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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.

GOVERNMENT INVESTIGATION OF RAILROAD ACCIDENTS.

The increase in the number of railroad accidents during the past winter has been so alarming as to suggest the urgent need for some preventive measures, immediate and drastic. There is little hope of any movement looking to this end being made by the railroads themselves. They are too hopelessly hidebound in conservatism and self-sufficiency to admit that remedial measures can be taken that will have any material effect in decreasing, or rather in staying the increase in, the number of passengers and employees that are killed and wounded in the day-by-day operation of railroads.

The remedy must come from the outside, and it can be found in the introduction of that excellent system of government inspection of railroad accidents, which has been in vogue for many decades in some European countries, and notably in England, where government inspection has been the chief factor in the wonderful immunity from accident which the railroad system of that country has enjoyed. Although two or three serious accidents have caused the death rate to rise to an unusual figure during the past year, the average annual number killed is extraordinarily low, and recently in a single year over a billion passengers were carried without the loss of a single life. In the United States, where we have no adequate government inspection of accidents, our railroads, during a period of a little over six months of the present year, have killed, in generally avoidable accidents, well on to half a thousand passengers.

Under the British system of government inspection, if a railroad wreck involving loss of life occurs, the railroad officials are prohibited from clearing up the wreck, except so far as is necessary to rescue passengers, until it has been made the subject of a searching examination by the presiding engineer of a Board of Trade commission, appointed specially for railroad wreck investigations. Roadbed, ties, rails, wrecked engine and cars, are left *in statu quo*, in order that the government officials may have every possible scrap of evidence at hand that can in any way assist in determining the causes, immediate and remote, of the disaster. An elaborate report is then prepared and placed on record. It can readily be understood that these reports constitute an invaluable mass of data for the guidance of the railroads in the prevention of future accidents.

Compare that method with the system adopted in the United States, where, as soon as an accident occurs, and especially if it be one incurring heavy loss of life, the wrecking train is rushed down to the wreck, the wrecked cars dragged back onto the tracks and hauled away, the Lord knows where, and those cars that are so badly wrecked as to be incapable of replacement—the very cars, mark you, which could afford the strongest evidence as to the cause of the disaster—are burnt up at the side of the track, and the metal parts carted away to the junk pile. In a word, the evidence upon which an intelligent and impartial study of the wreck could be based, is swept out of existence by the wrecking crew. Frequently, the only fruits of investigation that remain are the individual impressions of this or that head of the department—superintendent, chief engineer, road master, or whoever may happen to be within reach of the wreck.

It is admitted that the leading railroads claim that careful investigations are made of every serious accident; but the results of these investigations are filed away in the secret archives of the company. Such lessons as may be learned from any particular disaster are confined to the officials of the road on which it takes place. There is no dissemination of information, not even among the railroads themselves; and as to the making public of such information, it is never contemplated for an instant. True it is, that the publicity bureau of a railroad is sometimes instructed to make a statement; but such investigations and statements are always *ex parte* in character; and we may be sure that, where an accident is directly due to poor equipment or faulty operation, the typewritten sheets of the publicity bureau will make no mention of the fact.

If the publication of the findings of the Board of Trade investigation of English railroad accidents ended the matter, these investigations would have merely an academic interest; but it is upon these findings that the government regulations affecting the construction, maintenance, and operation of railroads are based; and it is our belief that to this system of investigation, with its subsequent law-making, the English railroads owe their remarkable immunity from accidents.

The crying need of the hour is the institution of a government board for the investigation of accidents on United States railroads. This board should be composed of railroad engineers of ability and experience. They should be paid salaries commensurate with their reputation, and sufficient in amount to place them beyond any possibility of temptation. They, and their local representatives in the various parts of the country, should be invested with sufficient authority to enable them to make the most searching investigation and to enforce the attendance for examination of any official or employee from president to trainman. Upon this commission would devolve the duty of outlining such legislative measures as, in its opinion, were necessary to secure the safety of the traveling public. It is our firm belief that before such a commission had been in active existence five years, the number of railroad accidents in this country would have been cut down 50 per cent, and that before a decade had passed the number would have been reduced to the more humane figures which obtain on European railroads.

COMPARATIVE ECONOMY OF PRODUCER GAS AND STEAM.

It is known in a general way that a good producer-gas engine plant will yield a horse-power upon about one-half the amount of fuel that is necessary to generate one horse-power with a steam plant. The relative efficiency of gas and steam has recently been made the subject of analysis by a well-known pioneer in the field of producer gas, J. M. Emerson Dowson, who bases his comparison upon a steam and gas power plant, each of a capacity of 250 horse-power. In the case of the steam plant, he finds that of 1,120 heat units contained in the fuel, 224 units are lost in radiation, flue gases, ashes, etc., and that 896 units appear in the steam that is generated. Of this amount, 112 units are lost by condensation in the pipes, etc., leaving 784 units that are supplied to the engine. Of these, 667 units are lost in the exhaust, leaving only 117 units to be converted into work in the engine. Of these, 17 units must be deducted for engine friction, leaving only 100 units, out of 1,120 originally in the fuel, available for useful work on the engine shaft. In other words, in order to obtain 100 heat units in useful work on the shaft of a steam engine, there must be 1,120 heat units in the fuel burnt up in the boiler. A similar investigation of the producer-gas plant shows that there need be only 525 heat units in the fuel consumed in the producer to give 100 heat units of useful work on the engine shaft. In the producer-gas engine 105 units will be lost in radiation, etc., from the gas plant; 126 units will be lost in cooling the engine; 177 will be lost in the exhaust, and there will remain only 117 units to be converted into work in the cylinder, of which 17 will be lost in engine friction, finally leaving 100 units to perform useful work. This comparison shows a saving in fuel of 53 per cent in favor of the producer-gas plant. A comparison by the same authority of two 40-horse-power plants, gas and steam, shows a saving of 70 per cent in favor of the gas plant. Excellent as is the economy of the gas plant as shown by these figures, it must be noted that the heat losses are still very large, and future improvement in economy must be looked for mainly in this direction, both in the gas plant and in the engine.

PROGRESS ON THE ERIE CANAL.

As in the case of the Panama Canal, the work hitherto accomplished on the Erie Canal has included a large amount of preliminary operations which do not figure in the statistics of total excavation done in the prism of the canal. At the present writing, over $35,000,000 worth of contracts are either ready to be let or have just been let, and these, when completed, will cover 209 out of the total 440 miles of canal to be excavated. Some conception of the magnitude of the preliminary work which has already been done may be gathered from the fact that the corps of engineers engaged on the surveys have run levels over nearly 1,500 miles, have done the transit work over more than 1,000 miles, and have completed the topographical maps of 130 square miles of territory. The investigation of the sub-surface along the route of the canal by drilling in earth, sand, and stone, has been carried out on a vast scale, the total amount of drilling that has been done amounting to over 40 miles of vertical depth. At the time of the last report of Col. Thomas W. Simons, consulting engineer in the construction of the work, which was made in January of the present year, the work under contract covered a distance of 70 miles and represented a prospective outlay of $20,000,000. A fact, most encouraging and very unusual in work of this character is that every item of expenditure thus far placed on record is below the estimated cost. On that portion of the work then under contract, there had been a saving of nearly $3,000,000 over the preliminary estimates. We have often had occasion to speak in these columns of the far-reaching effect in economy of time and expense which will be produced in engineering works by the extended use of concrete in place of stone masonry. In the present report, the extent of this economy in works of magnitude is forcibly illustrated, for Col. Simons states that when the Board of Engineers decided to use concrete instead of stone for the masonry of the canal, a saving of $16,000,000 was effected on this item alone. The report closes with the welcome statement that the last vestige of organized opposition to the canal work has disappeared. Although this opposition was at one time very active, the interests that were opposed to the improvement of the canal have abandoned their attitude, and no effort is being made in any quarter to hinder the prosecution of the work.

COMPLETION OF THE SECOND TUBE TO BROOKLYN.

With the completion, a few days ago, of the second of the twin tubes by which the Rapid Transit system of this city is being carried beneath the East River, the linking up of Brooklyn and Manhattan by an unbroken stretch of Subway tracks is brought one step nearer realization. Compared with the work of driving the longer tunnels beneath the Hudson River, the construction of the tubes beneath the East River has been a far more formidable task. If we except the difficulties encountered by the English company which attempted to drive the first tube beneath the Hudson River, the work of connecting Manhattan and New Jersey has not been attended with very serious trouble; at any rate, if there have been difficulties, they have been overcome so quietly that the public has heard very little about them. The East River, however, has proved a very difficult proposition, largely because of the varying character and consistency of the material through which the tubes had to be driven, sand, rock, and mud being successively encountered. It is to this variation of the material of the river bottom, coupled with what we have always considered to be the over-light construction of the tubes, that the trouble in the way of faulty alinement and elevation and the distortion of the tubes themselves, is largely due. The bending stresses at the point where the tubes pass rather suddenly from solid rock into soft mud have been so great as to crack some of the plates, and most of the delay on these tunnels has been due to the necessity of repairing these broken plates, and restoring the grade of the tunnel at points where it had fallen below the proper elevation.

PRESERVATION OF STEEL WORK IN TALL BUILDINGS.

The question of the probable condition of the steel work of the modern office building, shut in, as it is, beyond the possibility of inspection, is one which has often been asked and very seldom definitely answered. During the past two years there have been a few opportunities presented by the demolition of skeleton steel buildings, to determine the amount of deterioration of steel when it is inclosed in masonry. But in each case the period of time which had elapsed since the erection of the building was too short to afford any adequate test; that is, a test from which definite conclusions could be drawn. A few months ago, however, during the reconstruction of San Francisco, it was found necessary to remove the six upper stories of the Mutual Life Insurance Company's building in that city; and as the building, which is a steel frame structure, was erected in 1893, the intervening thirteen years may be considered to have afforded an excellent test of the tendency to rusting, in a building of this character. The condition of the building, as described by Mr. F. B. Gilbreth, who had the contract for removing the top six stories, shows that it was of the best construction of those days, and that the laying up, and filling of joints in the brick, stone, and terra cotta was as nearly perfect as possible. The exterior walls completely inclosed the steel frame, which was put together with bolted connections. The floors were of hollow terra cotta arches and the partitions were hollow terra cotta blocks. According to the testimony of several occupants, the earthquake did practically no damage to any part of the structure, and in taking down the building there was no evidence that it was in the least injured by the heavy earthquake shocks.

The damage from fire was similar to that observed in the Baltimore and other big conflagrations. Com-