 inch high. This produced an elevation of the wheel amounting to 0.16 inch with the pneumatic and 0.40 inch with the solid tire. In other words the pneumatic absorbs four-fifths and the solid tire only one-half of the obstacle. The difference increases with the size of the obstacle. On an elongated block 4/5 inch high, the rise was 0.36 inch with the pneumatic and 1.16 inches with the solid tire. A semi-cylinder 1.2 inches in height caused the wheel to rise 0.28 inch with the pneumatic, and 1.04 inches with the solid tire. Finally, with an elongated obstacle 1.2 inches high, the wheel rose 0.44 inch with the pneumatic and 2.36 inches with the solid tire. In every case the ascent of the wheel, carrying a pneumatic tire, is less than the height of the obstacle; while with the solid tire the ascent is always greater than the height of the obstacle, unless this is very small. In endeavoring to repeat the experiment with the solid tires, the steel axles of the two wheels, whose diameters were 1.8 and 2.4 inches, became sprung. In order to avoid breakage the manufacturers of heavy automobiles have been obliged to reinforce their axles. M. Michelin states that he has seen axles made of I bars of forged steel of a height of 9 inches. For heavy-weight vehicles Michelin recommends the multiple pneumatic. It may consist, according to the weight which it has to carry, of two or more pneumatics, placed side by side upon the same wheel. For heavy vehicles, we are not concerned with high speed, and the construction must be adapted to give great strength in supporting loads. The envelope of the multiple tire, therefore, would not be suited for a touring car. It might be feared that two or more tires exposed together to the inequalities of the road would wear out almost as soon as a single tire, but this is not the case. Twin tires are found to last from three to seven times longer than single tires.

This is chiefly due to the law which we have already quoted, but there are other reasons. The twin tire suffers less from the brakes because their pressure is distributed over double the surface. Seventy-two experiments have proved that, at the same pressure, a pneumatic of small diameter absorbs obstacles better than one of large diameter.

ON COURTESY.

A large railway company, which every morning pours into New York thousands of suburban residents and in the evening carries them home again, has issued a set of five rules for the consideration of its agents and conductors—a semi-decalogue which constitutes an admirable code of manners and which may well be adopted not only by other railways, but by almost every public institution and business house. Conductors whose task it is to collect railway tickets usually assume an attitude which may best be described as restrained ferocity. Tickets are imperiously demanded, rarely asked for. When they are held out with rabbit-like submissiveness, they are snatched as if the passengers were reluctantly disgorging property stolen from the company. Starting with the principle that courtesy is a practical workaday application of the Biblical command to do unto others as you would they should do unto you, the little code of manners referred to points out that railroading is a highly complex and technical business, with every detail of which the employee of the road must be familiar, but of the intricacies of which the passenger has no conception. If in his bewilderment the patron of the road should seek enlightenment surely it is the duty of the employee to give politely and clearly whatever information may be asked. The manner of expression as well as the actual words used constitute an important element in the art of being polite. As the rules in question put it "a gracious manner . . . is to your words what oil is to machinery in making them more effective to their purpose."

The suggestions here very briefly summarized may profitably be applied by every business man in his daily commercial life. The man who solicits your advertisement, the salesman who has samples to exhibit, the life insurance agent whose hair-trigger tongue pleads eloquently for your family, even the seductive canvasser who tries to inveigle you into buying a history of the world in twenty-five volumes, can be listened to for a courteous minute or two and politely dismissed without seriously clogging the wheels of business. Perhaps they may really have something worth while of offer. Above all, the tellers and the cashier