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RAILWAY FREIGHT-CAR PROBLEM

AND ITS

CHEAPEST AND BEST SOLUTION

BY

H. W. PERRY.

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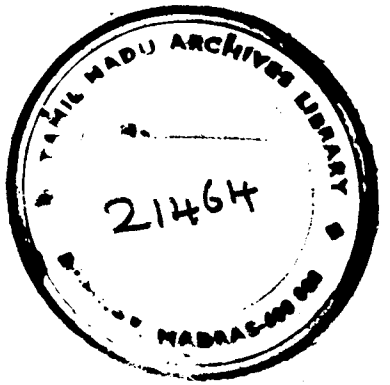

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The
Great Railway Freight-Car Problem.

1. The United States of America possess at the present time about 40 per cent. of the total Railway mileage and Engine power of the whole world, and more than double the total number of Freight cars owned by all the other countries in it put together. They are thus by far the greatest Railway nation in the world, and American Railways lead all others in the quantity and density of traffic handled and moved daily.

2. Yet the Railway situation in the States at the present time is anything but satisfactory, and appears to be approaching a deadlock that will have the most disastrous national consequences, on account of the enormous expenditure that is required to afford the facilities needed for moving the rapidly increasing freight traffic of the country *by the present methods of working.*

3. On the 14th of January this year President James J. Hill of the Great Northern Railway addressed a most remarkable letter on the subject to Governor Johnson, of Minnesota, as follows:—*

* NOTE.—Throughout this paper the italics in quoted passages are the author's.

The business of the United States is to-day so congested that from every portion of the country arises clamor for relief. The railroads everywhere are taxed beyond their power. The people of the States are, therefore, face to face with *the greatest business problem that has ever threatened the nation.* During recent years the volume of business has increased and is increasing with extraordinary rapidity, while the necessary additional trackage and terminals have not been equal to the demands upon them. The resulting situation is *a freight blockade of enormous proportions*, especially at all terminal points. How to remedy this is a problem financial, mechanical, and physical.

4. The following figures compiled from the official reports of the Interstate Commerce Commission show the growth and existing conditions :—

	1895.	1905.	Per cent. Increase.
Total single track, miles	180,667	218,101	21
Locomotives ...	36,699	48,350	35
Passenger Cars ...	33,112	40,715	23
Freight Cars ...	1,196,119	1,731,409	45
Passenger Mileage ...	12,188,446,271	23,800,149,436	95
Freight Ton-mileage ...	85,227,515,891	186,463,190,510	118

Increase in volume of Railroad business 110 per cent. in 10 years.

5. These figures show the cause of the delay in the national traffic movement, which threatens to bring industry to a standstill. There are, and will be, enough cars to carry the country's traffic if the cars can be moved, but engines and *cars must have tracks upon which to run.* The most impressive fact is that railroad building has fallen off just as the demand on trackage has increased, and at this moment when the demand is greatest it is at its smallest. Since 1904 the Railway trackage has increased only 1·45 per cent. per year to 220,000 miles now, while the traffic has increased at the

rate of 11 per cent. per year. To meet this increase trains run faster, cars are larger, and locomotives more powerful.

6. But *the inadequacy of terminal facilities in the great centres prevents the free flow of traffic. The average speed of a passenger train is from* 12 *to* 15 *miles an hour. The average distance travelled by each freight car is about* 25 *miles a day. That is, the entire freight equipment of the country is employed to the fair limit of its capacity only* 2 *hours out of the* 24. *Cars stand for days or weeks in yards or at transfer points awaiting their turn. The problem and the necessity are enormous.* Suppose that only 25 per cent. additional track with necessary terminals and equipment making 33 per cent. is to be built during the next 5 years, or, say, in round numbers, 75,000 miles of tracks as the requirement for the country to meet immediate needs. No practical man would furnish the facilities required including terminals and additional equipment for less than $75,000 a mile. *The new work, then, would amount to* $5,500,000,000, *or a yearly average of* $1,100 *millions, which should be spent before the commerce of the country can be moved properly.*

This sum is more than twice the entire currency in circulation in the country, and only a little less than twice the deposits of all the Savings Banks in the United States put together.

The question of Terminals alone is almost prohibitive. Terminals now in use were acquired when property was cheap, and can be enlarged only by heavy outlays. In many cities it is not even a question of cost, since the areas necessary to handle railroad business properly are not to be had at any price.

7. Again in April this year Mr. W. C. Brown, senior Vice-President of the New York Central lines, said in an address delivered before the Buffalo Chamber of Commerce :—

There never was a time when there was so much freight waiting for transportation, and almost valueless without it, as there is to-day. Great manufacturing concerns all over the country have been embarrassed by the inability of the railroads to furnish fuel and raw material on the one hand, and their loading platforms have been filled with finished product that has been sold, and the delivery of which is urgently demanded by consignees, but which the Railways have been unable to handle.

8. Further and more serious than this is the fact that the elevators in Chicago and all the great trade centres of the West, and local elevators throughout the great grain-growing States, are filled with grain of last year's crop which, unless moved within a very short time, on account of climatic conditions, will be greatly impaired in value.

9. This condition extends from the great grain-growing States through to the seaboard. Elevators at Buffalo have been full of export grain during the entire winter, some of it having been in the elevators more than four months, and during the same period ocean vessels have cleared from New York and Boston every week, many of them half-loaded and in some cases with sacked sand and gravel for ballast in place of export grain for which they held contracts.

10. The shortage of cars for export freight is not confined to grain and its products. Through the month of January and a large part of February the International Harvester Company was short 200 cars (daily) for export loading. The same condition applied to factory, farm, and mine, and to every State in the Union.

11. It is not entirely a question of cars and engines. If the roads could at once provide themselves with ample power and freight equipment, they would be immediately confronted by the inability to move the freight over their roads (for want of trackage) or to handle it at seaboard terminals (for want of yard space).

12. Real estate in New York, Boston, Philadelphia, Baltimore and other Atlantic port terminals costs almost as much per square foot at the present time as it did per acre at the time the original terminal facilities were provided, and adequate facilities can only be provided now by the expenditure of millions of new money.

13. In every great manufacturing centre vast additions are being made to manufacturing plants, all of which will add to the already tremendous freight tonnage, which the past year has demonstrated beyond any question of doubt that the present railroad facilities are utterly inadequate to handle.

14. Great questions, fundamental in their character, far-reaching in their effect, and of vital importance to every business interest in the country, are pressing for solution. Every consideration demands that these questions be settled permanently.

15. Similarly Commissioner F. K. Lane, in his "Report on Car Shortage and Car Service" to the Interstate Commerce Commission, wrote at the commencement of this year as follows :—

Although the 1906 crop scarcely exceeded that of 1905 and was smaller than in at least one other preceding year, yet the railroads tapping the great grain belt of the North-West seem to have been quite overwhelmed by it, and 50 million bushels of grain remain on the farms, and in the country elevators of North Dakota. Only 38 per cent. of the crop has been shipped.

16. The country or line elevators at a number of country stations are full. Some of them reached their capacity as early as September and still have the grain they held. Thousands of bushels of wheat are lying at this time covered with snow in open bins built beside the railroad track.

17. The farmer cannot sell because the country dealer cannot buy. The country dealer cannot buy because the country elevator

is already full. The country elevator remains full because the railroad has not moved the grain from the country elevator to the terminal elevator. The terminal elevators at Duluth, Superior, and Minneapolis, which act as great reservoirs for the line elevators, *are almost empty, and at no time during the season have they been filled to more than one-third of their capacity.*

18. This unfortunate chain of conditions has involved financial loss which begins with the farmer, but includes the merchant, grain-dealer, elevator-man, miller, *and the railroad*, and is to be reckoned by the reduced price upon millions of bushels of grain, for every one of which there is demand. The farmer has been compelled to ask the merchant to extend his credit. The merchant, elevator-man, and country dealer have been forced to seek new and unusual loans at the Banks. The dealer who sold grain for November delivery has failed to keep his contract and has made a loss. Interest and Insurance have eaten away the profit of the dealers, and the price of grain has fallen from 2 to 6 cents. a bushel at a large number of the country points.

19. In the year 1906 both the Great Northern and the Northern Pacific *largely* increased their equipment. *Notwithstanding this increased equipment, they hauled less grain, they furnished fewer cars to the line elevators, and they delivered fewer at the terminals than they did in* 1905.

20. The enquiry into car shortage so far as it affected the movement of grain in the North-West justifies the following conclusions:—(1) The Great Northern and the Northern Pacific roads did not suffer by reason of diversion of their cars to other roads. The balance between these and other railroads was in favour of the Great Northern to the extent of 2,000 cars, and of the Northern Pacific to the extent of 6,000 cars. (2) *Both roads had more equipment than they had last year when their cars were furnished more promptly and better time was made*, and less complaint by shippers. * * * (5) The elevators at terminals made no delays in freeing equipment.

21. Figures submitted by the largest receivers of grain at Chicago showed that *the average length of time required for switching loaded cars to the elevator after notice of destination is received by the railroad is from* $3\frac{1}{2}$ *to* 5 *days, and for car-load freights to be switched through Chicago takes from* 8 *to* 15 *days.* This shows the congested condition of the terminals.

Freight Congestion is World-wide.

22. The foregoing extracts indicate the gravity and difficulty of the problem confronting the Railways of the United States, but this problem is by no means confined to them. The conditions complained of by American shippers exist also in other countries. A correspondent of the London *Times*, writing in April this year, says:—

> So inadequate are the resources of some of the English Railway Companies that many collieries are losing time and steel works are being shut down in the Midlands notwithstanding heavy order books, because the Railways are unable to move the output from the pits or to supply the furnaces with fuel.

And in May a deputation representing the Newcastle, Sunderland, Hartlepool, and Middlesbrough Chambers of Commerce waited on the Traffic Committee of the North-Eastern Railway to represent the wagon shortage in the North of England, and the scarcity

of wagons during the busy season, and said there had been a deficiency in the supply during the last 18 months.

23. Only a short time ago there was a serious traffic congestion on the Italian roads, and vessels could not be unloaded at Genoa because the wharves were blocked with freight for which the Railways were unable to supply cars. This drove the trade to Marseilles, but even there complaints similar to those made at Genoa have arisen, and now two special new car factories have been started at Douai to do something towards putting an end to "the present chronic wagon shortage in France."

24. The *Railway Gazette* of the 15th March 1907 says:—

The present congestion and shortage of wagons and locomotives seems to be general. The needs of American, Italian, and German Railways have recently been referred to, while in Russia over 100,000 wagons loaded with grain are said to be at a standstill. In France, on the Orleans Railway, things are said to be as bad as they were on the Western Railway, and they are no better on the State Railways. In Hungary a very heavy expenditure on Rolling Stock is about to be voted.

25. In Canada, also, there has been, and still is, a great congestion of freight traffic, and the *Railway World* of the 5th April this year stated that—

In order to move the 36 million bushels of wheat still in first hands or in interior elevators, the Railways will have to move 200 cars *per day* for six months. For the same period *last year the average number moved by the Canadian Railways was* 690 *cars per week*

(*N.B.*—Although Canada has over 80,000 freight cars on its 21,000 miles of railroads). "In addition there must be taken into account the transportation of oats, barley, and flax which combined almost equal the wheat crop."

26. In India, also, the same conditions prevail and £3,500,000 have been provided this year by the Government mainly for extra freight-car equipment.

The London *Times*, commenting in March last on the shortage of Rolling Stock on Indian Railways, says:—

There is now abundant evidence to show that the shortage of the means of transport is inflicting a very real and serious injury on the trading community at large. We read of enormous deposits of manganese ore already mined and representing in value almost as much as the whole Indian wheat crop, now piled along the sides of the lines waiting for wagons to carry them to the coast. We hear again of vessels delayed for weeks at the port of shipment unable to load their cargoes because there are no trucks on which to bring down the cotton and the jute crops to the seaboard, and of collieries unable to move their coal.

27. Again at the half-yearly Meeting of the Bengal and North-Western Railway in May last the Chairman, Colonel T. Gracey, said:—

Dealing with the wagon shortage on the Indian State Railways and the difficulties with regard to coal, the Company's Agent in India had had a most anxious time, and more than once they had been obliged to contemplate stopping the train services for want of fuel.

The Far-reaching Effects of the Block.

28. The evil effects of this general congestion of traffic on Railways are not restricted to Railways and traders alone, but extend to every industry and community in the world. For the letter of President Hill showing the enormous sums that would be required by the American railroads, and the realization that similar expenditure would sooner or later be needed for all other Railways, at once led to an increase in the already high price of money all over the world; and this increase, while adding considerably to the difficulty of the Railways in their efforts to increase their own facilities, has also added generally to the burden imposed on every industry and community by those who control the supply and price of the only legal medium of exchange.

29. The effects of this additional burden have already manifested themselves even amongst national Governments in a general stoppage or postponement of much-needed works and improvements for which they might be required to raise loans in the money market, and the Railway Corporations themselves have in many cases been obliged to suspend or defer alterations and extensions on account of the high rates at which the money for them has to be borrowed. Weaker Corporations and private individuals have in several instances been forced into bankruptcy.

30. Speaking on the situation as it is now, President Hill said on the 13th of June:—

There is a general slowing up of business everywhere. The cause of the trouble is that the business of the United States has outgrown the capacity of its railroads, and the railroads are in no position to catch up. If men cannot get their freight moved they must cease to produce it. In a letter to Governor Johnson last January I estimated that $1,100 million a year for 5 years would be necessary to put the railroads in shape to move the traffic of the country. During the past seven or eight months the railroads have raised something like $800 millions. Has it gone to increase facilities? Not at all. *Most of it went to pay off old bills.* It does not appear any easier for a railroad to get money now than it was a few months ago. I know of instances in the Western cities where $5,000 lots of short-term notes of some Eastern roads are being peddled around on a 6½ to 7½ per cent. basis. *Railroads cannot increase their facilities under these conditions.* The Government will ultimately be forced to lend its credit to finance the needs of the railroads. *The situation may lead to Government ownership of the railroads.* This is no mere theory but a condition. The country is large and still growing. The railroads are away behind.

31. Again the *Railway World* of the 28th June in its Financial article says:—

Mr. F. A. Vanderlip, Vice-President of the National City Bank of New York, is popularly and, we believe, properly regarded as possessing the clearest insight into the direction of the financial tendencies of any American financier. The remarks as to the immediate future of American business with which he concluded his address before the Virginia Bankers' Association have therefore attracted wide attention.

Mr. Vanderlip ventured the following forecast:—

Nearly all experienced business men are of the opinion that we are facing a practically certain recession in trade: that we have ahead of us a period of smaller industrial totals. Such a view is almost universal among well-informed business men. There is no longer the disposition to courageously enter upon new enterprises. Railways are curtailing expenditures; Bankers are inclined to exercise caution in extending accommodation; most manufacturers and merchants are planning their fall campaign with much conservatism. That the period ahead of us is one in which commercial activities will be curtailed and manufacturers' totals show a decrease, there is really little division of well-informed opinion.

32. The same paper quotes declines of from £3 to £50 in the average prices of 20 leading British Railway shares on June 11th, to show that the depression in securities is not confined to the United States, and says:—

These declines are comparable with those experienced by American Railway stocks, and go to show that a common cause is operating in both countries, namely, the readjustment of fixed incomes to higher prevailing rates of interest.

33. Similar conditions prevail in all the other principal Railway countries, and it is a question of the utmost International importance to determine how this great problem is to be solved, and how the block in Railway traffic, which has caused the enormous losses involved in a general "slowing up" of business and retardation of the progress of the world, is to be removed.

The First and Main Point.

34. The first step in this enquiry is to ascertain from the actual facts *whether there is really any need for the enormous expenditure estimated as being required by the railroads; or whether the facilities they need cannot be much more cheaply obtained by some alteration or improvement in their methods of working.*

35. For it is the anticipation of this great financial requirement that has sent up the price of money and caused losses and difficulties for greater than those caused directly by the Railways themselves.

36. As the American Railways lead the world and are in a more advanced stage of development than those of any other country, we shall base our enquiry mainly on the facts afforded by them, and the conclusions thus obtained will apply to all Railways generally.

The Actual Facts.

37. Now from estimates based on the latest statistics available it appears that there are about 222,000 miles of railroads in the United States, with 18,500 miles of 2nd track, 3,500 miles of 3rd and 4th track, and 75,000 miles of yard track and sidings.

38. There are also about 52,000 locomotives, 33,000 passenger, and 12,000 mail and baggage cars, and 1,850,000 freight cars, averaging about 32 tons carrying

capacity each. One-fourth of this number of freight cars average about 22 tons capacity, and the remaining three-fourths about 35 tons.

39. In the last year these vehicles conveyed nearly 900 million passengers an average distance of 35 miles each, and less than 1,600 million tons of freight, an average distance of about 135 miles.

Analysis of these Facts.

40. President Hill, in his letter to Governor Johnson already referred to, stated that the average distance travelled by each freight car is 25 miles a day, and this average is generally accepted as being correct. For the 1,850,000 freight cars in the States this would give a total freight-car mileage in the year of 16,880 millions.

41. In 1901 the average load of all loaded American freight cars was 15·7 tons, and in February this year (1907) the Director of Maintenance and Operation of the Harriman lines, in making a comparison of the working on his own and the Hill systems, showed that the average number of tons of freight per loaded car was 21·5 on his own and 21·3 on the Hill lines.

42. As all railroads have been endeavouring for years to increase their average car-load, and as plenty of traffic was offering last year, it may be safely assumed

that the average load of a loaded car was about 20 tons during this period.

43. To move the 1,600 million tons of traffic carried about 80 million car-loads must have been required, and as the average haul of this traffic was 135 miles, the total loaded freight-car mileage must have been about 10,800 million car-miles.

44. Now, subtracting this from the total freight-car mileage of 16,880 millions, we get 6,080 millions of freight-car miles that must have been hauled *entirely empty*. This is 36 per cent. of the total and *nearly 60 per cent. of the loaded freight-car mileage*, and as every empty-car mile is equivalent on the average to 32 tons of carrying capacity and about 15 tons of dead weight, we get no less than 194,560 *million* ton-miles of empty carrying capacity and 91,200 *million* ton-miles of dead weight hauled in these entirely empty cars during the year. When the freight to be carried does not entirely balance itself in each direction, there must of course always be some empty return car-mileage, but with the enormous tonnage of raw and manufactured freight offering in all parts of the States (see para. 7), the return loading could scarcely have been so low as to equal only 20 per cent. of the total loading, and it is very probable therefore that there was a considerable proportion of quite unnecessary double haulage of empties.

45. Moreover, as the average carrying capacity of all the freight cars is about 32 tons, while only about 20 tons of freight were carried in each loaded car, it follows that about 12 tons of empty carrying space equivalent to 5 tons of dead weight must have been hauled in every loaded car-mile, so that no less than 129,600 *million* ton miles of ***empty*** carrying capacity, and 54,000 ***million*** ton-miles of dead weight were quite needlessly hauled *in the direction of the loading* in these loaded freight cars; and this although there were several thousands of tons of freight waiting to be hauled in this direction!

46. Again, as the speed with which these loaded and empty freight cars were moved averaged 13 miles an hour, while the distance they travelled averaged only 25 miles a day, it follows that *for* 22 *out of every* 24 *hours, or for eleven months in the year, every one of these* 1,850,000 *freight cars must have been standing locked up in terminal and other yards, and lying totally useless for its prime purpose—the movement of freight!!!*

47. Further, at the 13-mile speed a fully loaded car might have run its 135-mile journey in 10½ hours, and allowing a day for its outward run, and another for its return back, in addition to a day at each end for loading and unloading, the 1,850,000 freight cars could have transported the entire 1,600 million tons of freight actually

moved during the year, *within three months time* (assuming only 20 per cent. of the total as return freight), and at this apparently reasonable rate *could have moved four times the traffic that was actually moved in the whole year!*

48. This analysis shows that *there is in reality no shortage in the number of freight cars, but a tremendous shortage and stagnation in their movement.* As locomotives are necessary for all car movements it is sometimes considered that the shortage in the movement of the freight cars is due to a shortage of locomotives. This, however, is not the case as may be seen from the following figures.

49. Out of the 52,000 locomotives in the States over 30,000 are employed in the movement of freight, and about 9,500 in switching cars in yards and sidings, so that on the average each of the freight locomotives hauled about 563,000 freight-car miles in the year. The average gross load hauled by each freight locomotive was about 730 tons, or nearly 26 loaded and empty freight cars per train, and the number of freight train-miles run by each locomotive during the year was nearly 21,660.

50. This gives less than 60 train-miles per day for each freight engine, and at the average speed of 13 miles an hour the daily *running* time of these engines would average under five hours, or less than half the daily working time of many of the human employés of the railroads.

As these locomotives are machines, and ordinary mill, pumping, and marine steam engines work continuously for weeks and months at a time, it does not appear unreasonable to expect that *with triple crews* they should be able to give an average of nearly four times more haulage work than they do now. At any rate, these figures show clearly that the shortage in the movement of freight cars was not due to a shortage in the number of freight locomotives, as everyone of those actually in use was standing still or not hauling cars of any sort for over nine months of the year.

51. Having, then, an ample supply of freight cars and of engines, the next item that would affect the movement of freight by railroads is trackage. President Hill in his letter said:—"Engines and cars must have tracks on which to run," and estimated that 75,000 miles of additional trackage were required to meet immediate needs. Now, of the 222,000 miles of railroad in the country, only about 18,500 miles are double-tracked, and of the latter about 3,500 miles have 3rd and 4th tracks. So that *over* 203,000 *miles or* 91 *per cent. of the total railroad mileage is single-track road.*

52. In 1905 for less than 750 million passengers the total passenger train-mileage, including half of the mixed train-mileage, was 480,000,000, and for less than 1,440 million tons of freight the total freight train-mile-

age, including the other half of the mixed train-mileage, was 573,000,000. For this traffic about 15 million passenger trains were run, an average distance of 32 miles each, and about 4·4 million freight trains were run, a distance of 130 miles each.

53. For the 900 million passengers and 1,600 million tons of freight carried over slightly longer distances in the year just passed, it is very probable therefore that about 18 million passenger and 5 million freight trains were run over distances of 35 and 135 miles, respectively. This would give 630,000,000 passenger and 675,000,000 freight train-miles run during the latter year.

54. The total number of revenue train-miles run last year world therefore be about 1,305 millions, and allowing for light engines and Railway Companies' material and ballast trains not included in this figure, the total number would probably be about 1,320 million train-miles. On the total mileage of 222,000 this would give an average density of nearly 6,000 train-miles per mile for the year, or less than 17 *trains both ways* over every mile per diem.

55. Now of the total mileage less than one-fourth consists of main or trunk roads with heavy traffic, and fully another fourth is composed of roads in thinly settled districts and branch lines or feeders averaging not more than 2 trains each way daily. At the head of

the heavy traffic roads stands the four-track main line of the Pennsylvania Railroad on the 330-mile section between Pittsburg and Philadelphia with a movement of something like 100 trains each way daily. Suburban lines with their heavy passenger traffic also have a very high train density, but this extends only over comparatively short lengths.

56. As the Railway traffic generally was very congested last year, it is very probable that over the 55,000 miles of trunk lines with heavy traffic, one-third of which is double-tracked, the average number of trains run daily exceeded 20 trains *each* way. Moreover as the total mixed train-mileage of the States is very small, it is certain that over the other 55,000 miles of light and branch lines the number of trains was not less than two each way daily (one passenger and one freight), and as the average for the whole mileage was under 17 trains *both* ways daily, it follows that *over the remaining* 110,000 *miles of road the average number of trains run last year cannot have been more than* 12 *trains each way daily.*

57. Again, on the four-tracked New York division of the Pennsylvania Railroad a total of 700 freight and passenger trains both ways was run daily during 1906, nearly 250 trains each way being passenger trains; so that it is probable that on the 18,500 miles

of double, and partially trebled and quadrupled, main and suburban track the average number of trains run daily last year exceeded 40 *each* way. Hence, if the average over the entire 55,000 miles of these trunk lines was as high as, say, 25 trains *each* way daily, the average number of trains run over the remaining 36,000 odd miles of *single track trunk lines during the past year cannot have been more than* 18 *trains each way daily.*

58. These figures are, of course, general averages, and there may have been short periods when the actual traffic was very much heavier, but for each such period there must have been a corresponding period in which the traffic became proportionately lighter, and as the congestion in the movement of freight has continued more or less for the greater part of the year, it is evident that the above averages could not have been greatly departed from, especially for any length of time.

59. Now, a traffic averaging about 36 trains each way daily on a double-track road (for the combined averages of the doubled, trebled, and quadrupled lines could not have been much more than 40), although heavy, is nothing very exceptional, for it means that on the average trains follow each other on the same track at intervals of more than half an hour. On the Central London and many other urban and suburban

double-track lines trains follow each other daily during the busy hours at intervals of 5 and even 2 minutes. It is true these are all passenger trains which all run at about the same speed, so that the necessity for trains to overtake and pass each other is reduced to a minimum. But on such roads the number of trains run daily each way exceeds two and three hundred, and there appears to have been no reason why, if the congestion in the freight traffic could have been relieved by the measure, the freight trains on these doubled lines should not have been run at the same speed as the passenger trains. There are many kinds of food and perishable freight traffic which are regularly run into large cities by high-speed freight trains, and the extra cost of hauling the remainder of the freight at this speed on the doubled sections would have been very small compared with the losses sustained by the Railways through the congestion in the freight traffic. That this measure was not generally adopted is evidence that it was not considered likely to afford much relief, and that the freight congestion was due to other causes.

60. Again, a traffic of 18 trains each way daily on a single-track road, though also comparatively heavy, is equally nothing very remarkable, especially on main or trunk lines where passing and crossing side tracks are provided at frequent short intervals. Only recently during the 20 days ending March 5th, the Louisville

and Nashville Railway averaged 52 trains per day on the 75-mile section of its single-track road between Decatur and Black Creek, and although this was considered an exceptional handling of trains on a single track, there does not appear to be any very great reason why an average of about two-thirds of this number of trains daily should not have been maintained, if urgently required, by well-equipped main or trunk lines. Undoubtedly such lines would be the better for doubling, but the traffic in question is certainly not the limit of their capacity when there is a heavy loss to be otherwise encountered.

61. It thus appears that although possibly at some times the congest on in the movement of freight traffic may have been temporarily increased, it was by no means caused by deficiencies in *road* trackage, for on three-fourths of the total railroad mileage in the States the number of trains run daily could not have exceeded the very moderate limit of 12 trains each way. It is only on the 36,000 miles of single-track trunk lines that double tracking was probably called for, and certainly should be provided at an early date. The absence of this trackage however in the past year, though it very probably added more to the cost of working than would otherwise have been necessary, was certainly not a main factor in producing the

widespread and long continued block in the movement of freight.

62. Having, then, an ample supply of freight cars and engines and at least a sufficiency of road trackage, why was not the freight moved? The *Railway World* of the 4th January last said:—

> What the railroads all over the country need are more tracks, *better terminals, more and larger freight classification yards*, and additional cars and locomotives;

and President Hill stated clearly in his letter that—

> The inadequacy of terminal facilities in great centres *prevents the free flow of traffic.*

63. Now there are already no less than 75,000 miles of yard tracks and sidings in the State (see para. 37), and allowing running or train passing sidings of about an *average* length of $\frac{1}{4}$ mile at every 3 miles on the 36,000 miles of single-track trunk lines, and at every 5 miles on the remaining 165,000 miles of single-track ordinary and branch lines, not more than 12,000 miles of track would be required for passing sidings. *Therefore fully* 63,000 *miles of track must already be available for yard and terminal purposes.*

64. Assuming that only 10 per cent. of the entire rolling stock of the country was employed on the running lines at any time, yard accommodation for about $1\frac{3}{4}$ million vehicles would be required, and at an average length of 50 feet per vehicle these would need about 17,500 miles.

From a general comparison of the stabling capacity and mileage of track in various yards it is found however that almost as much trackage as is actually occupied by the stabled vehicles is necessary to allow for their movement over switches and connecting lines, so that nearly 35,000 miles of yard track would really be needed.

65. The accommodation in yards is generally apportioned according to the requirements of the traffic, and where this is not the case, the yards generally grow by additions during a long and continuous period of experience until they are more or less closely proportionate to these requirements. A margin, therefore, of 28,000 miles, or 80 per cent. of the total accommodation needed, appears ample to cover any errors in this apportionment, or any violent *unbalanced* changes in the usual origins and destinations of the traffic. *Fluctuations in the volume of the latter without any alterations in its course, especially if they are more or less general, do not or should not affect the apportionment if it has already been properly made, as the total number of vehicles to be accommodated is not increased by such fluctuations;* and when there is a widespread and general increase of traffic, the distribution of vehicles has to be equally general and widespread, so that unusual concentrations of them are or should be *less* likely than before. *The increased traffic in such cases can only be met* **by an increased rapidity in the movement of the limited number of vehicles through the various yards.**

66. Hence it appears that even in the matter of yard tracks the railroads of the United States had at least a very reasonable margin beyond the actual requirements for the movement of their rolling stock. It has also been seen that their road trackage was very reasonably adequate, while their supply of freight cars and locomotives was ample for the movement of the freight traffic offering last year. That they failed to effect this movement and produced an unparalleled congestion of freight, causing enormous losses not only to themselves but also to the whole community of the country, can only be ascribed to some very radical and serious defects in their methods of working.

Present Methods of Working.

67. A close examination, therefore, is necessary of the present methods of working freight traffic on Railways, and this can best be done by studying the movements of an ordinary freight car during *one* of its trips. At the start we shall presume that the car has been brought in empty amongst a lot of other loaded and empty cars on a train, and is left standing on one of the receiving tracks of the yard by the road engine.

68. There are goods offering at the station and the empty car is required for loading at the outbound freight-house. There are, say, a dozen other cars standing on each side of this empty one on the same track, and some

of these dozen cars contain fast or perishable freight which should be sent on by the next train, others are road or transfer cars to go to the transfer shed, others again contain inbound freight for the inward freight-house, and some are special or private cars to go to special or private sidings.

Before the yard engine can switch the empty car into the outbound freight-house it is necessary that it should dispose of each of the other dozen cars ahead of it, and as these are not in regular order nearly two dozen push-and-pull shunts over various switches and sidings are needed with the cut for their disposal.

69. Finally, however, our empty car reaches the outbound freight-house track, but here again another stop occurs. The freight-house platform can only accommodate eight cars at a time, and these are already there undergoing loading. Five of them may be fully loaded, but they cannot be moved until the loading of the remaining three is completed. So our empty car has to wait outside until *all* the eight cars ahead are loaded up and moved out. At last however it gets its turn and receives its freight.

70. "Now he's off!" an innocent observer might remark. Not a bit of it. Only two of the other seven cars in the freight-house have been loaded, and our patient car has to wait till the remaining five have

completed their loading and also until the yard engine arrives to draw the lot out. It then gets moved into an outbound track, but here again it has to wait. Of the 16 cars that have been loaded only six are for the same south-bound direction as our car, and with the other through or special south-bound cars in the yard there is not a sufficient number to make an economic haulage load for the large locomotive available.

71. Consequently both this locomotive and our half dozen or more south-bound cars have to wait once again until either more south-bound cars are loaded at the station or more are brought into it by other incoming trains. How long this may be depends entirely on the state of the traffic offering for the south-bound side. If this is heavy the cars will probably go on after only a few hours' delay. If it is light they may be detained a whole day or even more. This long detention may also occur at way stations when the traffic is heavy owing to none of the passing trains having any room or load margin available for taking on the cars.

72. Finally, however, a sufficient number of cars is obtained to make up a load for a south-bound train. Do they start off at once? No; the cars are all mixed up on the south-bound track, and 40 or 50 push-and-pull shunts are necessary to put them into the order of their destinations, so that the cars at the forward end of the

train may be those that will have to be detached at the nearer stations in the order in which they will be passed by the train. Our car, we shall assume, is for a distant destination and so it is away in the latter portion of the train.

73. At last everything is ready, the train crew have arrived, and the train starts off. It does not go very far however before it has to be side-tracked for a north-bound train to cross it on the single track line. After waiting half-an-hour to let this train come up from the next telegraph section ahead, the latter arrives and our train is able to resume its journey. After going through a couple of stations the destination of one or more of the leading cars is reached and the remainder have to wait while these are being detached and shunted into their proper inbound or receiving track. This done the train starts once more, but soon comes to a stop, as it has to be side-tracked again, this time to allow a south-bound passenger train to overtake it. Here it has to wait till the passenger train has run through both the telegraph sections behind and ahead of the side track, and just as the line is cleared by the passenger a north-bound special arrives at the side track next ahead, so our freight train has to wait on still further until this special also has travelled over the section which may be anything from 4 to 8 miles in length.

bring another load of freight down from its original starting point for at least another fortnight or so.

79. Now, apart from the side-tracking delays which indicate the great saving and advantage of a double track road, it is evident that an enormous amount of switching and shunting has to be done, consuming both time and haulage power, merely to preserve something like order in the cars on a train, and to facilitate the detaching or handling of particular car-loads at various points.

80. It is also clear that a very large proportion of the delay to the movement of cars and freight is due to the fact that all the loading and unloading of these cars has to be done along a very limited length of freight-house or team tracks, so that all the other cars that there may be in a yard have to wait for hours and even days while the limited number of cars that can be handled on this length are being dealt with, and owing to the increased size of the cars, the length of this time has been increased instead of decreased in recent years.

81. A further and very large delay in the loading and unloading of cars is due to the fact that all the freight to be put into the cars or that has been taken out of them, is confined to one and the same short length of deck or team way beside the limited and particular length of track provided for loading and unloading the

cars, so that while there may be acres of land unutilised elsewhere in the yard, the part of it where the most important work has to be done soon gets blocked up and rendered almost impassable with the freight brought in by shippers for despatch, or by the loose freight unloaded by them from inbound cars, and which they are not able to load up and remove in their own wagons or carts as fast as it can be unloaded from the railway cars.

82. The same conditions apply to cars that have to be loaded from or into elevators, or that have to be dealt with in private or industry sidings, and when the freight requiring to be dealt with is in large and bulky sections so that they cannot be speedily handled, the delays thus caused are very materially enhanced.

Recent Remarks and Recommendations.

83. The *Engineering News* of the 4th April this year, in an article on "Double Tracking and Yard Improvements to facilitate Freight Traffic on Railways," stated that—

> The worst delays to the continuous forward movement of freight are those which occur in the switching yards, and through cars must pass through a number of such yards in travelling to destination. The aggregate detention from the time cars arrive (in a yard) in one train to the time they leave on another may run into days. It has been estimated by officers in the car service departments that freight cars are in movement on the road only about six hours per day or less and that *the average speed is but four miles an hour,*

making the daily mileage only 24 miles. Other estimates put it at only 16 miles travelled per day.

84. Mr. W. E. Beecham, of the Chicago Milwaukee and St. Paul, remarked at a recent Meeting of Car Service officers that while some speakers had stated that freight moved with "reasonable dispatch" on their roads, he desired to be put on record as saying that "*Freight does not move with proper dispatch on any Railway.*" (This same gentleman has stated elsewhere that—It is asserted with statistical accuracy that there are in existence at this time enough freight cars to provide *amply* for all the requirements of traffic conditions *for some time to come*, if they were properly distributed and promptly and efficiently handled; but, nevertheless, no such shortage of cars has been experienced in this country in any previous years as the railroads now have to contend with.)

85. At a Meeting of the American Railway Association in October 1906 a report of the Car Service Committee was presented giving returns from 130 Railways *with* 1,497,274 *freight cars in service* and operating 177,415 miles of road. *The average mileage per freight car per day was* 23·55, *ranging from a minimum of* 3 *miles to a maximum of* 43 *miles per day. Of the* 109 *Railways* specifically reporting the daily mileage, *there were* 26 *roads with an average freight-car mileage of less than* 10 *miles a day* (*N.B.*—This is on nearly one-fourth of the total number of reported roads), 35 roads with averages from 20 to 30 miles, and *only* 13 *roads with averages from* 30 *to* 40 *miles. Thus on about* 70 *per cent. of the roads the average movement is only* 10 *to* 30 *miles per car per day.*

86. "We have made a somewhat extended enquiry," continues the *Engineering News*, "as to the matter of detentions of cars in yards. In regard to local or destination cars which are to be unloaded in the yard or sent to some local industry for unloading, it appears

that *in some cases a car may wait for days in a yard before it is moved to the industry's track, and then be again left empty on this track for an equal time* before being brought back into the yard for movement elsewhere. We learn that at Chicago the *average* delay to cars from the time they reach their stations to the date of their being reconsigned *or unloaded* is about 2·3 days. This includes both Railway and consignee's detention, *but apparently not the return of the car.*"

87. At St. Louis the minimum time for *local* cars is 48 hours, with a maximum of 10 days, and *an average of* six *days.* This represents the total time elapsed after the car comes in off the road until it is unloaded at the industry tracks and is returned to the trunk line for re-forwarding.

88. In one particular *large yard* which is *generally congested,* the Railway holds consignments of grain, hay and similar commodities for diversion orders from the shipper or consignee. *Including the free time* provided for giving notice of arrival at this yard by the shipper or consignee, the time allowed for diversion is about 2 days and 14 hours per car *exclusive of Sundays and legal holidays.* When a car is ordered out of the yard by a shipper or consignee *there is usually considerable delay because the car may be in the middle of a large yard filled with cars awaiting orders.* There are no systematic records to show what the detention is to such cars after the forwarding orders are received.

89. In a paper read before the St. Louis Meeting of the Association of Transportation and Car Accounting Officers *in* 1905, Mr. T. S. Bell, of the Pennsylvania Railroad, said:—"We are endeavouring to formulate some methods by which car movement can be given closer supervision and to establish such records and methods that will give our people the necessary information to keep in touch as to yard delays, train and car movement, terminal delays and delays at sidings and point of shipment where freight originates. It is also necessary

to keep a close supervision over the empty cars. We have been keeping certain records during the past year and find that *our greatest trouble is to get cars through yards and released at terminal points.* These are the big problems which we are endeavouring to solve first."

90. At the same Meeting it was stated that on the Southern Railway steps had been taken to reduce the yard delays. By taking the conductor's reports of outgoing trains and finding the time at which each car had arrived at the yard from the conductor's reports of inbound trains, the average delay to such car was found to be 18 hours and had been reduced to 13 hours, although even this was far too much. On the main line from Washington D. C. to Greenville, Miss: 1,107 miles, there are seven relay points, and if a car of freight should meet with the average delay at each of these points (as it must on the average) it would mean 91 hours or *nearly 4 days' delay*, or 13 hours stop after (every) 158 miles run. Much of this delay is due to holding the trains to make up the full tonnage rating, but this may be overdone, as what is saved in transportation expenses is more than lost by having the car idle and out of service:—

In this connection Mr. J. N. Searle, of the Southern Railway, said at the above Meeting:—

If we were to eliminate our through trains that go through a terminal and take into consideration only the delays to slow freight, our delays would be something like 20 to 24 hours (*i.e.*, six days to a week for the seven relay points). That seems very unreasonable, but it is true.

91. In concluding its article the *Engineering News* states that—

Methods for facilitating the movement of cars through yards have been under consideration for some time by the Committee on Conducting Transportation of the Association of Transportation and Car Accounting Officers, but as yet its recommendations have related principally to the adoption of a proper system of auditing the cars. A more radical and apparently quite practicable step was suggested by Mr. J. M. Daly, of the Illinois Central Railway in the discussion of this Committee's Report at the New Orleans Meeting in November 1906. This was that solid trains should be run between important points made up of cars entirely for the train's own destination. By such a system the switching at intermediate points would be greatly reduced.

92. Mr. Daly said:—

Freight moving east bound from Chicago is now made up in trains with some cars for Buffalo, Cleveland, Boston, Philadelphia, and New York. My idea is that the time is coming when *stations like Chicago* will build solid trains of freight for New York and similar trains for Boston and Philadelphia. *On the Cleveland business it would pay to hold the loads at least two days in order to make up one solid train of dead freight to that point.* The benefit would be in saving 6 to 12 hours at Elkhort, Toledo, Cleveland or Erie and again at Buffalo, or 24 to 48 hours in all. *Under our present method we are breaking up nearly every train at every terminal point*, because there are some cars on it that must come out and other cars in the yard that must be added to it. *Freight held 48 hours to complete a full train would still make better time after it is made up in a solid train than we make to-day.* The only breaking at the important terminal points would be on 2 or 3 mixed trains containing miscellaneous loads where the business is not enough in two *or three* days to justify a solid train.

N.B.—The loss and delay in holding up of both freight *and cars* for 2 or 3 days would still have to be incurred under this system.

93. Finally the *Engineering News* concludes that—

The difficulties in supplying cars to shippers appear to result from congestions and delays in the handling of traffic, **and not** *to any shortage in the supply of cars.* (See Para. 48.)

94. Again, in a paper on "Increasing the Earning Capacity of Freight Cars" read by Mr. J. E. Muhlfeld, General Superintendent of Motive Power, Baltimore and Ohio Railway, at the Meeting of the Railway Club at Pittsburg in March this year, the author said :—

While cars are intended for the legitimate purpose of transportation, *they do every thing but spend the majority of their time in moving freight.* A commercial or industrial organisation would not think of allowing the equipment *upon which it is dependent for its output to lie dormant for* 21 *hours during each* 24 *hour period, but this is the freight car situation of railroads which are to-day being criticised for the non-movement of important traffic. Under these conditions instead of a shortage of car supply there exists a shortage of car movement.*

95. Regarding "The Sluggish Movement of Tonnage at Terminals" Mr. Muhlfeld said :—

The longer time taken for loading and unloading the cars of increased cubical and weight capacity per lineal foot of track space *has contributed materially to the inability of railroads to derive from their enlarged and improved trackage, terminal yard, motive power and operating facilities the* (faster) *movement of revenue freight that their investment has provided.*"

96. Railroads should apportion the car supply on the basis of the time required to load and unload, and the existing situation should be remedied by restricting the free time allowance for loading and unloading car-load freight to the real necessity of shippers and receivers, so that the railroad terminal yards and equipment shall not be **incapacitated** *through the failure to handle lading on and off cars promptly.*

97. The railroad demurrage rules and rates should be brought more nearly to a basis commensurate with warehouse storage charges, so that the value of (the outlays on) equipment, tracks, and terminal space will (each) have similar earning capacity.

98. Mr. Muhlfeld concludes his paper with a number of suggestions—To accomplish better results in the distribution and movement of cars amongst which the following may be mentioned :—

(*a*) An increase in the carload minima commensurate to the enlargement in the equipment. (*b*) The use of cars for such commodities as will permit of maximum lading, *quick loading and unloading*, and non-interference with the use of the equipment for its designated purpose. (*c*) A public storage for bulk freight that cannot be promptly disposed of or transhipped at lake and tide-water ports. (*d*) A reduced and uniform free-time allowance for all commodities and an increased demurrage charge for cars placed on railroad and industrial tracks for loading and unloading. (*e*) The discontinuance of costly stop-over privileges for sampling, transferring or milling grain, dressing lumber, compressing cotton and like manipulation involving rebilling at intermediate points. (*f*) A curtailment of the re-consigning and re-adjusting privilege and an increase in the charge. (*g*) The non-holding of motive power for maximum train loads to be moved *against* the flow of traffic. (*h*) The running of trains at

regular intervals and with respect to the destinations of the cars, rather than from one division terminal to another.

99. The *Railway World* of the 3rd May last stated that from the Report of the Car Efficiency Committee of the American Railway Association submitted at its Meeting at Chicago in April this year—

It appears that *the car supply in February* 1907 *was* 150,000 *cars short of the actual traffic offered for transportation during that month. The problem of car shortage, the operating, men declare is to-day the greatest and gravest which the railroads have to face and solve.* A searching investigation made by the Committee disclosed that the car shortage was not due to decreased car efficiency, as the records from railroads owning 79 per cent. of all the freight cars in the country showed that *the average daily movement of all freight cars had been* 25·4 *miles* (sic).

100. Regarding the delay in unloading cars at lake ports, it was estimated that 75,000 cars arrived with freight for steamers during the season of navigation and that *the average delay in unloading the cars was six working days.* Six days' delay thus represent the service of 450,000 cars. *One day's reduction would mean the use of* 75,000 *cars for that time, and that would mean* $750,000 *income to the railroads.*

101. The Association reaffirmed the principles stated in a Resolution passed 24th October 1906 that each railroad should be assured at all times of the use of a number of cars equivalent to the number it owned, and furthermore that the development of this principle by the American Railway Clearing House be approved. Both the Car Efficiency Committee and the Committee on Car Service favoured the continuation of the Clearing House experiment until it should be determined beyond question whether it has efficiency in the matter of reducing car shortages.

102. These Committies also favoured a Car Pool. It was stated by the Car Service Committee that a car pool virtually existed whether the railroads liked it or not, but that the present car pool was car-thievery—a car pool without regulation,—and that it would be far better to have a car pool with regulation. To illustrate to what lengths this unrestrained car pool was leading it was stated that one road in January 1907 was discovered to have 143,703 more cars on its tracks than it owned. *This was* 70 *per cent. in excess of its own cars*, and more than double the entire car shortage of the entire country during that month.

103. The Committee recommended that in view of these facts a penalty of $5 be imposed for every car that is diverted, *i.e.*, not loaded back in the direction of the home road, when the road diverting the car has an equivalent of 95 per cent. of its car equipment in use at the time. The Association approved of this $5 fine, and has referred the proposal to the railroads for vote, stating that, as it will be legal for a railroad to refuse to send its cars over a railroad that refuses to become a party to the agreement, all the railroads of the country will be forced to join.

104. Under the heading "Rule to Check Car Shortage defeated by *many* votes" the *Railway World*, 28th June 1907, says:—

New rules regulating the exchange of cars between the various roads, which were submitted for adoption to the individual members of the American Railway Association have been voted down to the great disappointment of the framers. These rules provided that a car off its own lines should never be loaded in a direction away from its home, and a fine of $5 was provided for every infraction of the regulation, which was intended to hasten the return of cars to their owners. It had been hoped by the roads having a good supply of equipment, and who are the principal sufferers, that the proposed new

rules would correct the flagrant misuse of these cars by roads insufficiently equipped, and would force them to purchase a sufficient supply of cars to take care of the traffic originating on their lines. It seems, however, as if the majority of the roads did not care to assume the added responsibility which the new rule would entail.

105. Mr. Arthur Hale, Chairman of the American Railway Clearing House, said before the Transportation Association of Milwaukee in April this year:—

Twenty-four miles per car per day is about the average that railroads were making between 1902 and 1905. In the first-half of 1906 this rate was raised to 25·7 miles. *Neither of these figures is at all impressive.* When an intelligent citizen learns for the first time that the freight cars of the country make only 24 or 25 miles a day, *he feels at once that something must be wrong—and very wrong.*

106. There are a great many things which influence the rate of movement of a freight car. The railroads have doubled their per-diem rate of car hire as between themselves. They are following up their own delays faster than ever before. On the other hand, the public is handling cars quicker. An increase of 1 mile a day in the average car-mileage means an increase of 80,000 or 100,000 cars in this country, and that number of new cars would cost the railroads nearly $100 millions. *My estimate is that the country loads about* 150,000 *cars a day* (*N.B.*—Only about 8 per cent. of the total number of cars in the country, and this in spite of the abundance of freight offering.) An increase of one mile means, therefore, an increase of 6,000 or 7,000 car-loads a day. *The railroads are adding nearly* 200,000 *cars to their equipment this year*, and my prediction is that with the help of the public they would increase the efficiency of the cars that they have *as much again.* If we succeed in this we will *in a year or two* catch up with the shortage.

(Nothing is allowed apparently for the growth of the traffic in this period?)

107. In an article on the "Necessity of Increasing the Efficiency of Railway Equipment" by Mr. J. W. Midgeley in the *Railway World*, 7th June 1907, the author says:—

Operating efficiency must be increased, for unless those entrusted with the management of railroads address themselves resolutely to their task and satisfy the public that they are furnishing as efficient transportation as it is by many thought would follow were the Railways to be operated by the Government, they will contribute much towards making that question the dominant issue during the next Presidential Contest. *Railroads must take decisive and immediate action.* The Interstate Commerce Commission will back them.

108. But no single railroad can act independently, For no relief can be expected from independent action however just and advisable or beneficent it may seem. To stop the 'billing to order" and other "stop-over" privileges which materially contribute to car shortages, single-handed, while helping a company temporarily by releasing cars, would cause it to be punished by loss of traffic and shippers taking away their traffic to other lines when the tonnage became light. Hence there must be concerted action between all Railways, *but there is a growing unwillingness of railroads to co-operate in improving the dubious outlook for transportation.*

109. At no previous time has there been a greater need for concerted action looking to the provision of adequate transportation than there is now and will be for the next year or more. Carriers must pull together for the common good if they would avert drastic legislation. An organization of about a dozen higher

officers of the different leading Railways, *whose conclusions would be binding*, is needed to meet emergencies like the one which now confronts American railroads, but as this is at present improbable, it remains *to adopt all available means to accelerate the movement of freight cars.*

110. The first step would be to correct abuses that retard their movement, *viz.*, holding shipments *on track* awaiting reconsignment instructions, stoppage of same in transit for compression, cleaning, milling or otherwise enhancing the value of commodities and rendering that service at little or no expense to shippers. In the same category should be included delays at terminals, especially at lake or seaports awaiting transfer to vessels.

111. While proposing to hold shippers to stricter accountability for car detentions, it should be remembered that *Railroad Companies are likewise at fault.* The importance of action (on their part) looking towards the accelerating of the movement of freight cars cannot be overestimated. Until 2 years ago the average mileage of the freight cars of the country was placed at 23 miles a day. *Through persistent prodding operating officers have so stimulated car movement that it is now said to approximate* 26 *miles per day.*

112. The accepted theory (*sic.*) is that an increase in the average mileage places that proportion of additional cars at the disposal of the railroads. In the instance cited an addition of 2·7 miles per day would be an increase of 12 per cent., and as there are about 2 million freight cars in use upon American railroads, it would be equivalent to adding 240,000 available freight cars. Think of the saving in money thereby effected. The provision of 240,000 new cars would at this time involve an expenditure of over $200 millions. *Such vast outlay* can be avoided by the simple expedient of so accelerating the movement of freight cars as to add 2 *or* 3 *miles*

to the daily average per car. Surely this should be a sufficient incentive.

113. Averages however are apt to be misleading, because they include wide variations. For example, the Pennsylvania, with a density of traffic elsewhere unequalled and comparatively short hauls, attained a daily average of 27 miles per car. As the aforesaid system controls fully 12 per cent. of the total number of freight cars in use, it is conclusive that many roads must have lingered around 20 miles per car per day, otherwise the average would have been further increased. This fact locates a real grievance to the redress of which stringent remedies should be directed.

114. As showing that similar conditions and difficulties exist on Railways elsewhere, the following extracts from a paper on "Freight Traffic Working" read before the British Association Meeting at York in August 1906 by Mr. W. T. Stephenson, of the North-Eastern Railway, may be cited:—

The task of increasing train loads has been a difficult one, and further progress in this direction is likely to prove more difficult on account of the lack of good terminal accommodation. This is nowhere more apparent than in the accommodation at our large marshalling yards. In many cases these yards are inadequate for the traffic to be dealt with. The sidings are too few to separate the traffic properly, and what sidings there are are too short to hold long trains. Further, these yards are in many cases situated in large towns, and their extension can only be carried out at enormous expense, as houses and in some cases large works would have to be bought to make room for the extensions.

115. On one of our English Railways the average number of wagons per goods train has increased from 30 wagons in 190[illegible]

35 wagons in 1906 and *the paying load per train from 46 tons in* 1900 *to* 82 *tons in* 1906. *The average wagon load has also increased from* 4·2 *tons per wagon in* 1903 *to* 4·8 *in* 1905. Most of the figures relate to the North-Eastern Railway, with which the writer is connected, but *they can be taken as typical of the general movement on all Railways in the country.*

Recent Results.

116. Apart from the general disastrous results produced by the congestion of traffic in all the principal Railway countries of the world which have been already referred to in paras. 28 to 33, the difficulties and defects indicated by the various Railway officials cited above have produced other and more specific results which are of the greatest consequence to the Railways of the United States.

117. The latter themselves have been making strenuous efforts to increase the movement of their cars and freight. In the North Philadelphia yard of the Pennsylvania Railway the average detention to the cars sent out was six and-a-half days in September last and was reduced to five days in October. In Pittsburg "where there is usually the greatest congestion and difficulty in moving freight," the average detention to cars was over eight days in August and was reduced to six days in October.

118. In spite of these efforts, however, the delays generally have continued, and as the average mileage per

car is only about 25 miles a day, while the average freight haul is 135 miles, it is clear that *all the cars of the country have not been able to make more than* $2\frac{1}{2}$ *trips on the average in a whole month.* Mr. J. E. Challenger, Manager of the Philadelphia Car Service Association, reported in February this year that on one of the roads in Philadelphia 450 cars of produce consigned to one yard had been detained for an average of 10 days, and that some of the cars were detained for 46 days.

119. The result of this has been that although the Railways have built more cars and made greater efforts yet *less produce has been carried by them within a given time—the produce season—than was carried last year* (see Commissioner Lane's statements quoted in para. 19 above).

The *Railway World* of the 17th May this year stated that—

> Extraordinary efforts had been exerted by the railroads to clear their yards and stations of delayed business, which have been greatly assisted by the milder weather which has permitted of greater regularity of railroad traffic.

Yet in spite of these efforts the total number of car loads handled by the railroads during the first three months of 1907 was *less* than the number handled *during the same period* in 1906, being 7,522,000 against 7,666,000 in the previous year.

120. The same paper also said:—

Receipts of grain and grain products at Boston, New York, Philadelphia, Baltimore, New Orleans, and San Francisco for the first quarter of this year are *still almost* 25 *per cent. below* those of the corresponding quarter of 1903. The car arrivals and shipments at and from the primary live-stock markets of Chicago, Kansas City, Omaha, St. Louis, St. Joseph, St. Paul, and Sioux City during March 1907 were both less than the figures for 1906 and 1905. The live-stock arrivals also were less. Anthracite coal shipments during March and for the first quarter of this year are both below those of 1906. The total receipts of grain, coal, and lumber at *all* lake ports open to navigation *were lower* in March 1907 than in March 1906.

121. President Hill, speaking *in the middle of June this year* concerning the movement of last year's crop, said :—

The most of last year's crop has been moved out of the North-West. I have heard reports that 25 to 30 million bushels still remain. As a matter of fact, there are not more than 7 or 8 million bushels left.

122. The result of this prolonged delay in the movement of grain has been a very serious deterioration in its quality and condition which has caused financial and other losses even greater than those referred to by Commissioner Lane and already quoted in para. 18. In a paper on "Grain Inspection and the Export Trade" by Mr. J. D. Shanahan, Government Grain Expert, before the Texas Grain Dealers' Association on the 24th May this year, the author said ;—

During the past year we have ample evidence of *an appreciable constriction in the prices paid for, and the volume of grain sold to, our European customers, and also of an enormous deterioration and waste of grain crops in this country.* Specifications of No. 2 wheat generally required it to be sound and of No. 2 corn that it should be dry, but samples tested by the writer from various elevators and shipments and cargoes showed some No. 2 hard winter wheat as *containing only from 9 to 33 per cent. of sound wheat*, and as much as 35 per cent. and more of bran and burned wheat—skin-burned or *bin*-burned.

123. The result of the losses thus caused by the failure of the railroads has been to produce a bitter popular outcry against them, and the adoption of legislation to compel them to do better. "Reciprocal Demurrage" Bills have been passed rendering railroads liable to a penalty of one dollar per car per diem for every car which they fail to furnish to shippers within six days when 10 or less than 10 cars are required, and within eight days when more than 10 cars are required. In some States Bills have also been passed compelling all freight to be moved at an average speed of not less than 50 or 60 miles a day, and that cars be delivered at unloading points within 24 hours of reaching destination, the demurrage to be paid to the shippers for failure to perform either of these requirements being also one dollar per car for each 24 hours' delay.

124. To meet these Reciprocal Demurrage laws the railroads now require shippers to notify their requirements a week beforehand, and to stipulate the capacity

of the cars required. They have also formed a Car Efficiency Bureau to insist upon more prompt loading and unloading of cars by shippers and consignees, and have increased their demurrage penalties for delays in doing so. They have also decided to require a payment of $2 per car per day on every car of grain held beyond 48 hours and diverted.

125. Further and more important still, the railroads have raised the minimum quantity which a shipper was permitted to load and ship at the car-load rate from 8,000 to 12,000 lbs., and have also made *a general advance in their rates for the conveyance of freight exceeding 5 per cent., nearly 3,000 different articles being so affected.*

126. *Thus the whole community have been made to suffer permanently for the defects in the working of the railroads*, and the general increase in the cost of all the United States industrial products thus produced will no doubt affect the demand for them in other countries, so that the increase in their export trade will probably be retarded.

127. But the loss, in spite of this distribution and raising of rates, is still mainly that of the railroads themselves, for in addition to the loss of traffic which the delays in the movement of cars involve, and the falling off in total traffic thus produced, the railroads have to incur heavy extra expenditure in providing additional cars

and larger yards and terminals for handling them. The Pennsylvania Railroad alone bought over 17,000 cars in 10 months of last year, and many other Railways have purchased over 10,000, the total of new cars for all the railroads in the States being close on 200,000 for the 12 months. Additional rails have also to be purchased for these extra cars to run on, and in April this year the Steel Corporation reported that it had enquiries on hand for the delivery of about 250,000 tons of rails in 1908.

128. The expenditure already incurred by railroads, however, is but a trifle compared with that which is contemplated, for example, in the estimate made by President Hill and referred to in para. 6, which runs to $5,500 millions. Another high authority in railway matters, Mr. Harriman, the greatest holder of railway stock in the United States, said in a recent interview that—

> The railroads of the States will have to be rebuilt with much heavier rails and with a gauge of six feet instead of the present 4 ft. 8½ in. The combination freight car of the present will have to give way to an all-steam freight car 2 ft. wider, 2 ft. higher, and several feet longer. Tunnels will have to be enlarged and bridges must be rebuilt to make them equal to the increased loads. *To do all these things will cost billions of money. Nobody can tell how many billions.* I think it would pay well to rebuild all the roads in the country on a 6-ft. gauge and supply new cars and all equipment to match. (N. B.—*This when, as we have seen in paras.* 39 *to* 65, *the present*

railroads have ample cars and trackage, and move only 20 tons of freight in a car over 25 miles every day ! ! !)

With reference to this suggestion, however, Mr. T. Conway writes in the *Railway World* of the 14th June that—

To increase the height of the car or to broaden it would necessitate the reconstruction of bridges and terminals, the rearrangement of yards, the moving back of station platforms, and *the readjustment of almost every industrial plant into which the cars are sent.* The magnitude of this work is so enormous that it seems exceedingly unlikely that it will ever be undertaken.

129. The necessity for and prospect of this large expenditure, in addition to causing railroads to increase their rates and charges, has also forced them to adopt many economies, the chief and most doubtful of which has been the slowing down of the speeds of all trains. From the 9th of June this year on all Western roads about 5 hours has been added to the running time of all through west-bound passenger trains, and over 6 hours to the east-bound ones. In addition to generally lengthening the schedules of the passenger trains between Chicago and the principal western cities, *several hours will be added to the timing of all freight trains from the Missouri River westwards.*

130. Mr. P. S. Eustis, Traffic Manager of the Burlington, one of the largest railroad systems in the country, said in June this year—

There was a time when the trains of the West were noted for the speed with which they were sent over the country, but *because of*

the increased business they can no longer make that speed. Local business is increasing and trains are becoming heavier until now, if you take the report from any Union Depôt in the West, you will see that all trains are arriving late from 40 minutes to 2 hours on the average. It was certain that something had to be done, either the running times of these trains had to be let out, or slower trains put on to handle the intermediate business and the faster ones let hustle along to care for the through business. There never was much money in the passenger business, and now that the legislatures have reduced the fares, there is no special inducement for us to use up all the energy of our roads in hustling these passenger trains across the country *while train after train of freight is made to wait for them to pass.* This however is not the main issue with us. The freight business is so heavy that *on these single track* roads we must give more consideration to it. Consequently we have seized the other horn of the dilemma and have decided to lengthen the running time of the trains.

131. The *Railway World* states in reference to this action :—

The Eastern Railroads have not been running their passenger trains as a rule any closer to their schedules than the Western roads, and it is likely that the Eastern roads will try to lengthen their schedules after the example of their Western connections.

132. Thus instead of quickening up the speeds of all their trains and clearing their single track lines more rapidly, or building 2nd tracks to enable them to move much larger numbers of trains daily, the railroads of the States are being forced to adopt a retrograde policy of slower train movements *just at the very time when the increase in the quantity of traffic offering*

should call for a more rapid movement and circulation of vehicles than ever. This decrease in the running speeds of trains involves not only more staff and more fuel and motive power, but also increases the number of trains to be crossed or passed on the single-track lines during each run very materially, and it is extremely doubtful whether any advantage at all will be derived from it.

133. The most convincing result however of the loss to the railroads is to be found in the increase in their operating expenses. The *Railway World* in March last said:—

There is no doubt that the cost of operation will be greater this year than it was in 1906.

And again in May:—

Reports of Railway earnings, both gross and net, for March are distinctly disappointing. The figures *for* 91 *roads* are as follows:—

	March.	
	1907.	1906.
	$	$
Gross earnings	141,580,502	128,600,109
Operating expenses	100,612,575	87,695,996
Net earnings	40,967,927	40,904,113

Almost the entire increase in gross earnings has been swallowed up by operating cost, leaving a gain over the corresponding month of 1906 so small that it is scarcely worth considering.

Again on the 7th June this paper said:—

Railway net earnings throughout the Eastern part of the United States show a tendency to decline with the rapid increase in operating cost. In the South Western territory gross earnings have been increasing so rapidly that the increase in the operating cost *has not yet* been able *to overtake* them.

134. Another and more serious result entailed by the present defective methods of Railway working has been *a direct loss of human life and limb*, due principally to the "persistent prodding" and extraordinary efforts exerted by the railroads to clear their yards and stations of delayed business. See paras. 110 and 118. In Bulletin No. 22 issued in June by the Interstate Commerce Commission on Accidents on the United States Railways in the quarter ending 31st December 1906 it is shown that 1,196 employés were killed and 15,845 injured, and 234 passengers were killed and 3,669 injured—*a total of nearly* 21,000 *casualties in the three months! and an increase of* 1,094 *casualties over those in the preceding three months!* In spite of the compulsory and general use of automatic couplers no less than 84 of the employés were killed and 1,083 injured in coupling or uncoupling vehicles.

135. The damages to engines, cars, and roadway by these accidents was $3,099,228, or *over one million dollars every month.* In one instance $10,950 were awarded as compensation for personal injuries at a level-crossing against the New York, New Haven, and Hartford Railroad, and in another $200,000 were paid by the New York Central Railroad to a Mr. Kleist for injuries sustained by him. Most of the accidents were caused by or occurred to new and inexperienced men.

The Evil.

136. From the foregoing it is evident that while the railroads of the United States are causing an enormous loss of money and an appalling loss of life, their present methods of working are so defective that neither their engines and cars, nor their tracks, are being utilised to anything like their proper or possible capacity.

137. Moreover as time goes on there does not appear to be any improvement, for the difficulties of supplying cars and moving freight increase as more cars are built and limited yards and terminals blocked up by the increase in traffic. The *Washington Post* in March last stated that *the congestion that began last summer is still unrelieved,* and Mr. Midgeley, in the article already quoted in para. 106, said.—

To my thinking the reasons for the popular hostility towards railroads are of minor importance compared with *what confronts us. As yet no immediate remedy has been presented and it is not certain that one can be indicated.*

138. The same conditions apply in a less degree to railroads all over the world, and the need for the solution of the great Railway problem is as pressing as ever.

The Root of the Evil.

139. Now, wherein does the mischief really lie? President Hill touched on the source of it in his letter when he said, "Cars stand for days and weeks in yards

or at transfer points *waiting their turn,*" and Mr. Muhlfeld indicated this still more clearly when he wrote (see paras. 95 and 96) that railroad terminal yards and equipment were "*incapacitated* through the failure to handle lading *on and off cars promptly,*" and that the railroads were unable to derive any benefit "from their enlarged and improved trackage, terminal yard, motive power, and operating facilities" on account of the ***long*** time taken "*for loading and unloading the cars.*"

140. *Why* is it, then, that such a long time is necessary to load and unload a freight car? And *is it not possible to reduce this time?* The answers to these two questions contain the key to the solution of the entire problem and from them we see at once that *the root of the evil is the present freight car.*

The Freight Car.

141. Every freight car comprises *two different parts which have entirely different functions to perform.* One part is the box or top which contains the freight that is carried, and the other part is the underframe and wheels that carry the box and its freight and run on the rails.

142. The latter part is rigidly confined to the track, and in all existing freight cars *the first part or box is rigidly and inseparably connected to the under frame and wheels so that it also is absolutely confined to the track.*

143. *Hence it is necessary when loading or unloading a freight car to handle every individual article or package that forms its freight, and as this may amount to anything from 20 to 50 tons in weight, it is obvious a long time must be required for the process. And during all this time the frame and wheels are uselessly locked up standing idle, and about 50 feet of most valuable track space in the freight-house is blocked up.*

144. *Cannot this time be reduced? Of course, it can. The simple and obvious remedy is to make the top or freight-containing box completely separate and detachable from the frame and wheels, so that it can be quickly lifted or rolled off the latter, and be removed to any convenient place where it can be loaded or unloaded at leisure.*

145. This comparatively slight and insignificant alteration is really *the greatest economic improvement that can be effected in Railways, and solves the great Railway problem of the world.*

146. It is, indeed, most extraordinarily surprising that it has not been considered and adopted before, especially as the writer has been endeavouring to draw attention to it and point out its advantages at different intervals for the past four years and more. We shall now indicate these advantages once again.

The Divided Freight Car.

147. One of the first objections that may be raised to the separation of the freight-containing portion of the car from its under-frame and wheels is that this is too large and clumsy to be handled separately on and off the rails. The answer to this is that this top or box can easily be cut up into a number of smaller and more convenient boxes. The average load of a loaded car is about 20 tons in the States, and only about 4 or 5 tons in Great Britain, and not much more elsewhere. The average capacity of the Standard American Freight Car is 32 tons, and it is only about 10 or 20 tons elsewhere. A divided car with four 8-ton boxes on it would equal the standard capacity, and each box being only about 8½ ft. by 8½ ft. by 8 ft. in size would not be too large or heavy to handle separately.

148. To lift such boxes, however, would require a system of travelling cranes in all freight-houses, and would involve the cost of frequently hoisting the entire freight tonnage against gravity. The boxes therefore should be on small wheels or rollers, so that they can be easily rolled off and on to the frames of the cars, and can be also easily moved about on platforms or anywhere.

149. To assist in this movement the floors of the cars, on which the boxes would lie, might be made to tilt up a few inches or so, and the surfaces of the

freight-house and other platforms might be made with a slight grade, so that the roller boxes could be delivered from the cars on the upper side of the platform, and, after being unloaded and reloaded on it, could be run down to its lower edge and there run on to the frames of the cars standing on a slightly lower-level track.

150. Further, to enable the boxes to be freely moved about on the platforms and to save loss of moving space between the floors of the cars and the undersides of the boxes, spherical ball-bearings might be employed instead of wheel or cylindrical rollers, so that the boxes could be moved *in any direction and round sharp corners without requiring to travel over the arcs of circles.*

151. A second objection that may be raised to the use of these roller boxes is that they would be unsafe to haul in a train, as owing to the rocking of the cars at high speeds and over uneven tracks they would tend to roll laterally clean off the sides of the cars. The answer to this is that the boxes can not only be confined laterally, and be secured or fastened down to the frames of the cars more strongly than the present rigid tops are attached to them, but simple arrangements can also be made for throwing the boxes off their roller bearings while they are running on the cars. Loose detached loads of all sorts of awkward shapes and sizes are now daily accepted without fear and hauled quite

and unload the cars from the same track. In this case slightly more force would be needed to move the boxes, but being on roller or ball-bearings the total force required would not be much, especially as the boxes would not require to be moved more than a few feet on the platforms.

In these cases a slight slope towards the track might be given to the platforms so as to facilitate the loading up of the cars, as the tilted floors of the latter would suffice with a little assistance to send the boxes, up this gentle slope when being unloaded from the cars. To further facilitate the movement and handling of these boxes on the platforms, wedges or compound levers of a similar type to "The Giant Wagon Shunter" might be employed.

155. With ball-bearings it would also be necessary that the area of the platforms over which the boxes are handled should have a paved, wooden or other *hard* surface,—so that the balls might not sink into soft mud or stuff in wet weather. This however can be easily arranged, and if any of the boxes are required to be moved across further distances, narrow paved ways or shallow channel irons or even ordinary wooden planks might be laid down for the bearings to roll on, as the latter should be fixed to the under sides of the boxes at a standard width of, say, four feet apart.

156. For convenience, any of the four sides of the boxes might be made removable or with flap and swinging doors, and for bulk freight their tops might be left open, and their bottoms provided with the usual side or centre dumping arrangements, so that they may be loaded and emptied in the usual manner by being run under elevator shoots or over dumping pits, etc. For this kind of freight also larger boxes of, say, double size might be advantageously employed.

157. Thus it is not only the box cars but also all hopper, gondola, and other freight cars that may be divided. Even the ordinary flat cars should be similarly treated, and have their flat floors separated from the rest of the frame and placed on roller bearings. In the case of these cars the entire floor length might be made to roll off in one piece instead of being cut up into two or more short lengths.

The Great Advantages of the Divided Car.

158. Coming now to the advantages of this divided freight car, the first and greatest advantage is the ease with which *it enables a particular car-load or part of a car-load to be removed from a long rake or train without any movement or disturbance whatever of the other cars and loads.*

We have already seen in paras. 68, 72 to 76 and 79 the great difficulty and delay there is in getting a parti-

cular car-load of freight into or out of its position on a train, and the large number of shunts and switching operations that are now required for this purpose.

159. With a train of divided cars however any car-load or part can be at once taken off by. simply rolling it off its car frame laterally, and similarly any other load or box can be rolled on in the empty place within 2 or 3 minutes time.

At the smaller stations where the boxes are delivered and received on the same track all that a freight train would be required to do would be to stop and roll off its inbound boxes, and then to draw ahead and receive its outbound ones. At the larger stations where the boxes are delivered on one track and received on another the train, after delivering its inbound boxes, would simply be required to draw ahead and back down the 2nd track to receive its outbound freight.

160. A second great advantage that follows from this facility is that, as any box can be removed at any time and place from any train no matter what its situation is on the latter, *the necessity for classifying and sorting the cars on every train into a special destination order is entirely removed.* At junctions and car-transfer points all that will be required is a narrow box transferring platform on to which the main or home line will deliver its branch or foreign freight on one side, and

from which the branch or foreign train will receive its freight at the opposite side, and *vice versâ.* At large junctions or transfer points where much freight has to be exchanged, two or more such platforms may be provided, separate platforms being allotted for the delivery of outbound and receipt of inbound boxes so that the latter are never likely to get mixed up.

161. Thus 80 or 90 per cent. of the delay that is now experienced in large yards and terminals in sorting and classifying the cars into particular groups will be entirely obviated. As these delays (see paras. 83, 86, 87, 90, 100 and 117) run into several days out of each 12-day car journey of 135 miles (paras. 118 and 90), it is clear that a very large proportion of the freight cars of the country would be set free by this one facility alone. In para. 112 Mr. Midgeley showed that an increase of 12 per cent. in the daily mileage per car would be equivalent to adding 240,000 cars to the available supply.

Assuming that only 50 per cent. of the total time was spent by cars in classifying yards, or on classification and switching work in terminal and other yards, *the saving would be about* 5 *days on each* 12-*day trip, equivalent to an addition of* 800,000 *cars to the supply.*

162. In addition to this all the trackage, with its numerous frogs and switches that is now laid and used for car classification purposes, would be set free and

rendered available for the far more useful function of doubling the present single track trunk lines, or of providing new branch lines.

In one yard alone, at Altoona, the Pennsylvania Railroad has over 220 miles of track locked up, and the New York Central and Hudson River Railroad is now building a freight yard at Gardenville near Buffalo, which is to contain *over* 300 *miles* of track. There are many other freight yards with 40 to 60 miles of track in them, the total yard trackage of the country being about 63,000 miles (see para. 63).

163. As with the quicker movement a larger percentage of cars would be always on the running lines, less stabling accommodation would be needed for the cars, and 15,000 miles of track would be ample for this purpose. As the number of tracks in each yard would be greatly reduced an allowance of another 5,000 miles would suffice for their connections, and allowing the same percentage (80 per cent., see para. 65) as exists at present for ***unbalanced*** changes in the destinations of traffic, a total yard trackage of 36,000 miles would be ample, *so that quite* 27,000 *miles of track would be at once available for doubling an equal length of single-track trunk lines, or for providing new branch lines.*

164. The importance of double-tracking trunk lines, in spite of what has been stated in para. 60 above, cannot

be overlooked, for, in addition to the enhanced safety obtained by the removal of 80 per cent. or more of the train crossings, such doubling not only gives a much quicker service, both passenger and freight, to the public, but also *very largely increases the transporting capacity of a Railway, and enables it to effect this transportation work at a very considerably reduced cost.*

165. A third, and by no means unimportant, advantage of the use of the divided freight cars is that *at least* 5,000 *of the* 9,500 *locomotives at present employed in yard switching work* (*see para.* 49) *would be released and rendered available for hauling freight to destination.* This number of engines, together with the additional supply made available by the reduction in the delays to trains effected by the additional double tracking, would suffice, along with the 800,000 extra available cars, to provide sufficient equipment for dealing with all the traffic likely to be offered for transportation within the next year or two, especially as, with the increased rapidity of circulation, the transporting capacity of each unit of equipment would be largely increased.

166. A fourth advantage of the use of divided cars is that the enormous number of switching operations now required in all classifying yards, together with the strenuous labour and risk of life which they involve, *are*

entirely saved, as well as the damage usually done to the equipment in the hump shunting in these yards. *The dangers of coupling and uncoupling cars* (*see para.* 134) *will be almost wholly done away with*, for the rakes of trains in the direction of the traffic can be permanently made up of the full number of loaded car frames which the locomotive can haul, and the boxes on these frames merely exchanged as may be necessary at the different points passed by the train on its journey along the road.

167. The extent of the switching operations at present performed in classifying and terminal yards may be gauged from the fact that about 3,000 engines are constantly employed both day and night in performing them. At an average shunting speed of only 4 miles an hour this would mean over 105 million shunting miles in the year, to which should also be added the switching work done at smaller stations along the road by the 30,000 freight-train engines daily in attaching and detaching odd cars during their 60-mile runs (see paras. 50 and 68 to 76). If each road engine performed on the average only one mile of such switching work during each of its runs, the total for the year would be over 10 million shunting miles, and as each switching movement both in the large classifying yards and on the road is made along with some freight cars, *the total haulage work done in switching cars must amount to over* 115 *million*

locomotive miles and several times that number of freight-car miles per annum.

168. Now, what would any sane person think if he called a messenger boy to take a 10-lb. packet urgently from, say, the Central Park to Wall Street, and this lad put the packet into a 20-lb. box and, before starting, ran with it several times up and down 59th Street, then went on and did the same along 42nd Street, and on reaching Madison Square took several turns up 23rd Street and repeated the operation along Grand Street, until finally, when he reached Wall Street, instead of delivering his packet at once, he began again to run wildly up and down Nassau Street with it? Yet this is exactly the sort of operation that is now performed every day on a larger scale by every Railway in the world with every consignment delivered to it! And then complaints are made by these Railways that the cost of operating is very high!

169. A fifth advantage of the divided box car is that the cubical shape of the boxes enables them to be more fully filled with freight, especially with grain and other loose bulk freight, than is possible with the present long and narrow flat-roofed cars. Mr. T. Conway, in an article in the *Railway World* of the 14th June this year on "the Standardization of the Freight Car," says:—

It is almost impossible to get 50 tons of freight into the Standard American Railway Association Box Car. (This car is 36 feet long, 8½ feet wide, and 8 feet high inside, and has been

generally accepted and become a fixed standard, a change from which is exceedingly unlikely). If it is loaded with wheat, including the usual 10 per cent. overload which is provided for, to its capacity of 110,000 lbs., the load would come within six inches of the roof, which, while theoretically possible, is impracticable under ordinary conditions (owing to *the coning* of the grain round the inlets). On the other hand, if an 80,000-lb. car is loaded with 88,000 lbs. of wheat, the load would come within 2 ft. of the roof, which approximates much nearer to the (bulk) loading and *unloading conditions* that have to be faced. All of the other grains weigh less per cubic foot than wheat, so that a car loaded with any other kind of grain would weigh considerably less than its rated capacity.

170. A sixth advantage of the divided box car is that *by the mixed loading of boxes containing light and heavy freight on the same car, the full carrying capacity of each car and each axle can be fully utilised.*

This is rarely possible when the entire car has to be loaded with one and the same kind of freight as is necessary for bulk loading at present. In his article above quoted Mr. Conway says:—

There are *very few* of the most commonly handled commodities which are sufficiently heavy to permit of a 50-ton load in a standard box car. Hay, for example, would utilize but 38 per cent. of its (weight) capacity, *Merchandise only* 26 *per cent.* and Mill Stuff 62 per cent., while *the commodities usually classed as Miscellaneous would weigh only* 63 *per cent.* of the maximum (weight) carrying capacity of the car.

171. These advantages are very important, but a seventh and still more important advantage, which is

indeed *the greatest advantage of the divided freight car, is the very largely increased distributive power which it possesses, and which enables it to be run nearly always fully loaded where four large and undivided freight cars of the present type would each have to be run with a very small percentage of load.* In other words, it practically solves the problem of the small consignment.

172. Railroad transportation is essentially a distributive or a collective process. It is distributive of mining or manufactured products which are produced at various centres, and are required to be conveyed to a large number of consuming points scattered all over the country. It is collective of agricultural products which grow all over the face of the land, and are required to be brought to various markets and ports for sale and exportation.

It is the aim of every miner and manufacturer to get his products sold and consumed in every corner of the earth. It is the aim of every merchant to obtain the particular produce in which he deals from every corner of the earth.

173. Now the number of points to which Railway freight may be conveyed, or from which it may be collected, is very large. Taking them as being six miles apart on the average in the United States, there would be 37,000 of them. The number of different combi-

nations of these points, between any pair of which freight may be required to be exchanged daily, is over 684 millions. The average tonnage handled by all the United States Railways is under 4·4 millions daily. In other words, *it is possible* that every 5 tons of freight may be required to be sent to or collected from 70 different points. The *tendency*, through free trade and competition, is that it should be moved between *all* these points. Even if moved between only one-seventieth of this possible number of points, the *average* consignment therefore would not be more than 5 tons in a day. Larger averages could only be obtained either by combining consignments for several destinations into one car-load, or by delaying consignments and accumulating two or more days' despatches for each movement, or through the fact that the freight was at present being moved through *less than one-seventieth of its possible channels.*

174. Hence it is evident that the average daily consignment of freight between any two Railway receiving and delivering points must be very low, and is tending to become still lower. Also that the quantity of "Less-than-car-load" freight required to be carried by Railways must be considerable, and is tending to increase. Thus the traffic requirement of the present day is for a larger number of smaller cars rather than for the fewer number of larger cars now being built under the mis-

taken idea of economy in haulage. It is true there is an economy in the actual haulage of larger cars, but, as will be shown presently, this economy is wiped out several times over by the loss in the empty running of these large freight cars. It is only in a very few local and special cases where large quantities of coal and ore, or similar freight require to be hauled *regularly* between *certain* points that their use can be justified.

175. In his article already quoted (see paras. 169 and 170) Mr. Conway says:—

The movement for 100,000-lb. box cars has made slow progress and comparatively few roads have seen the advisability of accepting this type as standard. The deterring influence which prevents the adoption of this type of equipment is the difficulty of getting a 50-ton load with sufficient frequency to justify the construction of the more expensive car, and the handling of dead weight which must be carried in the event of the car not being fully loaded. *The Northern Pacific, for example, after conducting a campaign running over a number of years, could only get from* 23 *of their largest stations an average load of* 11,688 *lbs., i.e.,* less than six tons!

176. Mr. Neville Priestley, in his Report to the Government of India on the working of Railways in America, said:—

The traffic in less than car-load lots loaded at the Chicago station (of the Illinois Central Railroad) on the 29th of September 1903, the day I visited it, amounted to 15,522 *different consignments for* 1,920 *different stations*, and weighed 1,024 tons of 2,240 lbs. each, and *was loaded in* 202 *wagons*, (*N.B.*—The consignments *for nearly ten stations* must therefore have been *put into one*

and the same wagon) *giving an average load for each wagon of* 5 *tons.* (So that the average consignment *to each station* was *only about half a ton.*) For the first-half of the year 1903 the traffic in less than car-load lots *loaded* (only) at this same station *averaged* 988 *tons daily.* The wagons used averaged 195 daily, so that the average load per wagon was 5·2 tons.

177. Similarly as regards English (and other) Railways Mr. W. T. Stephenson, of the North-Eastern Railway, in the paper quoted in para. 114, said:—

Although large wagons of 40 or even 50 tons are right in principle, there are many difficulties in the way of their general adoption at present (1906). In ordinary goods traffic the average consignment is very small. *Particulars taken at six large warehouses showed* 82 *per cent. of the consignments to be under half a ton.* A statement taken for a week in 1895 on an English Railway showed *over* 40 *per cent.* of the *loaded* wagons carried *less than one ton.* To increase the average wagon load transhipping sheds were introduced to combine a number of small consignments, going in similar directions, to make up a full wagon load to a convenient distributing point. By means of transhipping at one warehouse *the average wagon load has been increased from* 29 *cwt in* 1905 *to over* 46 *cwt. at the present time* (*August* 1906). (*N.B.*—This is an average of *less than* 2½ *tons* per car for less than car-load freight.) The average wagon load (of *all* descriptions of freight) on one of our English Railways has been increased from 4·2 tons per wagon in 1903 to 4·8 *tons in* 1905.

178. At the Institute of Civil Engineers in 1904 Mr. Bury, the General Manager of the Great Northern Railway, said:—

The average load *for goods traffic throughout the country* was approximately *only* 2½ *tons.*

Again, Mr. T. H. Rendell, Chief Goods Manager of the Great Western Railway, stated in his evidence before the Canal and Waterways Commission in February this year that—

Of 740 *consignments of iron and steel* traffic handed to the Great Western Railway from a large works in South Staffordshire during the last half-year, 511 (*or* 70 *per cent.*) *were of under* 10 *tons weight,* 30 were between 30 and 50 tons, and only 5 over 100 tons.

Similarly Mr. F. W. West, Goods Agent of the London and North-Western Railway at Crewe, said in a paper read before the Brittania Debating Society in November 1906 that—

The best average load we could get for our local wagons has increased from 1 ton 14 cwt. per wagon in the spring of 1902 *to* 3 *tons.*

179. These extracts show that in spite of special endeavours and elaborate transfer sheds and other arrangements, the average car-load for Less-than-car-load freight is about 5 tons in the United States and barely 3 tons elsewhere. As this class of freight forms a considerable proportion of the total traffic of all Railways, and as the average carrying capacity of the freight cars is over 30 tons in the States and from 10 to 15 tons elsewhere, it is evident that the carriage of this freight must involve a very large amount of empty haulage. In para. 45 it was shown that during

the past year no less than 129,600 *million* ton-miles of *empty* carrying capacity, involving the haulage of 54,000 *million* ton-miles of dead weight, were handled by the United States Railways *in the direction of loading*, and here we have the main reason for this enormous wastage of haulage power, which is actually **just double the above figures,** as all the capacity and cars hauled *empty* in the direction of loading *must necessarily have to be hauled back again quite empty.*

180. Now with the divided freight car, as each box has a capacity of only 8 tons and every car carries four boxes, it is clear that a very much better percentage of loading will be obtained, for the 5-ton loads that are now put into *four* L. C. L. cars could all be put on to *one* divided freight car, *and would give it a 20-ton car-load. An average train of* 26 *Divided L. C. L. cars would thus carry* 520 *tons of freight for* 104 *different points, against only* 130 *tons hauled in the same train of undivided cars at present for* 26 *different points.* This is an enormous gain, but it is still not all the advantage, for owing to the facility with which the smaller roller boxes can be handled, they could easily be filled up with 8 tons of L. C. L. freight for adjacent points and be rolled off the train at the first one, unloaded of the portion destined for it, and be rolled on to a following train and sent off to the next adjacent point with very little

delay. This would enable a still better percentage of car and train loading to be obtained and would reduce the empty haulage still further, and in addition to the initial full load the partially emptied boxes, in being sent on from point to point, could take on any intermediate L. C. L. freight that might be offering.

181. An eighth great advantage of the divided freight car is the large saving in the double handling of freight which its use effects. For *box-load* consignments of *as low as* 5 *or* 6 *tons* can be conveyed direct from the shipper to the consignee *without being opened or handled in any way*, instead of requiring as at present to be mixed up with several other consignments in a large freight car, and to be unloaded and reloaded in detail at several intermediate transfer points. Similarly, less-than-box-load freight can be conveyed *in the original box in which it is shipped* to its destination, other intermediate freight of the same class being loaded with it between intermediate points on the route of the box as noted in the preceding para.

182. Thus not only the labour and time required for these transfers are saved, but also the cost of the entire transfer sheds and systems themselves; and more than this, the cost of the losses and damages sustained by the freight in the course of all these repeated and hurried handlings.

Mr. F. W. West, in his paper quoted in para. 178, states that at the London and North-Western Railway Tranship Shed at Crewe some 25,000 packages have to be distributed every 24 hours between 206 loading berths by from 80 to 100 different truckers, mostly untrained casual labourers, and the writer has personally witnessed sufficient damage done to freight within a few minutes in this hurried trucking along the edges of narrow platforms crowded up with piles of loose and valuable articles, to shock the nerves of an iconoclast.

183. Again, Mr. R. L. Calkin, Freight Claim Agent of the New York Central and Hudson River Railroad, said in an address on "Freight Claims and their Causes" before the New York Traffic Club in March this year—

During the past 10 years the claims which carriers have been called upon to entertain for loss and damage to freight have increased far beyond the growth of traffic, *making serious inroads upon the revenues and doubling the forces employed in claims, offices and elsewhere.*

Similarly Mr. R. L. Russell, Freight Claim Agent of the Philadelphia and Reading Railway, said in an address on "How to avoid Freight Claims" at Philadelphia in April this year.— Last year (1906) we had **seven** *times as* **many** claims for freight lost and damaged as we had in 1896, and *we paid out* **five** *times as much* **money**, and the way the claims are coming in now we will have a big increase this year over last year. True, our business has increased, practically doubled, in the ten years, but *the claims are out of all proportion to the increase in business*, and we are somewhat concerned about this state of affairs.

We are concerned about our reputation, and *we are worried about the increasing number of loss and damage claims, and the big amount of money we are paying out.*

184. In addition to this loss incurred by the Railways both in payments for verified damages to freight and in the cost of the staff employed to investigate and check these claims, as well as in the lower rates offered to induce consignees to ship in car-load lots, there is also the loss to the public in damages for which the Railways do not accept the risk or responsibility, and in the time and trouble involved in making and proving their claims, *as well as in the extra rates which the Railways must charge to cover the payments and expenses on account of them.*

185. A ninth great advantage of the divided freight car is the immediate relief which its use will afford to the delay and congestion at terminals. We have seen already in paras. 95 and 96 that it is the delay in handling lading on and off cars promptly at terminals that *ultimately* incapacitates the railroads, and renders them unable to derive any benefit from their enlarged yards and increased equipment and motive power, for along each platform of a terminal the entire track space is blocked for several hours while 5 or 6 thousand packages are being individually unloaded from half a dozen cars, and all this while hundreds of other inbound cars accumulate outside and are held up for days waiting their turn. (See para. 77.)

186. This block and delay are entirely obviated by the divided box cars, the roller boxes of which can be rolled off their frames and wheels in a very few minutes, and the latter sent off for other loads. Moreover, instead of blocking up the entire space where the next lot of cars is to be unloaded by spreading out the unpacked contents of the previous cars all over the platform immediately alongside the track, the boxes that have been rolled off the cars can be immediately rolled away to *any distance transversely from the track, or be hoisted at once by lifts to upper floor levels*, so that as soon as the emptied car frames are run out of the freight-house *another lot of cars can be brought on at once, and will find the platform quite clear and ready for the unloading of their boxes.*

187. The gain through this facility is enormous, for in addition to enabling freight to be delivered at the terminal freight-house as fast as it can be brought in by trains, *it enables the entire area and volume of the terminal, whatever its shape, to be commanded without any breaking of bulk whatever*, so that the boxes can be distributed over the whole area of all the floors, and can be unloaded and reloaded at leisure without any fear of damage or loss through the mixing up of the contents of various cars in one heap.

188. Even more than this, the boxes when once hoisted up, can be rolled by gravity across streets to private

warehouses adjoining the terminal, and may even be conveyed to them by road on drays or lorries, *so that consignees may do their own loading and unloading in their own premises, and the whole area of the city is made available for the distribution of the freight and the prevention of congestion.*

189. The important point to be noted about this is that *by the use of the divided freight cars the relief to all congestion can be obtained at once in these terminals without any enlargement whatever, and without the acquisition of a single square foot of additional land.* Under the present conditions, the railroads have already acquired and own large areas of most valuable property in cities, and still find them quite inadequate for their purposes.

190. Mr. B. J. Arnold, late President of the Western Society of Engineers, stated at a Meeting at Chicago in January this year that—

> From an examination of the map of the business district of Chicago, it will be seen that 23 *per cent. of this area is occupied by the tracks of the steam Railroad Companies.*

The proposed new consolidated Freight Terminal at Exchange Street in Buffalo will cover about 100 acres of ground near the business centre of the city,—and the new Grand Central Station in New York will cover 39 acres of the most valuable land in the heart of that city. Mr. Muhlfeld, of the Baltimore and Ohio Railway, in his paper quoted in para. 94, says :—

The matter of terminal facilities, which is the limitation of handling business during times of heavy traffic, is to-day giving railroad managers the greatest concern.

191. In their joint report on the improvement of terminal facilities at St. Louis, Messrs. R. Moore and A. T. Perkins, Consulting Engineers, said last year:—

It is estimated that in order to handle satisfactorily the business of the immediate future, the team track room of the terminal Railroad Association at St. Louis should be at least doubled. In connection with this matter of team track room *we would call attention to the matter of economy in its use, and this economy must of course be largely in the nature of a rapid loading and unloading of cars.* Twenty to 30 car lengths of team track with the necessary alleys and switches can be put on an acre of land, and where land is very valuable, the land interest charge for a car length of team track room may be *equal to the entire revenue* on a car of low class freight left on the track for not *uncommon* periods. Owing to the shortage of freight house room, the Pittsburg and Lake Erie now loads about half of its outbound merchandise at Pittsburg into cars on team tracks, as the Illinois Central now does at the St. Louis 10th Street Station. The cost of elevating freight including interest on plant, maintenance and direct and indirect operating expenses, has been carefully figured at 12 to 14 cents. per ton. In some cities, as in Baltimore and Washington, *the railroads, in order to get rid of inbound freight in the quickest manner and with the least freight-house space, are making direct store-door delivery to consignees within certain limits.*

192. Similarly Mr. F. A. Delano, of the Wabash Railway Company, speaking of "The Future of Railways" at the Chicago Traffic Club in May this year, said:—

The terminal problem is the most serious one. Any one can build a railroad between Chicago and New York or any two other cities, and may perhaps build a better one than any yet built so far as grade and curvature are concerned, but the rub comes in getting satisfactory terminal facilities, and in getting suitable locations in the numerous towns and cities between these terminals. The existing facilities in many cases cannot be duplicated because they are not to be had. Now that it is impossible to expand the facilities in the cities, *it becomes more and more important that better and more intelligent use be made of the existing property.* As the future develops railroads will find that they cannot use property worth 10 to 20 dollars per square foot for storage tracks and one storey freight-houses. They will have to create facilities which will make a better use of the ground. When machinery has been developed to unload cars; *when the freight from the cars may be taken with the minimum rehandling direct to the floor of the warehouse where it is to be unloaded or distributed; when ten-storey wholesale warehouses served with tracks on the ground or on subterranean floors take the spaces now occupied by storage tracks; when trucking freight by hand has become a thing of the past*—we shall realize some of the possibilities which the future surely has in store for us.

193. We have seen in paras. 186 to 188 that the use of the divided freight cars will completely fulfil the requirements of this remarkable forecast, and it should be clear from the nine great advantages that have been enumerated above, that the use of this divided freight car will also completely solve the great problems of car shortage, track shortage, empty haulage, small consignments, and terminal facilities that at present embarrass railroads and congest their traffic all over the world.

194. The divided freight car however does still more than this. It not only solves these great problems without involving any extra expense, but *it also saves money all round*, so that the cost of railroad operation instead of running close on to 75 per cent. of the gross earnings, may be reduced to less than 50 per cent. Capitalize this annual saving and try and imagine what it means—not only to the railroads, but also to the community at large.

Before however going into the pecuniary aspect or rather prospect of the change, it is necessary to consider some further advantages and possible disadvantages of the divided freight-car.

Further Advantages of the Divided Car.

195. In addition to the better train loads obtained by fuller car-loads, the use of divided freight cars enables advantage to be taken of any empty spaces that there may be *on different cars* to still further increase the train load. At present if 12 out of a train of 26 cars on the average train (see paras. 49 and 180) are only three-quarters full, the empty space, equivalent to 3 whole cars, has still to be hauled, as it cannot be separated from the loaded space in each car. With the divided cars, however, if one box on each of 12 cars was empty, they could all be rolled off, and 12 loaded boxes could be

substituted in their places, so that all the cars and the whole train would run fully loaded.

196. Again, the wind or air resistance to freight trains can be in many cases considerably reduced by the use of divided cars. In a train of mixed box and flat cars as they have to be placed in destination or attachment order, it often happens at present that several flat cars alternate at various intervals with the box cars, so that the number of exposed ends of the latter, against each of which the air pressure is considerable, is multiplied many times on the train. With the divided cars all the flat sections can be kept together and all the boxes can be rolled on in consecutive order, so that there is only *one* box end on the train for the wind to act against. As one-third of the engine power is estimated to be absorbed in overcoming air resistance at high speeds, this advantage may produce a considerable saving in fuel.

197. Another advantage of the divided car is that while it affords all the facility and convenience of a very small car, it also enables all the concentration of load, and ease of haulage and smooth running of very large and heavy cars to be obtained. For while the boxes themselves may be very small, the actual car consisting of the frame and wheels may be made of any size to hold any number of these boxes. Hence the *speeds* at

which these divided box cars may be safely hauled can be increased to much higher limits than are possible with the present mixture of short and long cars.

198. Again, as the frames can all be made of one standard size and type they will be cheaper to manufacture, and as they will all be of uniform strength the risk and damage to them from butting shocks will be much reduced. Even in cases of collisions it is probable that much less damage will be done to the box portions and to the freight inside them than is done at present, as the boxes will probably be pitched off bodily from the frames on either side and will not be telescoped or broken up.

199. Another advantage of the divided car is the great simplification which it effects in the coaling of locomotives, and the cheapness and rapidity with which this coaling may be done. Instead of the elaborate and expensive trestle and conveyor plants now used for fuelling purposes, all that is needed is a number of coal boxes which can be loaded up at leisure at the colliery or stacking ground, and be delivered by freight trains on to long narrow platforms on the opposite sides of which they can be at once rolled directly on to the tender frames of the locomotives without any breaking bulk or handling whatever. In the report of the Committee on Loco. Coaling Stations submitted in March this year to

the American Railway Engineering and Maintenance of Way Association, it is stated that the coaling of engines direct from coal cars *is the cheapest method*, and does not tend to break up the softer coals as the conveyors do.

200. Another advantage of the use of divided freight cars, which is of considerable importance in some countries, is the ease with which *the evils of any breaks of gauge can be avoided.* For by making the longitudinal dimensions of the boxes on one gauge equal to the transverse dimension of the other gauge, all that is necessary at transfer points is to turn the boxes round and arrange them laterally on the cars of the other gauge. Thus no breaking of bulk whatever is needed at these points, and the transfer of a whole train load can be effected in a few minutes. When it is remembered what enormous expenditures are being seriously contemplated in India, Australia, and other countries to get over the evils of the difference of gauge that exist in them, by converting one of the entire systems to the same gauge as the other, the value of this facility can be better appreciated—enabling as it does every country to have a cheap light gauge for branch and light lines, and a heavy one for the heavy traffic main lines.

201. A further advantage of the use of divided cars is the economy and facility with which their contents may

be transported across water, and be hoisted and dumped into the holds of ships, the entire weight and space occupied by their frames and wheels (the heaviest part of a car) being saved. For example, about double the quantity of freight could be loaded into each of the Car Ferries across the Great Lakes, and into each of the Car Floats at New York. Again, all the power required at present to hoist the heavy parts of the present cars in emptying their contents into the holds of ships would be saved, as only the comparatively light boxes need be lifted and dumped.

202. Again, with a few extra boxes in stock no inconvenience would be caused by shippers or consignees holding up freight in transit for any purpose whatever, as by rolling the boxes off their frames and storing them on platforms till required to be moved, the wheels and frames would be rendered available during all this time for the conveyance of other freight, and no valuable equipment or trackage would be locked up and rendered useless during these periods, as is unavoidably necessary at present. Thus it would not be necessary to charge shippers such high rates for detentions of freight as at present, and the community generally would benefit.

203. Passengers' baggage could be loaded up after being weighed directly into boxes near the baggage room, and could be unloaded from the latter in their

presence, the boxes being rolled between these rooms and their train cars with very little labour or trouble, especially if gravity is employed, and with a much greater saving of time than is required for the trucking or conveying of individual packages over this distance.

The saving of time effected by the adoption of this system would also enable Street and Inter-Urban Electric Railways to carry express parcels and light freight traffic, which at present they are unable to handle.

204. In freight-houses the enormous amount of labour expended in shifting and moving heavy packages about would be considerably reduced by the employment of these ball-bearing boxes, as they could be easily moved in any direction and would travel on the best known means for reducing friction, instead of being dragged along over rough floors as at present.

205. A further great advantage of the divided cars is their ready convertibility into vehicles for conveying freight of any description. If a few spare boxes or tops necessary for the conveyance of special kinds of freight were kept at the stations from which such freight was usually shipped, all the empty haulage and delay now required to bring these special cars from the various places on the line where they may at the time be scattered, would be entirely saved. Moreover the large number of valuable wheels and frames at present locked up

in the numerous different types of special cars would be freed and rendered available for use at all times.

206. The advantage of this facility however would be most evident in times of war, as the entire freight equipment of the country could be utilised in whatever type of cars was required, for after a time there would always be more tops or boxes than frames and wheels in use, and from the surplus the tops of the types required could be drawn.

207. Further, the delivery of this freight at *any* point on its route could be rapidly effected by merely throwing up a narrow bank beside the track, or dressing the face of a low cutting and slewing the line against it, instead of requiring the laying of additional sidings with their numerous switches and frogs as at present.

This facility of delivery would also be available to all Railways at all times, so that consignees could get their freight wherever they required it along the route, and congestions, if there were any, could be immediately relieved.

Possible Disadvantages.

208. The first disadvantage of separating the tops or boxes of the freight cars and placing them on rollers that might strike a casual observer, would be the danger through the risk of their rolling off the cars when the

latter were in motion at high speeds. This and the objection about the difficulty of handling them have already been answered, it is hoped conclusively, in paras. 147 to 152 above.

209. The next disadvantage that may be cited is that of an increase in the tare weight of the divided cars through the extra weight in the six added ends of the divided box, and in its second floor under the boxes. In reply to this it may be stated that as the boxes would not be required to withstand the butting and other shocks of the train, and would be of much shorter length than the car, they might be made of much lighter sections of material than are now required in the present inseparable and undivided box.

Also that as the roller bearings would all lie at fixed distances apart along the length of the car, no second floor is necessary, but only a few cross-pieces at these intervals to carry the rollers, and that as these cross-pieces could be the same as those now used to brace and strengthen the underframe, they would form part of the latter, and very little, if any, extra weight would be required.

210. Again, it may be objected that although there may not be much increase in weight, there would be a considerable loss of carrying space which is equivalent to it; but here also, though some little space has to be lost,

the latter could in many cases be reduced to a minimum by lowering the floors of the boxes below the level of the tops of the rollers, and allowing the latter to work in small semi-cylindrical "paddle-boxes" inside the freight box space.

211. A stronger and more conclusive reply however is to be found in the fact that even if the loss of space and increase of weight totalled out to an increase of say, 4 tons in the tare of each car, this would only amount on the *entire* 16,880 million freight car miles actually moved (see para. 40) to the haulage of about 25 per cent. more dead weight than is at present hauled quite needlessly ***empty*** *in the direction of the loaded traffic* (see para. 44), to say nothing of *the excessive* ***empty*** dead weight that has at present to be hauled back again.

Surely, considering all the great advantages and savings of the division already enumerated, this slight extra expenditure *in one item only* sinks into absolute insignificance!

212. An apparently stronger and more cogent objection that has been, and may still be, raised against the use of these divided freight cars, is that the platforms and yards may get blocked up with boxes—"a sea of boxes," as one critic has stated—and the condition become one of a congestion of loose boxes instead of cars. This is a specious objection which derives its character principally from the fact that it is thought that there would be about 8 million boxes to be handled instead of only 2 million cars.

213. Now the first thing to be noted is that the boxes are not confined like the cars to narrow strips of ground on which the rail tracks are laid, but command and may be scattered over the entire length and breadth of a yard no matter what its shape (see para. 187). They may also be conveyed by road or water to any part of a city so that its whole area is available for the relief of any congestion that might be possible, and can even be delivered by the railroads at any points along their routes (see paras. 188 and 207).

214. Secondly, as the boxes are not thus confined in unalterable rows like the cars, but are free to be moved in *any* direction, no sorting or classification whatever of these is necessary, so that all the time now wasted in the marshalling and classifying of cars in transit will be saved. Thirdly, that as there would not be any of the delays *en route* for classification, or at the terminals for loading or unloading (see paras. 160 and 186), each box being at once got out of the way and sent off to its ultimate berth as soon as it is unloaded from the cars, there would not be any of the accumulations of boxes in yards that at present occur with cars. It is these delays that lead to all the present congestions, for

when cars are being moved into a terminal or yard at the rate of, say, 2,000 a day, and stick for five or six days in that terminal, the number of cars accumulated in it *must* amount to 10,000 or 12,000 at *all* times, and this large number causes further delays, and necessitates the provision of still larger yards—witness the 25,000 *car* yard now being built at Gardenville near Buffalo.

215. Fourthly, that as there would not be any of these great delays in the movement of the divided freight cars, their circulation would be very much quicker, and a much smaller number of them would suffice for the movement of a given traffic tonnage than are now needed. This movement would also be accelerated by the doubling of the single-track trunk lines with all the trackage that the divided freight cars would set free from the present large classification and storage yards. Supposing the average time for the 135-mile journey was reduced from its present 12 days to six days as it very easily might be, *exactly half* the total number of freight cars now used would be required. Similarly at a terminal if the average delay was reduced from, say, five days to two days, only two-fifths of the total number of cars now accumulated in it would require storage.

216. Hence with the divided cars the total number of cars, and consequently the total quantity or volume of the boxes, requiring to be handled at any time would be

very considerably reduced, so that instead of any likelihood of congestion, there would really be much more space available for the freer movement of the boxes, and *as this space would not be encumbered with the loose contents of the cars spread out all over it, there would really be ample room, and no delay whatever for the want of it could occur.*

217. It has been stated in para. 215 that if the present 12-day journey of a car were reduced to 6 days, exactly half the present number of cars would be required to move the present tonnage of freight. This assumes that with the divided boxes all other conditions would be the same as they are at present It has been shown however that great improvements and savings would be effected by the divided cars in many other ways, *e.g.*, in better car-loading and reduced empty haulage. This would tend still further to reduce the number of cars required for a given tonnage, so that really much less than half the present number of cars would suffice. Hence instead of 8 million boxes, really only about 3 million boxes occupying much less than half the total space of the present 2 million cars would be required to be handled altogether. The other million cars and their boxes would be available for new roads or for taking care of new traffic, and also as a reserve to replace worn-out equipment.

218. Another objection that may be raised is that to trace and return to their rightful owners these millions

of boxes or tops would become a most difficult and elaborate process, involving the maintenance of a large and expensive recording staff. The reply to this would be simply to standardize the material and workmanship of the boxes or tops of each class or type, and then to pool the lot of them, merely ensuring to each Railway the return of the same number of tops of each type as it sends out to foreign lines. Later on, moreover, private boxes or tops built by shippers and manufacturers could also be required to be made to this standard, and could then be similarly included in the pool; and as these private boxes would tend to increase in number, the railroads would gradually be relieved of the cost and maintenance of the upper portions of all their freight equipment.

219. A further objection that might be raised to the adoption of the divided freight cars is that during the period of transition the use of both undivided and divided cars might cause a lot of confusion and delay as well as expense. Although it is not easy to see where the use of divided cars could cause any delay, still if there was any likelihood of such occurring, the divided cars with their boxes on top of them might be left as they were and be treated as ordinary undivided cars. in which case the situation would be no worse than it is at present. In such cases also, as both kinds of cars would practically be the same. no confusion could occur.

The power of division would be present and need only be used when and where desired. After about a third of the total present equipment has been divided, the undivided cars could be set aside on most roads and only the divided ones be used as such. One point to be noted however about the use of these divided cars is that there should be a strict rule never to move a car or frame without putting on to it a corresponding top of some type or other. This would ensure that the boxes or tops were as evenly distributed as the wheels and frames, and would prevent the accumulation of tops at one end of a road and of empty frames at the other.

General Advantages of the Division.

220. Having now considered the special advantages and disadvantages of the divided freight car in so far as it affects the methods of working of railroads, it remains to consider some of the general advantages of the division not only to the railroads themselves, but also to the community at large.

221. The first of these is the rapidity with which relief to the present chronic state of congestion can be obtained, for the process of division is a comparatively simple and easy one, and can be speedily effected as cars are sent into their shops for repairs in the ordinary course, and without any disturbance of traffic whatever. Moreover, as soon as there are four car tops or roller boxes

at any station, they can be utilised and rolled on to a single empty divided car frame on any train in the direction of these loaded boxes; and again as soon as one-fourth or one-third of the total number of freight-cars have been divided, entire railroad systems can be worked on this principle, as has already been shown.

222. The second general advantage of this division of the freight cars is the comparatively very small cost of the change. In a paper on "Repairs to Steel Freight Cars" read before the New England Railroad Club in March this year by Mr. J. MacEnulty, the author stated that the average cost of cutting the entire frame and body of a car apart and of re-rivetting it, obtained from railroad systems using over 100,000 steel cars, was only $140, so that an allowance of $300 per car would probably be ample for the division of its detached top into four complete boxes or sections, and for the provision of ball-rollers under these sections.

223. To obtain all the relief that is at present required the division of less than half the total number of freight cars in the country would suffice as has already been pointed out, and allowing for expansion and contingencies, we may take half the number of cars as requiring to be divided. This amounts to less than 900,000 cars at present, so that for their division well under $300 millions would be ample.

224. In addition to the division of the cars however, some slight alterations in filling up track spaces and widening and paving platforms would be required at many terminal and other freight stations. These alterations would be mainly in cheap mud and stone work, and as no additional land or freight-house space would be needed, the cost of all these alterations would probably not be more than double the cost of the division of the cars.

Thus a *total* expenditure of less than $1,000 millions by *all* the railroads of the States *jointly* would suffice to put them into complete working order on the new divided car principle, and would remove all the congestion and other difficulties that now beset and threaten to ruin them.

225. This sum is less than a fifth of that estimated as being required by President Hill (see para. 6), and, what is more, it is more than fully set off by the values of the 27,000 miles of trackage (see para. 163), the 5,000 locomotives (see para. 165), and the 900,000 freight cars (see paras. 161 and 217) which the change to the divided freight cars will immediately set free.

In addition to this there are innumerable savings in land, *e.g.*, in the large classification and storage yards which will no longer be necessary, in transfer sheds, in locomotive coaling plants, and in various other items that still further set off and reverse the balance of the capital expenditure that is required.

226. But much greater savings than are made in these capital charges are effected by the division of the freight cars in the repeated and continuous maintenance and operating charges. The number of freight cars to be maintained is reduced 50 per cent., and the present enormous loss in empty haulage by fully an equal amount. The large cost of all the sorting and classifying operations in terminal and other yards is saved entirely. The rapidly increasing charges for transferring L. C. L. freight, and for the claims for the losses and damages caused thereby, are nearly extinguished. The staff required to do the railroad work is much reduced, and the losses caused by the rapid depreciation of the enormous capital locked up in freight cars are halved. The losses, also, caused by the offering of lower rates to induce shippers to ship in car-load lots, and by their delaying or holding up equipment, are minimised.

227. The combined effect of all these savings is so great that, as stated in para. 193, it will probably reduce the operating costs of railroads from its present level of well nigh 75 per cent. to below 50 per cent. of the gross earnings.

This would mean a saving of about $350 millions *annually*, or more than the $1,000 millions required for the change, every three years!!

228. Besides these there are potential savings in the future and savings to the general community which must not be forgotten. Thus the necessity for all the enormous expenditure required for the increase of gauge contemplated by Mr. Harriman is removed; also the necessity for enlarging and extending the terminals at almost prohibitive cost in large cities. Again, the present enhanced penalties imposed on the shipping public, as well as the increased rates for freight transportation now charged them, may both be reduced.

229. Above all these, however, are the savings of the enormous and wide-spread losses at present caused by the great delays in the transportation of grain and other perishable products (see paras. 7, 8, 18, and 122), and also by the general increase in the price of money, and the general "slowing up" of business which it has led to (see paras. 28 to 33).

230. It is hoped that when it is realized that the railroads do not require the enormous sums of money that have been estimated by President Hill and others as being absolutely necessary for them, and that they really possess already sufficient capital in spare land and equipment to meet all their requirements for some years to come, the price of money will be reduced and the advance in prosperity which has been retarded will begin again.

TRICHINOPOLY,
8th August 1907.

W. H. PERRY