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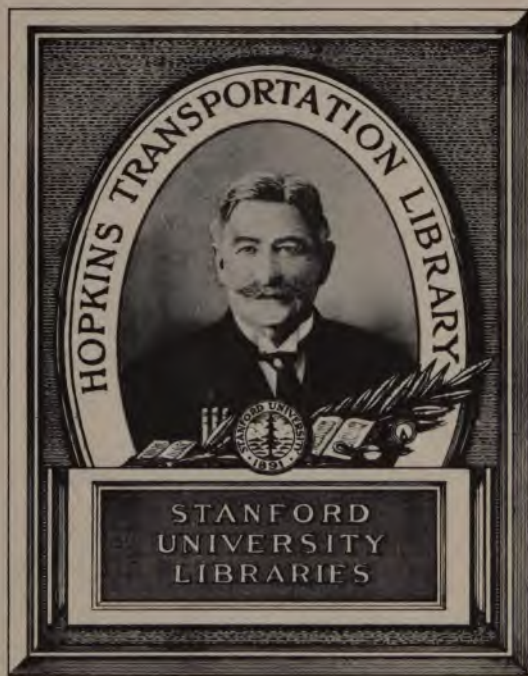
A COMPARATIVE ANALYSIS
OF
ENGLISH
RAILWAY PASSENGER TRAFFIC,

For the Five Years 1853-1857.

BY
S. CHAPMAN

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A COMPARATIVE ANALYSIS
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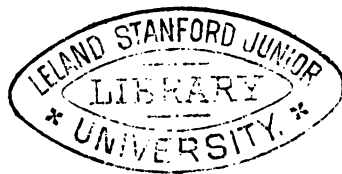
(Fellow of the Royal Statistical Society).

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I beg to express my indebtedness to the various officers of our principal railways for their great courtesy in answering my enquiries, and to tender my best thanks for same, especially to Messrs. H. Lambert, Great Western Railway; G. P. Neele, London and North Western Railway; J. Noble, Midland Railway; Hy. Oakley, Great Northern Railway; and H. Tennant, North Eastern Railway, who have allowed me the use of much valuable information not elsewhere obtainable, and without which several of the tables at end of this paper could not have been compiled.

S. C.

LOUGHTON, March, 1889.

A COMPARATIVE ANALYSIS
OF
English Railway Passenger Traffic
FOR THE FIVE YEARS
1883-1887.

THE steady decrease in 2nd class traffic first led me to consult the Board of Trade Railway Returns, with a view to ascertain whether such decrease were general all over England, or greater in some districts than others. This was by no means easy to arrive at, as the variation in such large masses of figures from year to year gave no clear impression as to the ratio of the variation of classes one to another. This induced me to compile the statement No. 1, which shows at a glance, in the nine columns to the right, the relative quantities of traffic conveyed, by applying a fixed number (100) as representing the whole traffic (1st, 2nd, and 3rd class), whether numbers of passengers or amounts, *i.e.*, numbers of pounds. Statement No. 2 supplements this information by giving in decimals of £1 the receipts from each passenger.*

* The figures in all the statements may be taken as accurate. Each "proportion" has been worked independently, and is proved by the whole balancing, and in case of "average receipts" the original decimal calculation has been verified by logarithms.

It is not my intention in this paper to analyse these returns too deeply, so as to show why the London Chatham and Dover Company should, alone amongst our lines doing more than a Metropolitan traffic, show a small but steady increase in the percentage of receipts derived from 2nd class, or why the Manchester Sheffield and Lincolnshire Company should have only 2·67 % of 2nd class passengers against the South Eastern 10·50 %, but merely to make a few disconnected remarks with regard to one or two points which have occurred to me in dealing with the question generally.

INFORMATION TO SUPPLEMENT BOARD OF TRADE RETURNS.

For the purpose of comparison, it would seem well that information as to the number of passengers actually booked on each line, and the gross receipts therefrom, should be accessible. Such information would give a far clearer idea of the number of journeys actually made, and would show whether the tendency is to travel farther or not. The present system does not, and enormously increases the apparent number of passengers (without arriving at, or assisting in any way towards, a "passenger mile" unit, as suggested by Sir Juland Danvers*) on a purely arbitrary basis, regulated only by the rule that an individual shall count as one passenger

* "Defects of English Railway Statistics." Sir Juland Danvers, K.C.S.I.—*Journal of the Royal Statistical Society*, vol. li. page 2.

if he perform a journey local to one company, but as two, three, or more if he touch other companies' lines—*e.g.*, a passenger booking from Camden Town to Kentish Town— $\cdot 6$ of a mile, would count as *two* (being included in both the London and North Western and North London returns); and one from Euston to Carlisle, 299 miles, as *one* only. Further, if one company absorb another, there is a decrease, apparently, in the gross number of passengers for the kingdom, and a tendency to increase the average receipts per passenger caused by an actual increase in the average receipts per passenger of the company making the purchase; whereas if each company showed its own bookings and gross receipts therefrom, the comparison would in no way be affected, it only then being necessary to add for the corresponding period to the numbers and receipts of the purchasing company those of the company absorbed.

To turn, however, to the

2ND CLASS QUESTION,

I am, and have been for many years, of opinion that there was ample scope for three classes of carriages, but am equally disposed to think, now that 3rd class carriages are run on nearly all trains, and these of such an extremely comfortable character as competition alone induced, the 2nd class, so far as companies north of the Thames are concerned, is doomed, unless, perhaps, on the London residential trains. The Great Northern policy of abolishing 2nd class fares in certain districts only has been condemned as half-hearted and piecemeal, but it is a question whether this

is really not the best solution of the difficulty. Every district has its peculiarities, and in the neighbourhood of the Metropolis the 2nd class local traffic is so important an element that it would be undoubtedly a serious loss of revenue to any company having a London terminus to abolish 2nd class fares within a radius of, say, 30 miles from the great city. No doubt the fact of there being but few cases where 3rd class season ticket rates are quoted contributes very largely to the enormous number of 2nd class seasons taken, and, as a rule (though by no means without exceptions), if a man hold a 2nd or 1st class contract ticket, members of his family or friends visiting also take tickets of corresponding class. Then, again, in most cases the 2nd *single* fares for short journeys are not particularly low (this does not refer to journeys wholly within the Metropolitan boundary), but the *returns* show a substantial reduction, whilst in nearly every instance the 3rds are double two singles.* It seems innate in an Englishman to make a *bargain*, even though he pay more than he need do, and the temptation to secure two journeys for less than the sum of two singles is one not to be overcome. Now, considering that in the vicinity of London 2nd class has the stamp of public approval, that passengers do not object to pay reasonable fares, that each compartment conveys ten passengers (same as a 3rd), and costs but a trifle extra for better upholstery, &c., it seems well to foster the traffic.

* The London and North Western Line must be excepted, as they offer cheap 3rd return fares up to Bletchley inclusive, and also very low 2nd singles.

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In the case of "A" the station-master informs passengers that there is only 1d. difference between 3rd and 2nd returns, and accordingly everyone takes second return or books single 3rd. Although fare tables are exhibited at every station, it is scarcely one passenger in a hundred who glances at them, and when one does it is probably only to verify the change received from the booking clerk. I very much question if one passenger in a thousand knows of the general revision and reduction of 2nd class fares which has taken place on the London and North Western system, and not between competitive points only—*e.g.*, Tebay to Penrith, 19 miles, 2nd single fare, 2s.—and this in some of the finest carriages in the kingdom. This Company should make its announcements in such manner as the Metropolitan Line, whose reduced fares are presented in such intensity of colour as to catch the public eye, notwithstanding "Pears' Soap" and "Colman's Mustard." Either this, or request *their* station-masters to follow the quietly persuasive example of the one at "A" if they wish to encourage 2nd class travel. There is, I am strongly of opinion, another way in which this particular Company might gain some long distance high-class traffic—*viz.*, by running a morning and evening Liverpool and Manchester express from and to London, 1st and 2nd class only, at such times as would allow a good business day either in London or Lancashire, and at such fares for special tickets "available on day of issue only," as should afford a substantial reduction on the sum of two singles. The time should not exceed—Manchester 3 hours 50 minutes, and Liverpool 4 hours, and a breakfast or dining-car (outward or homeward, as

the case might be) run. Birmingham might share in the advantage by slipping at Rugby and making first stop Stafford on the down, and correspondingly slipping at Stafford and stopping at Rugby on the up journey. This is by no means intended to advocate high speed where no end is gained. In the case of Edinburgh, although the 8 hours service (really 7 hours 45 minutes) last year deserved our warmest admiration, we must not overlook the fact that 6 p.m. is no more use for a business man than 6.30, and a tourist after a good luncheon at York or Preston can surely be satisfied with dinner at 7 p.m.; but in the case of Liverpool and Manchester, each half-hour means more time for business, and merchants and others would willingly pay for this. It is not so much the desire to travel 3rd class that obtains, but to travel as cheaply as possible by the selected train, and the same people who invariably come up from Leeds to London 3rd, in many cases go from Paddington by the 11.45 or 3 p.m. without feeling at all aggrieved because they must then travel 2nd.*

* Take as an instance a year's traffic *from* Holyhead and Bangor respectively—the former being served by the Irish mails and the latter not. The *whole* traffic, excluding London, shows a 2nd class percentage of receipts—Holyhead 16.22, Bangor 16.48; but if we analyse the eliminated London traffic, the gross receipts from which only vary as 17 to 16 at the two stations, we find this shows :—

			1ST	2ND	3RD	
Holyhead	29.85	28.37	41.78	= 100.00 %
Bangor	35.61	20.07	44.32	= 100.00 %

Although one might readily have assumed from the higher 1st class percentage at Bangor, the 2nd would also have been higher than Holyhead.

The North Eastern Company have exceedingly low 1st and 2nd single fares—*e.g.*,

	Miles	1st	2nd	3rd	3rd return.
*Hull and Doncaster,	40½	5/5	4/6	3/4½	5/9
Alston and Haltwhistle,	13	1/9	1/5	1/1	1/10

But they make no reduction on returns, and they do so invariably in the case of 3rd class, so that the bargain-loving northerner not only takes his 3rd *single* but also *return*. Further, the 3rd class carriages are as fine as any in the kingdom, and some of the 2nds are anything but attractive—*e.g.*, those between Driffield and Malton, or Selby and Market Weighton.† Then, again, 3rd class season tickets are largely issued. A combination of these reasons for travelling 3rd probably accounts for the very low percentage of 2nd class traffic on this line. It is a somewhat curious thing that many people who took 3rd class seasons when residing on the North Eastern Line, take 1st soon after moving to London.

Closely allied to the 2nd class question is the one regarding

*Compare—

	Miles	1st	2nd	3rd	3rd return.
Cannon Street and Staplehurst,	40½	10/6	7/	3/6	6/10
Falmouth and Truro,	12	2/6	1/9	1/1(par.1)	2/2

† The London and North Western similarly foster 3rd class traffic at the expense of 2nd between Llandudno Junction and Blaenau Festiniog. During the summer a saloon carriage is run for 3rd class passengers and the 2nds have to be contented with ordinary compartments, from the windows of which the majority of the occupants cannot obtain nearly so good a view of the scenery—a few *coupés*, it is true, appear. The fine 1st class saloon, with glass at end as well as side, is not announced in any way, and coming, as it does (to secure the best look-out), next the engine on a very long train, comparatively few of the visitors appear to know of its existence.

**THE ADVISABILITY OR OTHERWISE OF ISSUING
RETURN TICKETS AT A SUM LESS THAN TWO
SINGLE FARES.**

The information which has kindly been supplied me by the London and North Western, North Eastern, Great Northern, Midland, and Great Western railways has enabled me to prepare tables 3, 4, 5, 6 and 7, which go to show conclusively that return tickets at a reduced fare are appreciated by the travelling public. It will be observed, on reference to Table 1, that those companies whose general practice is to offer reductions to 1st and 2nd passengers only carry a greater proportion of traffic in the higher classes. The systems adopted by the Great Western and North Eastern Companies are exactly the reverse of one another, the former making large concessions to 1st and 2nd class return ticket holders, and none to 3rd; and the latter making no allowance whatever in the higher classes, but a reasonable abatement invariably in the 3rd.* The Midland

* As a rule—of course there are exceptions, but my remarks only apply to the general basis upon which the fares are calculated. The North Eastern line is much reviled in many districts (notably Hull and neighbourhood), and it appears but little known, or at any rate accredited, that this Company quotes the lowest fares for 3rd class passengers (taking the whole line into consideration) of any line in the kingdom. The Midland Company is popularly supposed to give the cheapest travelling to the 3rd class passenger, but owing to their general principle being to charge two single fares for a return ticket, the supposition is not founded on fact. Compare—

	Single.			Return.		
	1st.	2nd.	3rd.	1st.	2nd.	3rd.
N.E.R.—Hull and Market Weighton	2/8	2/3	1/7½	5/4	4/6	2/10
Mid.R.—St. Pancras and St. Albans	2/8	—	1/7½	5/4	—	3/3
The distances are identical.						
L. & N. W.—Euston & King's Langley	3/3	2/2	1/8½	5/4	4/0	3/0
A mile more.						

make no reduction either in 1st or 3rd class. Unfortunately, the manner in which the Great Western Company's accounts are compiled did not admit of their showing the numbers booked *at* their stations only, or the difference in percentages would have been still further accentuated; still, the 1887 results show that—

	1st Class.	2nd Class.	3rd Class.
Great Western Railway	46·62%	53·55%	20·25%
Midland Railway	25·37%	...	17·65%
North Eastern Railway	33·98%	35·71%	35·56%

of the passengers took return tickets.

The London and North Western table, which gives the fullest analysis, shows that there is a general tendency to travel further in all cases except 3rd return, and there is no doubt that the reduced fares alluded to in note (†) to some extent explain this, coupled with the fact that the various exhibitions held during recent years in London, Liverpool, and Manchester, caused enormous numbers of passengers to be booked from stations in the vicinity of these places at exceedingly low fares. Meanwhile the long-distance traffic remained practically stationary, and thus the average distance travelled became reduced. It is, however, by no means my intention to attempt to explain the results shown. This can be done by more competent hands than mine, and I only purpose making one suggestion: that in the case of competitive traffic, especially *long-distance, between great commercial centres*, it is advisable to make some reduction in the price of return tickets:—

a. 1st and 2nd only, if it be desired to foster the traffic in those classes, or preferably

b. In all classes ;

and the line having the greatest share in such competitive traffic should be the one to take action. The holder of the return half of a ticket is not infrequently the means of inducing another to return with him, who, left to himself, would have travelled by an opposition route ; and not only this, but if the return fare be sufficiently attractive, the passenger gained in all probability takes a return ticket also. Inasmuch as the line taking the greatest share of the traffic would, *inter alia*, issue the greatest number of return tickets, the tendency would be to gain a still greater traffic, and ultimately render unnecessary the running of an expensive train service by *all* competing routes. This would be more satisfactory to the public than an agreement between the competing companies and pooling of the receipts, which has a tendency to produce a comparatively poor train service ; whereas, once a company has the bulk of the traffic between any two profitable points, they would naturally do their best to retain it.

It is somewhat difficult to show the exact effect of quoting returns at less than two single fares, but an examination of long-distance traffic to the extent of a total of 150,000 passengers has been analysed for a basis, and we find—

a.	1st and 2nd return fares, showing a very slight reduction.		Returns, double two singles.
	1st Class.	2nd Class.	3rd Class.
Single tickets issued	67·18%	63·46%	96·30%
Return tickets issued	32·82%	36·54%	3·70%

b. All return fares double two singles.

	1st Class.	2nd Class.	3rd Class.
Single tickets issued	97·03%	96·36%	98·06%
Return tickets issued	2·97%	3·64%	1·94%

It will be observed in the case of *a* that slightly more 3rd returns are issued than in the case of *b*, although no reduction is made; but the immense difference in the 1st and 2nd class bears no comparison with this. I may mention that the figures from which these results were derived include both up and down traffic; that in neither case is there a "tourist" element, the centres being commercial, and that no "excursions" enter into the calculation.*

The consideration of cheap return fares naturally leads to

EXCURSION TRAFFIC.

Some considerable diversity of opinion appears to prevail as to whether excursion traffic should be cultivated or not. There seems but very little doubt that, judiciously managed, excursions may be made a source of profit without in any way taking from the ordinary traffic. On the one hand, in common fairness to the man who pays full single fare,

* With a view to test the accuracy of the conclusions drawn from example (*b*), traffic under precisely similar circumstances between other points, and covering over 100,000 passengers additional, has also been examined, and gives the following results:—

ALL RETURN FARES, DOUBLE TWO SINGLES.

	1st Class.	2nd Class.	3rd Class.
Single Tickets issued ...	95·77 %	95·33 %	97·41 %
Return " ...	4·23 %	4·67 %	2·59 %

thus confirming the deductions drawn from (*b*).

In all cases (*a*), (*b*), (*c*), the traffic analysed extends over a whole twelvemonth.

excursion passengers should not be permitted to travel by ordinary trains—*e.g.*, London and Bridlington 1st *single* and 1st *excursion*, both 30s.—which is manifestly unfair to the passenger who does not wish to return. On the other hand, in order to induce traffic, it is essential that the excursion passenger be not kept for hours in a slow train shunted to allow the passage of every ordinary. The case seems to be admirably met by the weekly excursions from London to the West of England and *vice versa*, run throughout the summer months by the London and South Western and Great Western Companies, who work *special* trains at a good speed* for places below Exeter, and convey thousands of passengers each season by them. The fares, distance for distance, are somewhat higher than those charged by the northern companies, but the tickets are available for a longer period. Undoubtedly one great reason for their popularity is the fact of the trains starting from town *every* Saturday. The northern lines do not seem sufficiently alive to the fact that although Ilfracombe and Scarboro' may not geographically appear *competitive* from London, yet by giving facilities to the one which the other does not possess competition is caused, and of a very strong nature.† London has an immense army of workers whose salaries are such that every

* Until the 1.0 p.m. from Paddington commenced running, July, 1887, the excursion was the best 3rd class train to Exeter and Plymouth in point of time.

† In one season 16 cases came under my notice of passengers who took their holidays in the West of England, owing to the facilities offered, the whole of whom would have gone north had similar inducements been offered.

additional sovereign spent in travel means a curtailment of the holiday, and this holiday being as a rule short, and the precise date fixed in many cases months before, it is only to be expected that excursions such as admit of two Sundays being included in a week's holiday, or three in a fortnight, and which allow a date being arranged any time during the summer (instead of, as in the case of the northern trips, having to wait for the advertisement, appearing about 10 days in advance of the trip, which only admits an absence from town of five days in most instances) should be largely patronised. The Great Eastern system of issuing fortnightly tourist tickets is one which has the stamp of public approval. There is no doubt but that if such excellent arrangements were made by the northern companies—as they doubtless would make, once they took the matter in hand—events would show that the Yorkshire Coast, Derbyshire, North Wales, and the Lake District had far more admirers than was ever anticipated. Of course, the great argument against this line of action is that the tourist traffic would suffer. Of course it might, to a certain extent; but if a record were kept of the dates on which the return halves of tourist tickets issued for distances of 200 miles and upwards were given up, it would probably be found that 90 % were considerably over a fortnight after date of issue. As a rule, the man who can afford to take his family these comparatively long journeys has three weeks' holiday or more, and if he, individually, were inclined to curtail this to take advantage of a 16-days' ticket, he would in all probability be overruled by the other members of his family. On the other hand, the man with

a smaller purse and shorter holiday (and very often larger family), not having the necessary facilities offered, is lost altogether to the three great roads to the north. In the case of the Great Eastern line, the distances being shorter and therefore fares lower, there is a greater risk of losing full-rate tourist traffic without gaining passengers who otherwise would not travel. Yet it is only fair to assume the issue of fortnightly tickets pays well or it would not have been continued.

In 1885 the various companies commenced to run long-date excursions every week during the season from the Lancashire and Yorkshire districts to Scarboro', Whitby, &c., and although, owing to the shorter distances, a much greater percentage of passengers who took tourist tickets in 1884, and did not desire to stay longer than the new excursion tickets would permit, naturally drifted from the "ordinary" into the "excursion" group than would be the case with the long-distance London traffic previously mentioned, yet from an analysis of the Scarboro' traffic I have been enabled to make from three of the leading towns, we find the gross receipts in the case of the smallest town of the three are only 5 % down, in the second case 13 % up, and in the case of the largest town 24 % up. Of course there is just a possibility that similar facilities not having been offered in the case of North Wales certain passengers visited Yorkshire instead.

Half-day excursions to places of popular resort seem to be a good source of revenue from the great towns in Yorkshire. The North Eastern line were the pioneers with

this kind of excursion traffic, and they must have earned a great amount of money which otherwise they would not have received.* It would never do to offer such low rates from London at holiday times—*e.g.*, Brighton at 1/9 on Whit Monday!—it would be simply impossible to take the people down, not to mention bringing them back again.

SEASON TICKETS.—In no description of passenger traffic has there been such an increase as in residential tickets, and in no kind of traffic do we find greater diversity of opinion as to the best system of regulating the charges. Some lines issue 1st, 2nd, and 3rd class, but the majority 1st and 2nd only. Some charge a man taking a 3 or 6 months' ticket much more heavily in proportion than by taking a 12; some permit a kind of "extension" to be made, whereby a 3 months' ticket may be extended to 6 on payment of the difference between the two charges, and similarly up to 12 months; and others charge equally for the four 3 months, one-fourth each of the 12 months' rate, which is probably the best system all round, and is certainly by far the simplest, so far as book-keeping goes.

The anomalies which exist for certain privileges are inexplicable to the general public. Take, for instance, the following Great Northern stations. The holder of a 12

* Take a single instance:—A gentleman residing in Hull went one season seven times to Scarboro' with these half-day excursions, and paid @ 1/9 = 12/3. On enquiring how many journeys he would have made had such excursions not been run, the reply was "NONE. I had no particular reason for going, and should certainly not have paid 7/6 railway fare for a half-day at Scarboro'." (His business did not permit absence for the *whole* day.)

months' ticket to King's Cross, desiring to change his ticket for one available in the City (Broad Street or Moorgate Street), would be charged additional rates as under:—

If holding a ticket to	1st Class.			2nd Class.		
	£	s.	d.	£	s.	d.
Holloway	4	1	6	3	4	0
Finsbury Park	3	16	6	2	13	6
Harringay	3	16	6	2	13	6
Hornsey	2	11	0	1	4	0
Wood Green	3	11	0	1	10	0
New Southgate	3	3	0	2	12	6
New Barnet	3	3	0	2	7	0
Hadley Wood	3	3	0	2	7	0
Potter's Bar	4	4	0	2	12	6
Hatfield	2	4	0	3	8	6
Welwyn	2	2	0	4	14	6
Knebworth	1	7	6	4	12	6
Stevenage	0	6	6	4	14	6
Hitchin	0	12	6	4	14	6

It seems a most extraordinary thing that the holder of a 2nd class ticket to Hornsey can have the use of the City lines for a charge of £1 4s. over the King's Cross rate, whereas a resident at Hitchin, who would probably (considering the train service and distance from town) not use the City lines one-fourth as often, has to pay £4 14s. 6d. for the same privilege. Further, it is equally remarkable that the 1st class passenger can have this extra mileage for 12s. 6d. per annum!

The Great Northern is merely taken as an instance. There are equally remarkable cases on the London and North Western and other lines.

Again a difference of opinion exists as to the desirability of permitting the user of a ticket over two sections of line slightly diverging—*e.g.*,

Finsbury Park	{	Barnet High Barnet.
Stratford	{	Chingford Loughton.

The Great Northern Company, *without extra charge*, make their London tickets available over both lines (intermediate stations on same basis—*e.g.*, Wood Green available at Highgate), whereas the Great Eastern rigorously limit the use of a ticket to the line actually selected. They have, probably such an immense suburban traffic that they do not wish to foster its further growth!

Taking the lines having termini in London altogether (not including such as the Metropolitan, which issue a great number of seasons wholly between *business* districts), there is a wonderful similarity in the rates charged for suburban tickets, distance for distance, and it is therefore the more remarkable that such diversity of opinion should exist with regard to the points mentioned, and other little matters of detail.

These stray remarks have spun themselves out to greater length than was originally intended, but they have been prompted by a desire to direct some attention to a few matters which, so far as I am aware, have not elsewhere

been touched on. The tables of figures will afford data for arriving at some *general* conclusions, but as Mr. Oakley remarked,* "The difficulty that a railway manager had to contend with was not so much in fixing an equitable rate as in reconciling as best he might the conflicting claims of the district he had to serve." No line has shown greater independence than the Great Northern in applying a particular system to a particular district. A careful study of human nature is essential to a railway manager, who must, on the one hand, offer such facilities to the 3rd class passenger as may make his line popular, and yet not cause an outcry from those willing to pay 1st or 2nd class and cause them to migrate into 3rd, because proportionately they do not receive as great value for their money. Friction has to be avoided in small matters—*e.g.*, examination of tickets and collection of excess fares.†

* Discussion on Sir Juland Danvers' Paper, Royal School of Mines, December 20th, 1887.

† The London and North Western and Great Northern Companies, with their *daily* examination of season tickets at Willesden, Finsbury Park, Chalk Farm, and Holloway, cause far less inconvenience than the irregular calls made by the Great Eastern Company (perhaps not more than three times in a month) at unexpected times on *leaving the terminal station*, when one's hands are perhaps full of packages. Further, the Great Eastern Company lose large sums annually by not collecting excess fares from passengers who deliberately travel in superior class carriages, the plan of collecting tickets at end of long trains (15, 17, and more coaches) rendering this impossible. The Great Northern, meantime, by having a large staff of travelling inspectors, collect an immense number of small amounts, and at the same time merit the approval of their higher class passengers, who appreciate having their interests protected.

Again, the North Eastern Company exasperate passengers by stopping trains within 100 yards or so of a station to examine and collect tickets—

One word in closing. Objection has been previously raised that passenger traffic is from time to time commented on, whereas merchandise, producing a much greater revenue, is comparatively neglected.

To this objection I would answer that, other things being equal, the line which best attends to any man's personal comforts can the most easily secure his general traffic, and the earnings of that train which allows an extra ten minutes for breakfast or five before dinner are not to be estimated simply by ascertaining the actual number of passengers it carries, especially if the local station master be courteous, and use his best endeavours to secure competitive merchandise traffic. It still holds good—

“THE PROPER STUDY OF MANKIND IS MAN.”

e.g., Hull, Drifffield, Bridlington, &c., &c., especially the first-named, where the London train is commonly detained 4 or 5 minutes, instead of collecting at last stopping place—and cause much annoyance by declining on many occasions (Hull again) to permit friends of departing passengers on the platform. Rough corners such as these should be smoothed down to make things run easily.

II.—Table showing the average receipts per passenger on the undermentioned Railways, arrived at from the numbers and amounts shown in the first two sections of Table I. —

COMPANY.	Year.	CLASSES.				
		1st.	2nd.	3rd.	All.	
GREAT EASTERN	1883	£ '0797	£ '0349	£ '0195	£ '0231	
	1884	'0787	'0328	'0193	'0224	
	1885	'0786	'0318	'0191	'0220	
	1886	'0785	'0312	'0191	'0217	
	1887	'0782	'0308	'0190	'0214	
GREAT NORTHERN	1883	'1917	'0636	'0466	'0482	
	1884	'1936	'0700	'0398	'0472	
	NOTE.—2nd class abolished	1885	'1913	'0625	'0386	'0452
	Nottinghamshire } May, 1885 Derbyshire } Lincolnshire } Yorkshire } January, 1886	1886	'1879	'0638	'0379	'0441
	3rd class passengers first conveyed by 10.0 a.m. 1st November, 1887.	1887	'1870	'0583	'0368	'0426
GREAT WESTERN	1883	'1772	'0860	'0469	'0582	
	NOTE.—Express fares abolished except by limited mail on 1st May, 1882, and finally done away with 1st March, 1884, when the limited mail ceased. 3rd class by all trains (except limited mail and two West of England expresses each way) from 1st January, 1877. The 12.0 from Plymouth and 1.0 p.m. from London commenced running July 1st, 1887.	1884	'1801	'0879	'0474	'0570
	1885	'1835	'0876	'0480	'0570	
	1886	'1825	'0861	'0476	'0560	
	1887	'1765	'0841	'0475	'0553	
LANCASHIRE AND YORKSHIRE	1883	'0714	'0425	'0263	'0289	
	1884	'0675	'0419	'0278	'0300	
	1885	'0676	'0402	'0277	'0296	
	1886	'0650	'0387	'0284	'0300	
	1887	'0633	'0391	'0288	'0302	
LONDON AND NORTH WESTERN	1883	'2283	'0971	'0465	'0584	
	1884	'2270	'0969	'0466	'0578	
	1885	'2308	'0977	'0468	'0575	
	1886	'2373	'0993	'0475	'0579	
	1887	'2387	'0994	'0470	'0570	
LONDON AND SOUTH WESTERN	1883	'1057	'0618	'0369	'0458	
	1884	'1045	'0604	'0370	'0452	
	1885	'1067	'0602	'0376	'0452	
	1886	'1086	'0584	'0370	'0443	
	1887	'1156	'0605	'0370	'0446	
LONDON BRIGHTON AND SOUTH COAST	1883	'1164	'0621	'0230	'0313	
	1884	'1164	'0635	'0246	'0326	
	1885	'1131	'0614	'0273	'0350	
	1886	'1186	'0651	'0268	'0344	
	1887	'1173	'0622	'0254	'0327	
LONDON CHATHAM AND DOVER	1883	'0715	'0429	'0168	'0236	
	1884	'0699	'0437	'0187	'0251	
	1885	'0711	'0433	'0189	'0253	
	1886	'0750	'0443	'0192	'0258	
	1887	'0776	'0454	'0191	'0259	

COMPANY.	Year.	CLASSES.			
		1st.	2nd.	3rd.	All.
MANCHESTER SHEFFIELD & LINCOLNSHIRE	1883	£ '1056	£ '0542	£ '0313	£ '0338
	1884	'1132	'0556	'0318	'0343
	1885	'1142	'0543	'0319	'0343
	1886	'1116	'0503	'0322	'0341
	1887	'1106	'0506	'0318	'0337
METROPOLITAN	1883	'0197	'0128	'0070	'0085
	1884	'0196	'0140	'0069	'0083
	1885	'0186	'0126	'0067	'0080
	1886	'0186	'0125	'0067	'0079
	1887	'0186	'0126	'0067	'0079
METROPOLITAN DISTRICT	1883	'0186	'0122	'0083	'0100
	1884	'0187	'0121	'0083	'0099
	1885	'0184	'0119	'0083	'0098
	1886	'0187	'0120	'0081	'0096
	1887	'0181	'0119	'0081	'0096
MIDLAND	1883	'1481	...	'0520	'0576
	1884	'1613	...	'0508	'0567
	1885	'1699	...	'0502	'0559
	1886	'1704	...	'0494	'0548
	1887	'1655	...	'0474	'0524
NORTH EASTERN NOTE.—The reduced 1st and 2nd class fares came into general operation in 1881.	1883	'1540	'0896	'0382	'0431
	1884	'1541	'0913	'0385	'0432
	1885	'1556	'0956	'0385	'0429
	1886	'1590	'0980	'0384	'0426
	1887	'1583	'0983	'0388	'0428
NORTH LONDON	1883	'0163	'0112	'0079	'0083
	1884	'0162	'0109	'0079	'0082
	1885	'0163	'0106	'0079	'0082
	1886	'0163	'0108	'0079	'0082
	1887	'0168	'0102	'0072	'0081
SOUTH EASTERN	1883	'1702	'0774	'0316	'0448
	1884	'1681	'0746	'0323	'0444
	1885	'1688	'0746	'0311	'0427
	1886	'1791	'0754	'0309	'0423
	1887	'1820	'0768	'0310	'0422
OTHER ENGLISH AND WELSH COMPANIES	1883	'0623	'0367	'0254	'0279
	1884	'0615	'0367	'0240	'0265
	1885	'0623	'0370	'0215	'0238
	1886	'0571	'0305	'0204	'0223
	1887	'0558	'0288	'0199	'0217
ALL ENGLISH AND WELSH COMPANIES ...	1883	'1003	'0484	'0281	'0336
	1884	'1004	'0478	'0283	'0333
	1885	'1001	'0458	'0281	'0327
	1886	'1002	'0445	'0278	'0321
	1887	'1006	'0414	'0280	'0320

LONDON AND NORTH WESTERN RAILWAY.

III.—Statement showing the percentage of passengers in each class taking single and return tickets, the percentage of GROSS receipts derived from single and from return tickets, and the AVERAGE GROSS receipts per single and per return ticket issued, (A) excluding and (B) including excursion traffic.

BOOKINGS FROM LONDON AND NORTH WESTERN STATIONS.

A.]	FIRST CLASS.										SECOND CLASS.										THIRD CLASS.									
	PERCENTAGE OF					AVERAGE GROSS RECEIPTS PER TICKET.					PERCENTAGE OF					AVERAGE GROSS RECEIPTS PER TICKET.					PERCENTAGE OF					AVERAGE GROSS RECEIPTS PER TICKET.				
	TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.		
	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%
1883...	53.07	46.93	55.53	44.47	4089	3703	£	.4689	.3703	£	.1764	.1721	£	.1764	.1721	£	.1764	.1721	£	.1764	.1721	£	.1764	.1721	£	.1764	.1721	£	.1764	.1721
1884...	53.34	46.66	55.07	44.93	4087	3812	£	.4087	.3812	£	.1747	.1705	£	.1747	.1705	£	.1747	.1705	£	.1747	.1705	£	.1747	.1705	£	.1747	.1705	£	.1747	.1705
1885...	54.76	45.24	55.48	44.52	4026	3911	£	.4026	.3911	£	.1727	.1728	£	.1727	.1728	£	.1727	.1728	£	.1727	.1728	£	.1727	.1728	£	.1727	.1728	£	.1727	.1728
1886...	55.52	44.48	56.31	43.69	4031	3903	£	.4031	.3903	£	.1756	.1734	£	.1756	.1734	£	.1756	.1734	£	.1756	.1734	£	.1756	.1734	£	.1756	.1734	£	.1756	.1734
1887...	55.38	44.62	55.93	44.07	4148	4057	£	.4148	.4057	£	.1766	.1772	£	.1766	.1772	£	.1766	.1772	£	.1766	.1772	£	.1766	.1772	£	.1766	.1772	£	.1766	.1772

B.]	FIRST CLASS.										SECOND CLASS.										THIRD CLASS.									
	PERCENTAGE OF					AVERAGE GROSS RECEIPTS PER TICKET.					PERCENTAGE OF					AVERAGE GROSS RECEIPTS PER TICKET.					PERCENTAGE OF					AVERAGE GROSS RECEIPTS PER TICKET.				
	TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.			TICKETS PURCHASED.		GROSS RECEIPTS.		
	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%	Single.	Return.	%
1883...	52.28	47.72	54.81	45.19	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693	£	.3693
1884...	52.48	47.52	54.38	45.62	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787	£	.3787
1885...	53.86	46.14	54.69	45.31	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804	£	.3804
1886...	54.75	45.25	55.55	44.45	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903	£	.3903
1887...	54.59	45.41	55.18	44.82	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052	£	.4052

NOTE.—The upper part of this Statement, marked A, deals with Ordinary Traffic only, *i.e.*, Season Tickets, Excursions, Soldiers and Police, and Excess Fares are excluded. The lower part, marked B, includes Ordinary and Excursion Traffic.

NORTH EASTERN RAILWAY.

IV.—Statement showing the percentage of passengers in each class taking single and return tickets, the percentage of NORTH EASTERN COMPANY'S receipts derived from single and from return tickets, and the AVERAGE NORTH EASTERN COMPANY'S receipts per single and per return ticket.

BOOKINGS FROM NORTH EASTERN STATIONS, INCLUDING ALL DESCRIPTIONS OF PASSENGER TRAFFIC
(SEASON TICKETS EXCEPTED).

YEAR.	FIRST CLASS.						SECOND CLASS.						THIRD CLASS.											
	PERCENTAGE OF			AVERAGE N. E. PROPORTION PER TICKET.	PERCENTAGE OF			AVERAGE N. E. PROPORTION PER TICKET.	PERCENTAGE OF			AVERAGE N. E. PROPORTION PER TICKET.	PERCENTAGE OF			AVERAGE N. E. PROPORTION PER TICKET.								
	TICKETS PURCHASED.		N. E. Co.'s RECEIPTS.		TICKETS PURCHASED.		N. E. Co.'s RECEIPTS.		TICKETS PURCHASED.		N. E. Co.'s RECEIPTS.		TICKETS PURCHASED.		N. E. Co.'s RECEIPTS.		TICKETS PURCHASED.		N. E. Co.'s RECEIPTS.					
	Single.	Return.		%	Single.	Return.		%	Single.	Return.		%	Single.	Return.		%	Single.	Return.		%				
1883...	64.85	35.15	60.29	39.71	%	£	1.598	1.941	61.88	38.12	59.33	40.67	%	£	0.995	1.107	68.53	31.47	52.32	47.68	%	£	0.354	0.702
1884...	66.09	33.91	62.50	37.50	1.625	1.901	63.10	36.90	61.48	38.52	1.017	1.090	67.56	32.44	51.83	48.17	66.48	33.52	50.81	49.19	0.362	0.700		
1885...	66.73	33.27	62.76	37.24	1.668	1.913	63.68	36.32	61.98	38.02	1.046	1.126	65.44	34.56	50.23	49.77	64.44	35.56	48.56	51.44	0.365	0.700		
1886...	66.58	33.42	63.92	36.08	1.642	1.847	64.11	35.89	63.89	36.11	1.078	1.089	64.29	35.71	63.60	36.40	64.44	35.56	48.56	51.44	0.365	0.700		
1887...	66.02	33.98	62.25	37.75	1.630	1.921	64.29	35.71	63.60	36.40	1.084	1.117												

GREAT NORTHERN RAILWAY.

V.—Statement showing the percentage of passengers in each class taking single and return tickets, both **EXCLUDING** and **INCLUDING** excursion passengers, and the **AVERAGE GROSS** receipts per ticket, counting each return ticket as two, and **INCLUDING** excursion receipts—also for the years 1886 and 1887, **EXCLUDING** excursion receipts.

**BOOKINGS FROM GREAT NORTHERN STATIONS, INCLUDING ALL DESCRIPTIONS OF PASSENGER TRAFFIC
(SEASON TICKETS EXCEPTED).**

YEAR.	PERCENTAGE OF SINGLE AND RETURN TICKETS PURCHASED.												GROSS RECEIPTS PER PASSENGER, COUNTING EACH RETURN TICKET AS TWO.																									
	EXCLUDING EXCURSIONS.						INCLUDING EXCURSIONS.						EXCLUDING EXCURSIONS.				INCLUDING EXCURSIONS.																					
	1st Class.		2nd Class.		3rd Class.		1st Class.		2nd Class.		3rd Class.		1st Class.		2nd Class.		3rd Class.																					
	Single.	Return.	Single.	Return.	Single.	Return.	Single.	Return.	Single.	Return.	Single.	Return.	Single.	Return.	Single.	Return.	Single.	Return.																				
1883...	64·95	35·05	65·06	34·94	84·61	15·39	64·82	35·18	82·00	18·00	64·24	35·76	81·53	18·47	66·39	33·61	58·84	41·16	81·17	18·83	65·83	34·17	78·84	21·16	67·35	32·65	54·61	45·39	79·07	20·93	66·84	33·16	76·71	23·29	66·84	33·16	75·98	24·02
1884...	66·39	33·61	58·84	41·16	81·17	18·83	65·83	34·17	78·84	21·16	66·84	33·16	76·71	23·29	67·35	32·65	54·61	45·39	79·07	20·93	66·84	33·16	76·71	23·29	67·35	32·65	54·61	45·39	79·07	20·93	66·84	33·16	76·71	23·29	66·84	33·16	75·98	24·02
1885...	67·35	32·65	54·61	45·39	79·07	20·93	66·84	33·16	76·71	23·29	66·84	33·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02
1886 ..	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02		
1887...	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02	68·84	31·16	75·98	24·02		

MIDLAND RAILWAY.

VI.—Statement showing the percentage of single and of return tickets purchased in each class, and the GROSS receipts per passenger, counting each return ticket as two.

BOOKINGS FROM MIDLAND STATIONS, INCLUDING ALL DESCRIPTIONS OF PASSENGER TRAFFIC
(SEASON TICKETS EXCEPTED).

YEAR.	TICKETS PURCHASED.						GROSS receipts per passenger, counting each return ticket as two.	
	1st Class.			3rd Class.			1st Class.	3rd Class.
	Single.	Return.	%	Single.	Return.	%	£	£
1883	74'05	25'95	%	85'09	14'91	%	'1655	'0535
1884	74'84	25'16	%	84'75	15'25	%	'1723	'0527
1885	75'25	24'75	%	83'81	16'19	%	'1779	'0527
1886	75'39	24'61	%	83'35	16'65	%	'1794	'0518
1887	74'63	25'37	%	82'35	17'65	%	'1742	'0503

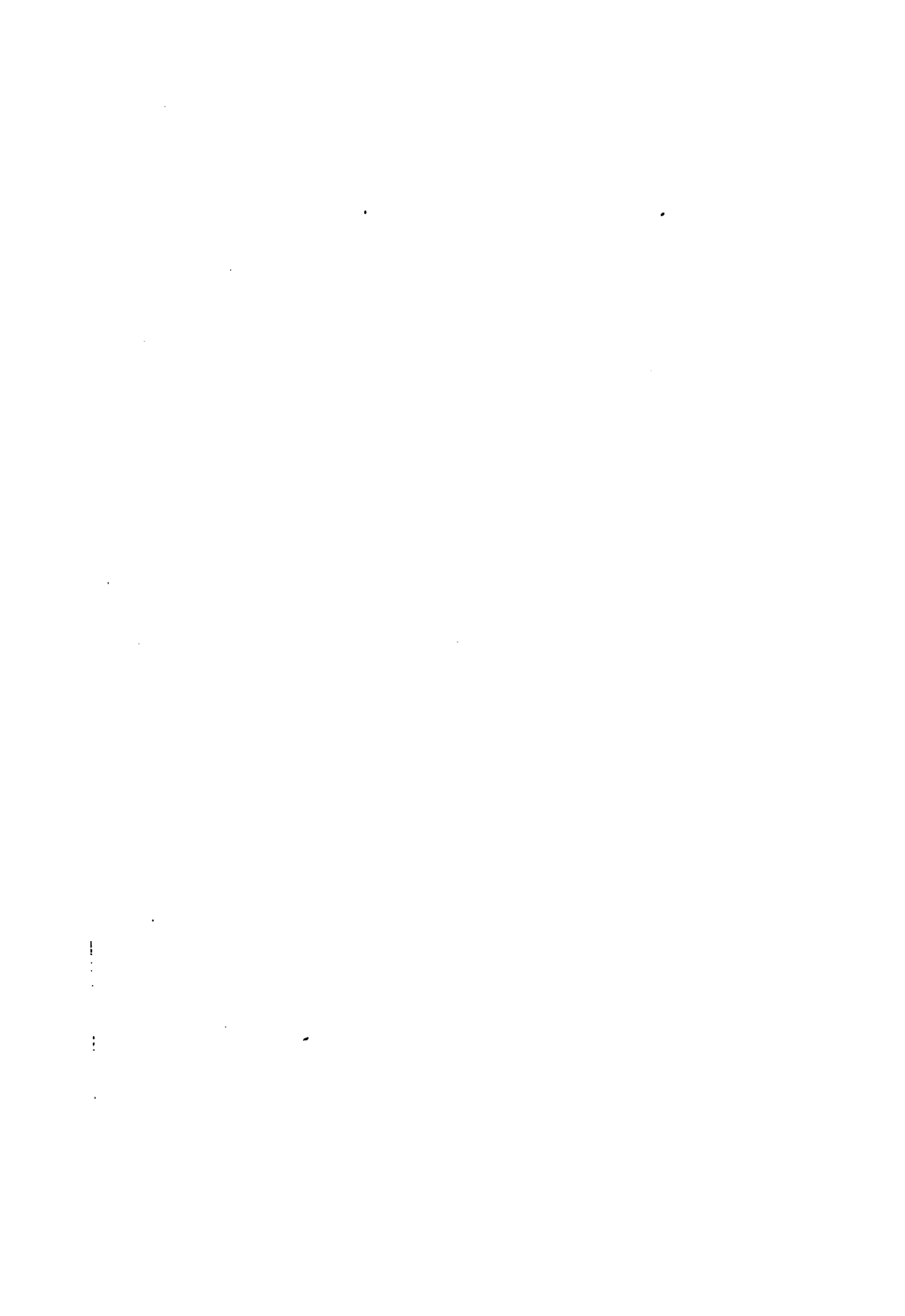
GREAT WESTERN RAILWAY.

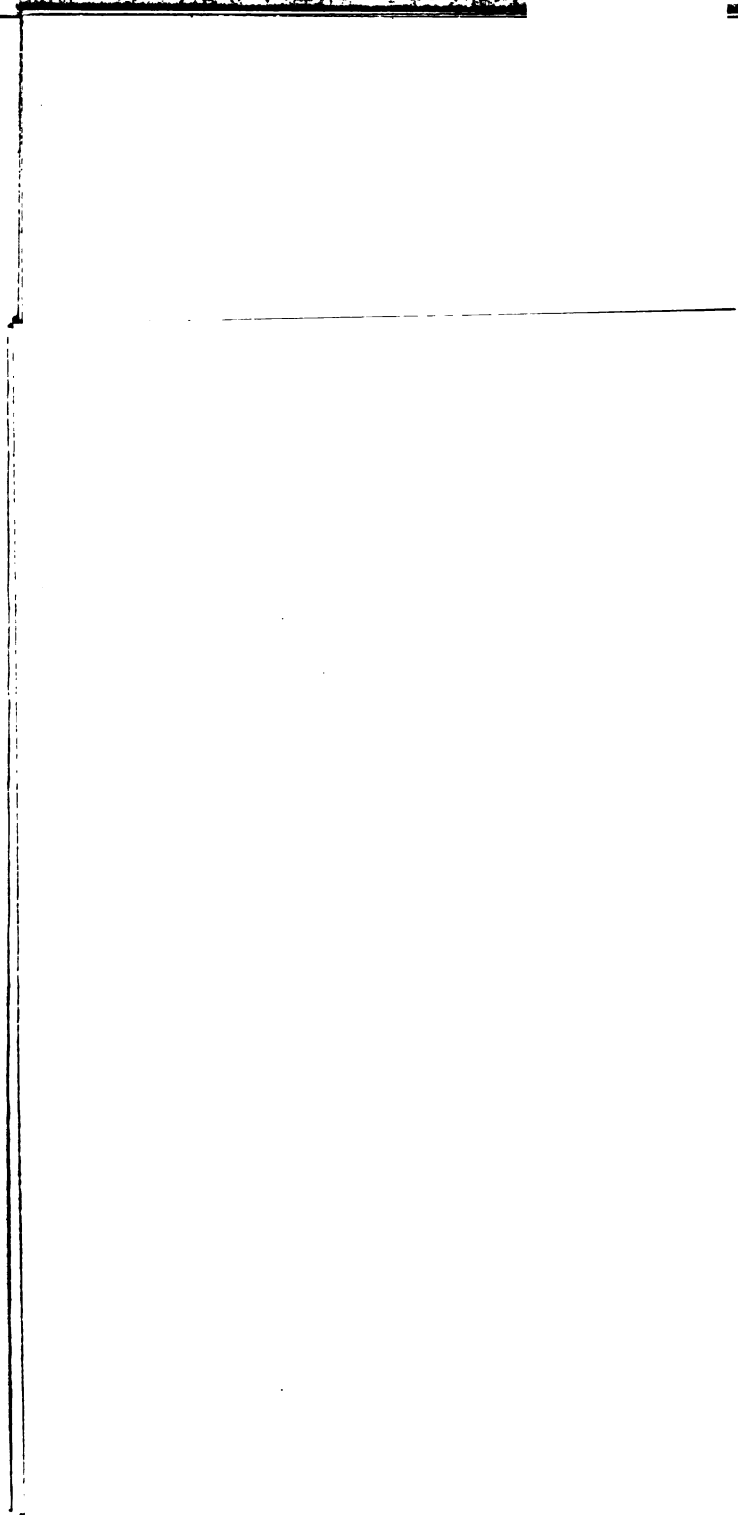
VII.—Statement showing the percentage in each class of passengers travelling over the Great Western system, holding single and return tickets.

BOOKINGS TO AND FROM GREAT WESTERN STATIONS, INCLUDING ALL DESCRIPTIONS OF PASSENGER TRAFFIC
(SEASON TICKETS EXCEPTED).

YEAR.	PERCENTAGE OF PASSENGERS HOLDING SINGLE AND RETURN TICKETS.					
	1st Class.		2nd Class.		3rd Class.	
	Single.	Return.	Single.	Return.	Single.	Return.
1883	% 52·80	% 47·20	% 37·91	% 62·09	% 82·64	% 17·36
1884	52·42	47·58	44·93	55·07	80·03	19·97
1885	53·06	46·94	45·60	54·40	80·21	19·79
1886	53·24	46·76	45·88	54·12	79·49	20·51
1887	53·38	46·62	46·45	53·55	79·75	20·25

NOTE (applying to Tables III., IV., V., VI., and VII.)—Lest there might be any question as to the propriety of publishing the actual figures from which these results were obtained, I have refrained from doing so, and give results only. That these are correct, I should have pleasure in establishing with the Company concerned if so requested.





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the 1990s. The first of these was the development of a new generation of high speed digital signal processing (DSP) chips, which allowed the development of more sophisticated signal processing techniques for the analysis of vibration signals.

The second development was the development of new methods for the analysis of vibration signals, which allowed the extraction of more detailed information from the signals. This was achieved through the development of new signal processing techniques, such as wavelet analysis and adaptive filtering, which allowed the extraction of more detailed information from the signals.

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