ROAD PROGRESS; OR, AMALGAMATION OF RAILWAYS AND HIGHWAYS FOR AGRICULTURAL IMPROVEMENT, AND STEAM FARMING, IN GREAT BRITAIN AND THE COLONIES, PP. 3-75

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ROAD PROGRESS;

OR,

AMALGAMATION OF RAILWAYS AND HIGHWAYS FOR AGRICULTURAL IMPROVEMENT,

AND

STEAM FARMING,

IN GREAT BRITAIN AND THE COLONIES.

ALSO

PRACTICAL ECONOMY

IN

FIXED PLANT AND ROLLING STOCK FOR PASSENGER AND GOODS TRAINS.

BY

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OF FAIR FIELD WORKS, BOW; AUTHOR OF "ENGLISH PLEASURE CARRIAGES," THE "IRON WAYS," ETC. ETC.

"He would fain keep a hold on the Actual, knit the New securely to it, and give to them both conjointly a fresh direction." * * * "He recognises Motion as the true element of Humanity, and principle of the Universe."

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PREFACE.

THE writer of the following pages has been connected with the operations of Wheel Transit from his earliest years; and, at the advent of railways, voluntarily abandoned the largest existing private business, in order to keep pace with the new movement. From the commencement, he was aware of the vicious system of railway mechanism; but to attempt to stem it, while the whole aim of the public was how to multiply the number of the railways without regard to their efficiency, was utterly fruitless. Time has brought the cure; diminishing dividends have forced on the inquiry of dissatisfied shareholders into the causes of the diminution. They may be summed up generally under two heads, viz.:—

1. BAD LEGISLATION.
2. BAD MECHANISM.

Under the first head may be ranged legal and parliamentary expenses, excessive cost of land and compensation, and the choice of injudicious routes. Under the second part may be ranged the imperfect construction of the "permanent way" and substructure, the unmechanical structure of the locomotives and trains; and, in addition to these, the excessive weight of the locomotives and trains beyond what the rails were capable of sustaining,—and it may be added, beyond what it is practicable by human art to make them sustain, with an economic use of steam power.

The losses under the first head are irreparable, and must, sooner or later, be written off the account as wasted capital not

to be retrieved. The losses under the second head must also to a given extent be considered waste; but they are fortunately capable of retrieval in future by better mechanism; and in connexion with this better mechanism, railways are capable of almost indefinite extension, at one-third the previous cost, so as to be not only within the reach of every district and village, but also to make it worth while to open up lines through hitherto uninhabited districts, for the purpose of bringing into work both upper and under wastes—thus increasing vegetable produce and mineral wealth.

The writer, while recognising the truth that every sound practice must have a sound theory belonging to it, is yet well aware that theories must be crude till experience as well as experiment have jointly furnished sufficient data whereon to construct them. In examining the defects of railways, he has, with considerable outlay of capital, verified, both by experiment and experience, the new system he advocates of proportioning the means to the ends. That, as an inventor and practical manufacturer, he seeks to obtain a pecuniary recompense, by an extended business, will scarcely be urged as an objection to his propositions, unless the propositions themselves be unsound. That these propositions involve the supply of trains at less than half the former cost, to be worked at less than half the former cost, and without destruction of "permanent" way or annual outlay thereon, is an imperative reason why railway proprietors should examine them, both with reference to existing lines and to those yet to be constructed, which are by far the most numerous, notwithstanding the retardation of their progress by blunders and mistakes, inseparable from a time of great excitement, with the stimulus of supposed inordinate gain. But, sooner or later, the greater part of the highways must be converted into railways; and, in examining the maps, we find that there is still a large arrear of rails to be laid down. It may be true that in some cases hills offer difficulties, but they are mostly surmountable by levelling, *or by mechanical art* in the improved structure of engines.

ROAD PROGRESS.

DESTRUCTIVE WEIGHTS ON RAILWAYS.

When numerous steam locomotists first applied their energies to the common highways, they had two difficulties to contend with—the opposition of vested interests in horse-flesh, and the advent of the railways, whereon the hard iron surface obtained an enormous advantage. Had the road owners understood their own true interest, they would have levelled the roads, and laid down rails, and thus maintained their advantage. But the horse interest prevailed, and as a consequence they lost the race against the railways.

Astonished with the results obtained by the hard iron tracks in diminishing friction, the railway people began to believe that "weight was of no consequence in railways." They assumed as dogmas,—weight is speed—wear and tear is practically *nil*—rails will last thirty years—rolling stock an indefinite period—and so on. The errors since persisted in, were not wholly without warning. The writer's voice was lifted up against them, unregarded amidst the din of cupidity, that defeated its own proposed object—gain.

But *truth* will find it way. Rails have been destroyed, and rolling stock has been resolved into its original elements, and amidst this "wreck of matter" many human beings have been prematurely cut off, whose deaths are clearly traceable, in most instances, to disproportion of materials, as clearly as that deep ships will ground in shallow water, or eggs break under cart-wheels, or ice melt at 40° of thermometrical heat above zero.

The general principles that should govern the construction of railways in nowise differ from those of highways. They are both *roads* to bear rolling wheels, composed of a wearing surface and a substructure; in one case a surface of stone over the whole substructure, for the wheels to travel over all parts; in the

other case, a narrow surface of iron fixed to timber or stone blocks forming the substructure, the wheels being trammelled to run on the iron surface.

On the highway the strength of the surface and substructure is usually estimated by the load which horses are capable of drawing; but to prevent the crushing of the surface, the wheels are increased in breadth in proportion to the load; and to produce voluntary compliance with this essential condition, the tolls on highways are lessened in proportion to the increased breadth of the tyres or tread on the road. There are, of course, limits to this, and the usual practical limit, is, what four horses can draw. Even with that limited weight, it was found that the abrading surface beneath the wheels and the horses' feet was so serious an evil, by producing increased resistance, that hard iron rails with a narrow surface were substituted for the broad surface of yielding stone, and thus grew up the railway system.

But iron is not indefinitely hard, or substructure indefinitely durable; and these two facts were thoroughly appreciated by the Directors of the Liverpool and Manchester Railway when, in offering a premium for the best locomotive engine, they specified the maximum weight to be under five tons.

But they did not at the same time specify a maximum of speed, because, at that time, speed was not imagined. Even passengers were not imagined.

Running trains commenced, and passengers increased; carriage after carriage was added, for steam did not break its wind, did not die on the spot, as horses would have done. The result was, a lessened speed from increased load. But speed must be had at any cost, and the power and weight of the engines were increased. Again more carriages were added, and again were the engines increased. Then began the struggle for speed between the broad and the narrow gauge, till the rails and substructure gave way, and shareholders awakened to the conviction, that in six years they had worn out the fixed plant that was to have lasted thirty, and had also worn out—their dividends.

There is no doubt that speed is a useful thing, if it can be attained without too high a cost; and there is little doubt that speed may be maintained without excessive cost. But, to accomplish this, the managers of railways must take example from the practice of the highways. There, the fast coach was the light coach—heavy conveyances travelled slowly. On railways this practice has been reversed. The heavier the engine the faster the speed—as though weight and speed were synonymous, and not the contrary. The whole present system is confined in a *vicious circle*, from which there is no escape but by remodelling.

The rate of travelling must in all cases be more costly as excess of speed is attained; but we must not lose sight of the fact, that a light well-constructed train, with a specific number of passengers, can travel at forty miles per hour at less cost than a heavy badly-constructed train at twenty. And an engine of ten tons weight can attain as great speed as the largest engine that ever was constructed, and in most cases greater speed—precisely as the light Arab horse can outstrip the elephant, whose feet sink into the ground—precisely as rails sink beneath the tread of our monster engines.

To obtain the maximum of result on railways, it is essential, before all things, to ascertain the proportion of weight on the wheels of the rolling stock that the rails and substructure can sustain at the maximum speed, without crushing; for the heavier the load, the less in proportion must be the speed. It is quite true that the greater the speed, the less at intervals is the vertical weight while running, but so much greater is the impinging force laterally and longitudinally, and proportionably greater will be the amount of destruction.

It must be evident that all surplus weight in rolling stock is an unnecessary evil, carrying about lumber without profit; and the longer and heavier the train, the greater is the proportionate weight. The mere arrangement of springs to provide against longitudinal concussion amounts to half a ton per vehicle. The enormous disproportion of dead weight to load that has obtained on railways may be gathered from the facts, that the light stage-coach weighed seventeen cwt. and carried nineteen persons, including guard and driver, while the first-class carriage on a railway weighs four tons and carries eighteen passengers only. The risk of longitudinal collision caused by long heavy trains is the reason of this disproportion.

This surplus weight involves another difficulty. To start a train into motion requires many times the power needed to keep up speed when once attained, supposing the road to be level, and in good order. To check the momentum thus acquired, in case of an impending collision, or when stopping at a station, requires a corresponding amount of power, by using breaks, or by reversing the steam. All this is positive waste, and the more frequent the stoppings the greater must be the amount of waste.

There are two ways of considering the question of traction: mechanically and commercially. A thing may be mechanically practical which is commercially unadvisable.

Mechanically. First, the rails should be so hard as to resist abrasion on the surface in contact with the wheels; and so stiff, vertically and laterally, as to be incapable of deflection by weight.