

ARE NARROW-GAUGE ROADS ECONOMICAL?

THE desirability of cheapening transportation is admitted by farmers and statesmen, merchants, manufacturers, and capitalists, and every additional contribution of fact and experience bearing upon the subject is read with a daily increasing interest.

Much may be said in favor of the narrow-gauge system under circumstances of isolation, where competition of the more firmly established system cannot be felt, and where capital cannot be obtained except for the smallest outlay. Under all other circumstances it can be shown that, in the present day and in this country, it is injudicious to invest money in any other than the standard-gauge roads. It can also be shown that the difference in cost of construction, equipment, operation, and transportation of the two systems has been greatly overestimated.

An exhaustive essay will not be attempted, nor will the reader be wearied with general statistics, which, in any case, are very unsatisfactory, unless all the conditions of the roads referred to are fully understood. The cost of different railways of the same gauge, either in construction or in operation, cannot be compared with each other without considering a variety of local circumstances. Hence, an array of figures showing the cost of construction and operation of railways in India, Great Britain and America, prove but very little in regard to any particular road upon which estimates may be required.

Tabulated statements as to the performance of locomotives, showing the mileage of loaded and empty cars; number of passengers carried one mile; the consumption of fuel, oil, tallow, and waste per mile run, are valuable to the officers of any particular road, showing, from year to year, what class of locomotives do the most work, and what men operate them most economically, but they prove very little in regard to any other road. This is owing to the fact that the grades and curves and the nature of the business are peculiar in each case. To do a light business it will cost, proportionately, very much more in the way of repairs, general and other expenses alluded to, than to do a heavy business. Hence, if one road is to be compared with another, the tonnage is a very important item. On some roads, the business is almost all in one direction, resulting in a heavy mileage for empty cars, which is

almost as expensive as to haul loaded cars. These points are mentioned to show that the conclusions drawn from statistics are to be taken, in any case, with great caution.

It will be my object to exhibit many details, drawn from personal experience in the operation of both classes of roads, from which the reader may make his own deductions.

CONSTRUCTION.

No good reason can be given why the excavations and embankments of the two gauges should differ more than two feet in width for the track, while the ditches should evidently be of the same width.

In the following remarks, the terms "narrow-gauge" will refer to a gauge of three feet, and "standard-gauge" to one of four feet eight and one-half inches. Assuming an embankment two feet high, with slopes of one and a half to one, we have, for a narrow-gauge road ten feet wide, two and eighty-nine-one-hundredths cubic yards of earth-work, and for the standard-gauge twelve feet wide, three and thirty-three-one-hundredths cubic yards of earth-work, per lineal yard of embankment,—a difference in favor of the narrow-gauge of thirteen and two-tenths per cent.

With the same conditions, the quantities for a four-foot embankment are as seven and eleven-one-hundredths to eight—a difference of eleven per cent.; for a six-foot embankment, twelve and seventy-four-one-hundredths to fourteen, a difference of nine per cent.; for a twelve-foot embankment, thirty-nine and thirty-three-three-hundredths to forty, a saving of six and sixty-seven-one-hundredths per cent.; for a sixteen-foot embankment, as sixty and forty-four-one-hundredths to sixty-four, a saving of five and fifty-six-one-hundredths per cent.; for an eighteen-foot embankment, as seventy-four to seventy-eight, a saving of five and thirteen-one-hundredths per cent. Thus in the lowest embankment the saving is slight, and as the embankments increase in height the saving is still less.

Pile-bridge work constitutes, on most of our western roads, a very important item of expense, since we sometimes have as many as five hundred bridges in one hundred and fifty miles of road. The piles, guard-plank and labor cost just the same on the

narrow as on the standard gauges. The iron in such bridges consists mainly in spikes, and drift bolts, which should not be much, if any, lighter.

On the narrow-gauge bridges, ties five inches by six inches by six feet are used; caps, ten by thirteen by ten; stringers, six by twelve by sixteen; while on the standard-gauge the ties are six by eight by eight; the stringers eight by sixteen by sixteen, and the caps twelve by twelve by twelve, making a difference of about thirty-two feet, board measure, per lineal foot of bridging. This saving will not amount to more than fifteen per cent. of the cost of the bridge. The rails used in the track may be one-third lighter. A narrow-gauge track-tie measures six by eight by six feet; while a standard-gauge tie measures six by eight by eight feet. There is a saving of twenty-five per cent. in the material, but the saving in the cost of the tie is only about twenty-one per cent.; because the labor of making the one is about the same as that expended on the other.

It is obvious that the cost of erection of station-houses, section-houses, tool and store houses, will be the same under each system. Turn-tables and water-tanks can cost but very little less on the narrow-gauge road, because the labor—a very large proportion of the expense—will be nearly equal in both cases, while the material can be but very little less on the narrow-gauge road. In the erection of shops very little can be saved, unless it be about two feet in the height of the walls. An examination of these details will show that forty per cent. is an exaggeration of the difference in cost, since the principal items of expense differ but little.

EQUIPMENT.

A NARROW-GAUGE coach will seat about forty, while a standard-gauge coach will accommodate, about sixty passengers. It will therefore require three narrow-gauge coaches to transport the same number of passengers that will be carried in two standard-gauge coaches. The labor involved in the construction of a narrow-gauge coach is very nearly the same as that required to construct a standard-gauge coach, although the quantity of materials required will be less. I need not make a detailed statement of the cost of building these cars or coaches, since it will be obvious that three narrow-gauge coaches will cost as much as two standard-gauge coaches.

The load for a narrow-gauge freight-car

is eight tons; for a standard-gauge freight-car, twelve tons; it will, therefore, require three of the former to do the work of two of the latter. The same reasoning will apply in the case of freight cars, which has been used in relation to coaches.

A narrow-gauge box-car weighs about eleven thousand pounds, while a standard-gauge box-car weighs about twenty thousand pounds; hence, in the transportation of three car-loads of freight over the narrow-gauge road, we will have about thirty-three thousand pounds dead weight, while in the transportation of two standard-gauge cars, there will be forty thousand pounds of dead weight; hence, the saving in dead weight appears to be about one-sixth of the weight of the box-car.

Very little is saved in the equipment of a narrow-gauge road with locomotive power, for a small engine will not do so much work in proportion to its cost as a large engine, and a million tons of freight can be hauled over any road with less cost for motive power with the large engine of a standard-gauge road than with the small engine of a narrow-gauge road.

OPERATION.

IN the operation of a railway, we find many expenses the same in both systems. The general offices must be maintained, telegraph operators, heads of departments, foremen in all branches of the work, mechanics, laborers, station agents, and trainmen must be retained in equal or greater numbers at the best wages, or they will go to other roads. At equal wages, it is difficult to retain the best class of men, because there is more or less feeling of insecurity,—unfounded, it is true,—which continually leads them to desert the narrow-gauge service. It is necessary to keep a foreman and several laborers on each section of the road, whose duties are the same, under similar conditions of road. It will cost the same on each to maintain this important and expensive force of men, as they have to run a hand-car, inspect track, bridges, culverts, crossings, fences, cattle-guards, etc., and perform the same labor of track lining and surfacing; and it will cost just as much to keep the right of way clear of grass and weeds, to maintain fences, to widen embankments, clear out ditches, tighten bolts, drive spikes, and clear driftwood from streams where bridges are in danger, to pump water for engines, and all the other duties which fall to this class of men.

One very important item of expense is the repair of bridges. In the renewal of material there will be a slight saving, but the repairs of buildings along the line of the road will cost the same.

Any one familiar with the pay-rolls of a railway, will appreciate the fact that an immense expense is incurred for labor in the repair and renewal of the track, bridges, and buildings, which, under the two systems, will be nearly, if not quite the same.

The labor involved in the repairs of rolling stock will be even greater on the narrow-gauge road, because it will require the same amount of labor to repair a narrow-gauge car as to repair a standard-gauge car; although, in the materials used, there will be some saving on the former. Add to this the fact that, in order to transport twenty-four tons of freight on the narrow-gauge, we must repair three cars, while to transport the same number of tons on a standard-gauge road, we have to repair but two cars, and it will be easy to see that, notwithstanding the saving in material, the cost of repairs on rolling stock, to transport an equal amount of freight, will be greater on the narrow-gauge than on the standard-gauge road. In order to haul the same amount of freight, the train expense will be much heavier; engineers, firemen, conductors, and brakemen, must be employed in greater numbers,—since trains are lighter,—and they must be equally skillful and have the same wages, and since the number of engines and cars must be about one-third greater in number to haul the same amount of freight on a narrow-gauge road, it is obvious that the very important items of oil, tallow, waste, and fuel, will cost much more on the narrow-gauge road.

It may be asserted that more engines will be required to haul a million tons of freight on a narrow-gauge road than on a standard-gauge road; moreover, the lighter engines do not execute their work so satisfactorily, as they get out of order more frequently,—because the flues are so much smaller, requiring frequent washing, which is not so effectual in preventing the accumulation of scale and mud.

Another great item of expense is due to the delay of trains and wrecks. Such incidents and casualties are more costly on a narrow-gauge road, because, for a given amount of freight, more trains are required, and more men and rolling stock are involved.

Whenever freight is transported for de-

livery to foreign roads, three narrow-gauge cars must be used in order to load two cars of the standard-gauge. A delay of, at least, one day will occur, in addition to the cost of transfer, which, if wagons have to be used, will be from three to six cents per hundred, or from five to nine dollars per car. It is often inconvenient for the shipper to load three cars at once, for the narrow-gauge road to furnish them, and for the foreign road to furnish the two cars, of the same class, at the requisite moment. When freight is received from foreign roads, the same difficulties occur. Moreover, foreign roads cannot be required to furnish freight in two-car lots; hence, the narrow-gauge road must either send a car partly loaded, or impose a rate destructive of its business, or else reduce its tariff. In the active competition for business which prevails at the present day, any one who has charge of a narrow-gauge road will readily admit that the gauge is of great disadvantage, for the reasons just stated, and because of the unwillingness of shippers to have their freight transferred by strangers, while in transit.

No assurances that damages will be paid if property is lost or injured will suffice to do away with this prejudice.

The writer has one case in mind where, if the gauges of the connecting roads were alike, he might secure from a short cross-road at least five hundred car-loads of flour, which is now transported about twenty miles beyond the junction, in order that it may proceed to its eastern destination without breaking bulk; for he could save this shipper twenty miles of hauling, and would gladly pay all charges for transfer, both at the point where the narrow-gauge road would receive the freight and at the terminus of the narrow-gauge road. It is asserted that freight of this description is more or less damaged, and rendered, in some degree, less marketable every time it is unloaded, though the injury may be so slight, in the case of each barrel, as not to justify a claim for damages. At all points on the road where a standard-gauge approaches it within wagon-haul, a narrow-gauge road will be placed at a disadvantage. Shippers are continually hauling to the standard-gauge road, in order to avoid subsequent transfer, and an extraordinary effort has to be made to hold business naturally tributary to a narrow-gauge road.

Freight, which is destined to terminal stations, where special track connections can not conveniently be made with all the

foreign roads, is subjected to transfer charges and to delays which place the narrow-gauge road at a disadvantage, so serious as to seriously reduce its revenue. In other words, all other conditions being equal, the very fact that bulk must be broken disqualifies the narrow-gauge road from doing business with foreign roads, except at cut rates, which competing roads will not permit for any great length of time. It may be affirmed, therefore, that the very fact of the gauge being below the standard places such a road in a position which prevents it from successfully competing for business. It must, therefore, be content with strictly local business and with the low rates which prevail elsewhere, for patrons of the road are dissatisfied with higher local rates than are made in other parts of the country. *This loss of business, in the course of a very few years, will more than balance the saving in cost of construction.*

We are, therefore, justified in the conclusion that an investment of capital in a narrow-gauge road is unjustifiable, unless the road be so located that it can never suffer from competition.

It has been suggested that the government construct a narrow-gauge road from the Missouri River to the Atlantic sea-board.

Aside from the constitutional question involved in this plan, the foregoing practical considerations alone condemn it. Besides, there are already more railways than are required by the business of the country.

It is very doubtful if the proposed narrow-gauge road would be built and operated for much less money, under any circumstances, and, since all appointments by the government will probably be based upon political considerations rather than fitness, it cannot be expected that a road operated by the government would, under any circumstances, be economically managed. Nor is it possible for any road to maintain a uniform rule as to rates and speed since all of these conditions are more or less affected by competition.

No shipper can afford to run trains of his own, as has been suggested in a recent article, since he could not expect to load the cars in both directions, nor would any railroad manager tolerate upon his line trains which are not completely under his control, for there would be endless complications growing out of such a system. When wrecks occur it would be difficult to determine who was responsible, because, in many cases, it is impossible to ascertain

the cause of a wreck. A train will occasionally go through a bridge, and it cannot be ascertained whether the disaster is due to a defect in the rolling stock or to weakness of the structure.

In regard to the relative claims of the two classes of roads, there is a tendency to exaggerate the cost of standard-gauge roads, their equipment and operation; and, at the same time, to depreciate the cost of construction, equipment, and operation of narrow-gauge roads.

For instance, it has been said, in relation to the equipment of a standard-gauge road, that the weight of a car is twenty thousand pounds, its capacity twenty thousand, and its cost \$735; whereas the fact is that the capacity of such a car is at least twenty-four thousand pounds, while its cost need not be more than \$400.

At the same time, the weight of a platform car of the narrow-gauge road is given at six thousand two hundred and fifty pounds, with a capacity of nineteen thousand. These cars weigh nearer nine thousand pounds, and they should be rated at sixteen thousand pounds load.

A writer in a recent number of the "Railway Gazette" has affirmed—First: That a narrow-gauge can be built and successfully operated, where a broad-gauge cannot. Second: That it can be built from one-half to two-thirds of the cost of the standard-gauge; and—Third: That it has equal capacity with the broad-gauge, at about two-thirds of the cost of operation. In regard to the first assertion, I will only say that, if such a place can be found, there and there only is the proper location for a narrow-gauge road; but, in view of the tasks accomplished in South America and elsewhere, it will be difficult to discover a region where this remark will apply. I deny that, under similar conditions, a narrow-gauge can be built for one-half or two-thirds of the cost of a standard-gauge.

This has been shown, I think, in the preceding pages, and I am ready to furnish further and complete evidence in support of my position, should occasion offer. Moreover, with the same cost of operation, a narrow-gauge road can never transport a greater quantity of freight; or, in other words, it will cost as much to transport a million tons of freight on a narrow-gauge as on a standard-gauge road; and if in the neighborhood of the latter, the freight cannot easily be obtained at equal rates by the standard-gauge road.

Let any man who is seeking for investment of capital in railway construction, consult those who have operated both classes of roads, and he will be advised, almost invariably, that he will save very little in cost of construction, equipment, and operation, and that he will lose business from competition, if he adopts the narrow-gauge. My

experience in the management of both classes of roads does not, therefore, lead me to conclude that the multiplication of narrow-gauge roads will cheapen transportation until the standard-gauge roads are suppressed, and even then the saving will be very much less than is usually claimed.

TOPICS OF THE TIME.

The Prudential Element.

WE have received a very candid and, in some respects, a very impressive letter, criticising Professor Sumner's recent article on "Socialism," published in this Magazine. We make space for a paragraph.

"He (Professor Sumner) is evidently more a student of political economy than of moral economy; for he seems to believe in those economic laws which offer their rewards to the sharp, rather than the moral man. The present economic laws are based upon free competition. Here the intellectual, subtle man has greatly the advantage. Right is determined by might in this as much as in the savage state, only here it is intellectual rather than physical might which controls."

The writer goes on to say that this kind of civilization is "only a step out of the merely natural brutal instincts," that men are mostly made and their lives directed by circumstances, and then he gives the familiar proposition that "one-tenth of the population of England die paupers *in order that* another tenth may live in luxury and die millionaires."

No account is taken in what we have quoted, and no account is taken in the letter, of the prudential element in human life and human society. This is the more remarkable because our correspondent assumes the rôle of morality with which that element is indissolubly associated. It is not true that the great victories of life are to the sharp and immoral man, as a rule. Here and there, by sharpness and cunning, men rise into wealth, but that wealth is not of a kind that is apt to remain. *It takes a certain amount of virtue, of self-denial, of morality, to lay up and to keep money.* In the lives of nearly all rich men there have been periods of heroic self-denial, of patient industry, of Christian prudence. Circumstances did not make these men rich. The highest moral prudence made them rich. While their companions were dancing away their youth, or drinking away their middle age, these men were devoted to small economies—putting self-indulgence entirely aside.

If our correspondent or our readers will recall their companions, we think the first fact they will

be impressed with is the measure of equality with which they started in the race for competence or wealth. The next fact they will be impressed with is the irregularity of the end. Then, if they make an inquisition into the causes of the widely varying results, they will be profoundly impressed with the insignificant part "circumstances" have played in those results. Circumstances? Why the rich man's son who had all the "circumstances" of the town, has become a beggar. The poor, quiet lad, the only son of his mother,—and she a widow, who could only earn money enough to procure for her boy the commonest education,—is a man of wealth and has become a patron of his native village. The man who possesses and practices virtue, makes his own circumstances. The self-denying, prudent man creates around himself an atmosphere of safety where wealth naturally takes refuge, provided, of course, that the man has the power to earn it, either in production, or exchange, or any kind of manual or intellectual service.

We are sorry that our correspondent, who seems intelligent in some things, should betray the ignorance or lack of reflection that appears in his proposition relating to the English paupers and millionaires. Nothing could be more grossly and abominably untrue than the statement that "one-tenth of the population of England die paupers *in order that* another tenth may live in luxury and die millionaires." There is not between the poverty of one class and the wealth of the other the slightest relation of effect to cause. If the poor people of England had taken for the last few centuries the gold that wealth has paid to them for work in honest wages, and used it only in legitimate expenses, if they had not debauched themselves with drink, spending not only their money but their life and their power to work upon a consuming appetite, the pauper class would be too insignificant to talk about. It is not "circumstances" that reduces the British workman to pauperism; it is beer, or gin. The waste that goes on in England, through the consumption of alcoholic drinks, is the cause of its pauperism.

The case, *prima facie*, is always against a pauper. The accidents of life sometimes cast a man or a woman high and dry upon the sands of a helpless