RAMBLES ON RAILWAYS.

With Maps, Diagrams, and Appendices

BY

SIR CUSACK P. RONEY,

B.A. TRIN. COLL. DUB., L.R.C.S.I.

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PREFACE.

Just as the Author was completing the last of the following pages, he was seized with very serious illness. It has delayed their production two months beyond the time originally advertised. Meanwhile, several changes have taken place, which, though not of much importance, may be briefly referred to. Thus, Mr. Anthony Trollope, mentioned at page 104 as amongst the literary men connected with the Post Office, has, since that page was printed off, ceased to be an officer of the department.

Some trifling errors must also be mentioned; thus, at note of page 211, the length of Australian railways is stated at 480 miles, whereas it should have been 669, as set forth at page 307. Page 212; it is stated that the Euston portico is not used by anybody, whereas empty cabs, having set down their fares, go through it. Page 359; the name of the Secretary of the Palestine Fund is "Grove" not "Groves." Page 390, line 27; the St. John's Wood Railway terminates at 1 mile and 1,320 yards from Baker Street, and then the Hampstead Extension will commence with a gradient of 1 in 27. Page 423, line 11; for "Lowe" read "Love."

The most important correction to be made has reference to pages 149 and 150, relating to the railway capital raised, traffic receipts, and net earnings for 1865. When the words in the text were written the complete returns of the Board of Trade had not been published, and the Author assumed that the debenture and preferential capital was greater in amount than it really

is. The reader is, therefore, requested to take the subjoined analysis of the railway capital of the United Kingdom, extracted from the City article of the *Times*, of October 29th, 1867, as containing an exact statement of the several portions into which that capital was divided on the 31st of December, 1865, and to substitute it for the statements in the text as given in the before-mentioned pages. If the traffic accounts, as published by the railway companies, be really correct, and that capital has not been improperly charged with items that should, in reality, be attributable to revenue, the dividends on unguaranteed capital are better, as a whole, than the Author assumed them to be.

"The complete railway returns of the Board of Trade for the year ended the 31st of December, 1865, have just been printed. They are full and elaborate, and would furnish excellent means for estimating the prospects of the enormous property involved, were it not for the drawback of their being issued so long after the period to which they refer. The leading features of the tables now presented may be summarised as follows:—At the end of 1865 the total *ordinary* capital of the railways of the United Kingdom was £219,598,196. Of this total £183,450,460 was represented by companies paying dividends, and £36,147,736, by companies (chiefly the Great Eastern and London and Chatham) not paying dividends, the latter including £12,849,590 for lines not yet opened. Setting aside the unopened lines, and reckoning only the capital of those at work—namely, £206,748,606—the average rate of distribution was £4. 11s. 5d. per cent., a satisfactory return could an assumption be safely made that it had not been in any degree paid out of capital. The result would have been still better but for the extent to which the average rate is reduced by the circumstance of the profits of the Scotch and Irish being below those of the English lines. The English rate was £4. 14s. 10d. per cent., while the Scotch was £4. 9s. 5d., and the Irish only £2. 16s. 8d. The lowest dividend disbursed by any of the English dividend-paying companies (57 in number) was by the Cromford and High Peak, which on an ordinary capital of £127,700 distributed 8s.

per cent. for the year, while the highest was £11. 2s. 6d., by the Lancaster and Carlisle on an ordinary capital of £2,420,300. The main cause of the respectable average of the English dividends is found, however, in the payment of £6. 12s. 6d. per cent. by the London and North-Western on an ordinary capital of £23,378,987; of £6. 15s. per cent. by the Midland, on £10,862,067; and of £7. 2s. 6d. per cent. by the Great Northern, on £6,455,584. At the same time there is an item which must now be regarded as fictitious, of £5. 15s. per cent., by the Brighton line, on an ordinary capital of £5,342,933. Of 19 dividend-paying lines in Scotland, the lowest was the Carlisle and Silloth Bay, 10s. per cent., and the highest was the Kilmarnock and Troon, £9. 5s. per cent., the ordinary capital of the latter being only £40,000. In this list the Caledonian figures for £7. 2s. 6d. on an ordinary capital of £4,141,254. Of 11 dividend-paying lines in Ireland, the lowest was the Waterford and Limerick, 15s. per cent., and the highest the Dublin and Kingstown, 9 per cent. The *preferential* capital of the railways of the United Kingdom was £124,263,475, and upon this the average rate paid (reckoning a sum of £8,455,279, on which the companies were unable to distribute anything) was £4. 7s. 9d. per cent. The total of the *debenture stock*, or funded debt of the railways in the United Kingdom, was only £13,795,375, and on this the average rate paid was £4. 2s. per cent., while the *debenture loans*, subject to renewal, and which in times of pressure must always be a cause of danger, amounted to £97,821,097, at an average rate of £4. 8s. 5d. per cent. The total paid-up capital of all kinds stood at £455,478,143."

The Author had thought, that in tracing tunnels to the time of the erection of Babylon, he had gone as far backward as it was possible to extend research on this subject. It appears, however, that he was mistaken, for, during a visit that he paid to Paris just before his illness, he lighted, in *Galignani*, upon the following extraordinary paragraph, which is given in *extenso*, exactly as he found it.

"Antiquity of Man.—A most singular and unexpected dis-

covery has just occurred at Chaguay, Department of the Soane et Loire, by some workmen. Engrossed in digging the foundations of a railway shed, at the depth of about ten yards, in a stratum of muddy clay and ferruginous oxides, remains of *proboscians* (elephants, rhinoceroses, &c.), were brought to light, comprising several back teeth and a formidable tusk, in large fragments, which, on being put together, constituted a length of seven feet. The depth at which this was found was more than six yards, higher than the level of the most considerable inundations of the Dheune, and in an undisturbed stratum. So far, there is nothing absolutely extraordinary, but who would have thought of finding, underneath the bed containing these fossils of the tertiary period, an aqueduct of the most primitive kind of human workmanship? Yet such is the case, and it is the only case of the kind on record. It is explained by M. Tremaux, who relates the circumstance, by the supposition—what seems indeed to have been the fact—that the tertiary fragments above alluded to had been pushed into the trench by a violent inundation, and thus filled up the aqueduct. The discovery of this aqueduct does not by any means authorise us to carry the antiquity of man as far back as the tertiary period, for, although the aqueduct lies under a stratum of tertiary formation, this stratum does not belong to the place, but was transported thither at a later period."

One step from that period, whatever it was, to *Anno Christi* 1867. During the visit above referred to, the Author was afforded the opportunity, by M. Mouton, the eminent French contractor, of an inspection of the plans of the proposed Paris Underground Railway, which it is hoped will be commenced before the expiration of 1868. The course of the line is from Long Champs Racecourse, beside the Seine, near Paris, underneath the Bois de Boulogne, thence to Arc de l'Etóile, from there almost in a straight line along the Champs Elysées, the Rue de Rivoli, the Rue St. Antoine, to the Chemins de Fer de Vincennes, thence to the Mazas Station of the Paris, Lyons, and Mediterranean Railway. Branches are given off from the main line just described, right and left, so as to form a complete underground connection between

all the Railway Termini of Paris. There will be one bridge over the Seine, and one tunnel under it. The total length of the railway and branches will be 23 kilometres, of which about 18 will be in tunnel or covered way.

It only remains for the Author to express the sense of deep obligation which he feels to his numerous railway friends for the kindness and promptitude with which they have afforded him information upon every point upon which he sought it from them. It had been his wish to enumerate specially the names of all these gentlemen, and it is a source of much regret to him that the limited space allowed for the Preface prevents his performing this act of grateful recognition. To Mr. William Haywood, the Engineer of the Corporation of London; to Mr. John Fowler, President of the Institution of Civil Engineers; and to other members of the profession, he is also much indebted. He ventures likewise to tender his respectful thanks to George Graham, Esq., the Registrar-General, for the great kindness and courtesy with which he replied to several questions relating to populations; and the expression of the same feeling is due to Mr. Juland Danvers, the Government Director of Indian Railways, from whom information was sought on several occasions.

The Author has by him materials for another volume of "Rambles on Railways," (relating principally to the railway networks of Foreign countries), which may probably be published in the course of the present year.

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RAMBLES ON RAILWAYS.

CHAPTER I.

TRAVELLING TWO HUNDRED AND ONE HUNDRED YEARS AGO—THE LIVERPOOL AND MANCHESTER RAILWAY—THE FIRST LOCOMOTIVE, "ROCKET"—THE GRAND JUNCTION, LONDON AND BIRMINGHAM, AND BIRMINGHAM AND MANCHESTER RAILWAYS—THE MIDLAND RAILWAY—EARLY GRADIENTS, INCREASE IN THEIR STEEPNESS AND IN THE POWER OF THE LOCOMOTIVE—THE CARRIAGE ROAD-WAY PASSES OF THE ALPS—MOUNTAINS OF THE WORLD—THE SŒMMERING AND BRENNER RAILWAYS—THE ROUTE BETWEEN LONDON AND PARIS.

When, in 1672, Madame de Sevigny wrote of a journey she had just made from Paris to Marseilles, she was able to inform her correspondent that she had completed it, with great satisfaction to herself, in a month. She travelled over 530 miles of ground; she was therefore able to get over some seventeen to eighteen miles a day. The courier that brought Madame de Sevigny's letter from Marseilles to Paris travelled twice as fast as she had done. He was only a fortnight on the road. In that year the course of post

between London and Edinburgh—130 miles less distance than between Paris and Marseilles—was two months: one month going with a letter, and one month coming back with the answer. Ninety years afterwards the one stage-coach between London and Edinburgh started once a month from each city. But in nine-tenths of a century, speed had been accelerated. It only took a fortnight on the road in each direction. Seventy-five years afterwards—that is, in 1837—the year before any portion of railway between the two capitals was opened for traffic, the mail-coach completed its 400 miles in forty-two hours, or one day eighteen hours. Now-a-days, our limited mail (one of the few "limited" associations of very modern date that has not come to grief) is $7\frac{1}{2}$ hours less time over the road than eighteen hours; and by the time the one day in addition has expired, a course of post from Edinburgh to London, and back again from London to Edinburgh, will have been nearly completed.

On the 14th of September, 1830, we opened our first passenger railway in England worked by the locomotive. The line, thirty-one miles long, was then called the Liverpool and Manchester, but it has long since become part and parcel of the London and North-Western Company. Although the railway between Birmingham and Liverpool was first projected so far back as 1824, its construction was not sanctioned by Parliament until 1833, and it was not completed for traffic until the 6th of July, 1837. The then London and Birmingham Company also got its act of incorporation in 1833, but, owing to the difficult nature of many of its works, and the time required for their construction, it was only on the 20th of September, 1838, that Liverpool, Manchester and Birmingham were completely connected with London by railway.

Several of the railways now constituting portions of the Midland Railway Company obtained their acts of incorporation in 1836. These lines, when amalgamated in 1844, comprised 181 miles. On the 1st of September, 1867, the mileage of the Midland Company was 695; and since the 1st of that month the important section between London and Bedford (forty-two miles long) was opened for goods traffic, thus making its present total working length, 737 miles.

By degrees, and notwithstanding the severe blow given to railway enterprise by the over-speculation of 1844-5, the net-work of British railways increased. On the 1st of January, 1843, there were 1,857 miles open for traffic; at the same date of 1849 they had increased to 5,007 miles; on the 1st of January, 1855, they were 8,054 miles; eight years afterwards, that is, on the 1st of January, 1863, they were 11,551; that day twelve months they were 12,322; on the 1st of January, 1865, they were 12,780; 1st January, 1866, 13,289; 1st of January, 1867, 13,882.*

We shall refer to the progress of the railway system on the continent of Europe and elsewhere hereafter.

Part of the heavy cost of the earlier railways was no doubt

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* The traffic receipts published each week by the newspapers neither represent correctly the actual mileage of railways opened nor the receipts upon them. Thus, although about 300 miles have been opened since the 31st of December, 1866, making the actual length of the railways in the United Kingdom nearly 14,200, the mileage upon which traffic was published for the week ending the 14th of September last was only 12,958. Many of the small railway companies, and those which are chiefly mineral lines, do not publish weekly traffic returns; and it is to be feared that, in the case of some of the larger railway companies, increased mileage is not included for several weeks—in some cases, for several months—after branches are opened, although the increased earnings are included in the published receipts.

due to the apprehension of engineers on the subject of gradients. And in the then state of our knowledge as regards the powers of the locomotive, this is not to be wondered at. Our first constructed lines had most favourable gradients. The rise from Camden Town to Tring, 1 in 200, or 26 feet in the mile for 31 miles, was considered by the late Mr. Robert Stephenson as the maximum gradient that ought to be ventured upon. Joseph Locke, more daring and venturous, and perhaps more prescient, ventured upon 1 in 100, or 52 feet in the mile for 10 miles; this is on what is known as the Whitmore incline, between Stafford and Crewe. Bucke, the engineer of the line from Crewe to Manchester, originally known as the Manchester and Birmingham, which obtained its act of incorporation in the same year as the Grand Junction, although it was five years later in its opening, determined upon a course the opposite of that which Locke had taken. Bucke therefore made his thirty-one miles nearly level, and no doubt (if we except the exceptional Great Western) there is not a line in England that comprises works better laid out as regards gradient, or more solidly finished than those we are now referring to.

There is a capital run of railway between York and Darlington, forty-four miles, almost level, and nearly straight. It was on this line that, just twenty years ago, most of the experiments and trials were made, instituted to vindicate the narrow gauge as the best for carrying on the traffic of the country. These trials formed one of the many phases of the great battle of the gauges, fought so vigorously by its champions on each side; yet, in the short space of the fifth of a century, how many of these then active and doughty men have passed away from us for ever.

By degrees, as the railway system progressed, we made

less flat gradients, and we made larger and more powerful locomotives. The result from the action of these two elements has been, that in present times we have got here and there to gradients of 1 in 45, 112 feet in the mile, more than four times as steep as Stephenson's incline between Tring and Camden. It was on the 6th of October, 1829, that George Stephenson's engine, "Rocket," was first tried on a short length of the Liverpool and Manchester Railway, in the presence of thousands, poured in from the adjacent country. Since then the weight of the engine has risen ten-fold, from six tons to sixty; its speed not quite three-fold, from twenty miles an hour to something under sixty. Additional weight has been essentially used for overcoming stiff gradients. The stiffest, as has just been said, 1 in 45, with a moderate load; a Titanic locomotive, unfettered with any weights behind her, can go up 1 in 25, or 211 feet in the mile; no steeper.*

But this rate of inclination, of 1 in 45, acquired on some few elevated ridges, as will be seen presently, at an enormous cost, was incapable of general application. Nevertheless, railways had hardly been established on low lands before men's minds ran upon constructing them over mountains. It is now fully twenty years since the first idea of placing an iron road upon the bed of one or more of the carriage roadway passes of the Alps was promulgated. Of course it found favour, and created interest. Nor can this be matter

* In the paper read by the late Admiral Laws to the Institution of Civil Engineers, on the 11th of March, 1851, upon the mode of working an incline of 1 in 27½ on the Oldham branch of the Lancashire and Yorkshire Railway, and in the report of the discussion which followed the reading of the paper, will be found several interesting details relating to the working of inclined planes on railways at that time.

of wonder when we remember that communication across them has, for centuries, been of world-wide importance. Even if we study the traces that still exist of man's earliest history in mid and southern Europe, we find that the passage of the great barrier which for more than 500 miles separates north from south, had occupied men's thoughts and actions from the remotest period. Etruscan tools, coins, and sacred images, have, as we learn from Dr. Ferdinand Keller's recent work on the *Lake Dwellings of Switzerland*, been found frequently and in abundance, not only on the northern slopes of the actual Alps, but far northward beyond them. We know too, that the ancient Helvites and Gauls were ever seeking the traverse of the snow-capped mountains, that they might exchange their own cold and sterile plains for those on the sunny side, which gave them warmth and luxurious cultivation. By degrees, the early few, savage, daring, and intrepid, increased in numbers; they became masses,—they became colonies. They obtained possession of, and held the districts which in modern times we knew as Venetia, Lombardy, and Savoy; but now they form the northern boundaries of undivided Italy.

In the early Roman period, the northern limit of Roman territory extended to the Po, and no farther. Beyond was Cisalpeà, and so it continued until Augustus Cæsar Imperator finally subdued, some thirty years before the birth of Christ, the whole of the warlike tribes, and brought them under Roman subjection. History records but one solitary instance of the vanquished erecting a monument to do honour to their conqueror. This was at Susa, and the inscription on the *Porta Cæsaris Augusti* tells us why it was erected, and what deed it was intended to perpetuate.

Hannibal's was the first army that made a passage across

the Alps, but the exact part at which he effected it is still matter of historic doubt. The balance of worthful opinion is however strongly in favour of its being by what we now call the Pass of the Little St. Bernard. The army would appear not to have been subjected to great difficulties in reaching its summit, notwithstanding that the 19th of October is believed to be the day on which the ascent was commenced, but the horrors to which his hourly thinned ranks were exposed, all occurred after they had attained the summit, and were within sight of the plains in which the autumnal foliage still spread a rich and glowing landscape before them. That some few of the army of ninety elephants with which Hannibal started from Spain completed the Alpine traverse is more than probable, but that one accomplished it is undoubted, for we have it on record that the Carthaginian General crossed the marshes of Clusium (which will be traversed by the railway train of the new and comparatively shorter line between Florence and Rome, to be opened for traffic a few months hence) upon the only elephant that was still spared to him.

Brockedon, whose illustrated work on Alpine Passes was published in 1828, states that there were ten passes traversable as carriage roads. The actual number has not been added to since then, but the trackway along many of the other passes has been greatly improved, and many, that at that period were only dangerous and very narrow mule paths, have now become available for *chars,* and possess other facilities and accommodation for traversing them that were quite unknown forty years ago. A very brief recapitulation of them may not be inappropriate. More full details of them can be obtained in *The Alps and the Eastern Mails,* a little work which we published a few months ago.

Commencing at the extreme west, we find the Col di Tenda, an easy pass for three-fourths of its ascent, when the mountain abruptly assumes a cone-like shape, and in a space of some two miles and a-half, rises on one side 1,200 feet. The descent on the other is of nearly equal length, and is nearly equally precipitous. Next comes Mont Genevre, the lowest of the Alpine passes that verge upon the Mediterranean. It is but a short giant's step from Mont Genevre to the Mont Cenis. Next after, comes the Little St. Bernard, perhaps the easiest of all the passes over the Alps that connect important places together, for the construction of a carriage roadway. Napoleon, however, did not view it in this light, his great roads, being the Mont Cenis and the Simplon. Before we reach this last-named pass, we have that of the Great St. Bernard, one of the loftiest in the whole range, being in immediate proximity to the three highest mountains in Europe, Mont Blanc, 15,732 feet above the level of the sea, Mont Rosa, 15,130 feet, and Mont Cezvin, 14,835 feet.* It was by the Great St. Bernard that

* France now possesses these three mountains, the highest in Europe; Switzerland possesses the two next highest, Finsterarhorn, 14,026 feet, and the Jungfrau, 13,716 feet, both in the Bernese Oberland. The highest mountain in the Austrian Dominions is the Orrtler Spitz in the Tyrol, 12,822 feet, the fourteenth highest in Europe. She also has the fifteenth, Gross Glockner, 12,431 feet. Spain possesses the sixteenth and seventeenth, Mulhaeen, 11,664 feet, and Pico de Veleta, 11,398 feet. Mount Etna in Sicily is 10,872 feet, the twenty-fourth in height in Europe, and the highest belonging to the Kingdom of Italy. Olympus in Thessaly is 9,749 feet. Monte Santo in Greece, 9,628 feet, is the forty-second highest in the European order. The forty-ninth and fiftieth are in Corsica, Monte Rotondo, 8,767; Monte d'Oro, 8,701; Parnassus in Greece is 8,068 feet, and Mount Athos, 6,776. The highest in the island of Sardinia is Monte Genergentu, the seventy-ninth, 6,293. The Rigi in Switzerland is 6,050. The highest in Styria is Wechselsberg, 5,352. The highest in Bohemia is Schneekoppe, 5,328. The highest in Sweden is Mount Adelat, 5,145.

Napoleon crossed with an army from Switzerland into Italy, in the winter of 1800, and, by a fall from his mule, narrowly escaped being hurled from the precipice of St. Pierre into the abyss beneath it.

Next after the Simplon comes the St. Gothard, and then

The highest peak of the Apennines, Monte Corno, the thirty-sixth highest mountain in Europe, is 10,144 feet. The next highest, Monte Amaro di Majella, the fifty-first, is 9,113; Monte Velino, the sixty-second, 7,851; Termenillo Grande, the sixty-eighth, 7,212. Monte Cimone the seventy-first, 6,975. The height of Vesuvius is 6,950 feet less than that of his brother volcano, Mount Etna, being only 3,922 feet, and the 125th in European order. The highest mountain in Portugal is the Sierra de Foga, 3,609 feet. The Gross Arberg is the highest in Bavaria, 4,832 feet. Coming to the United Kingdom, we find that Ben Nevis in Scotland, 4,406 feet, is the highest, it is the 111th in European order. They come afterwards as follows—Ben Macdin, 113th, 4,296. Cairn Tuol (Aberdeen), 115th, 4,225. Cairn Gorm, 121st, 4,090. Ben Lawers, 124th, 3,984. Ben Avon (Aberdeen), 129th, 3,821. Snowdon in North Wales, 134th, 3,590. Schehallion, Scotland, 135th, 3,547. Cairn Lewellen, North Wales, 136th, 3,471. Curran or Cairn Tual, near the Lakes of Killarney, 140th in European order, is 3,045 feet. Ben Lomond, Scotland, 144th, 3,912. Helvellyn, in Cumberland, 147th, is the highest in England, 3,115 feet. Skiddaw in the same county is fifty-seven feet lower, being 3,058, and Cross Fell, also in Cumberland, is 2,928. The Cheviot is 2,669, and Coniston Fell, in the Lakes District, is 2,649 feet. The Nephin Mountain in the County of Mayo is 2,638 feet. The Morne Mountains, in the County of Down, are 2,493 feet, Shunner Fell in Yorkshire is 2,348. The summit of Gibraltar is 1,493 feet. and whether Arthur's Seat Edinburgh be or be not a mountain, it is 822 feet above sea level.

But many mountains in other parts of the world are of much greater altitude than those in Europe. The highest in Asia and in the world is Deodunga, or Chingo-pamari, in Nepaul, 29,002 feet, or exactly $5\frac{1}{2}$ miles above sea level; and there are no less than twenty-eight other mountains in Asia, the height of which exceeds 20,000 feet, besides seven that exceed 15,000, twelve that exceed 10,000, sixteen that exceed 7,500, twenty-two that exceed 5,000, and six that are below 5,000, the lowest enumerated being Taganai, in the Ural Mountains, 3,532 feet above the level of the sea. The total number of the above is 92.

The highest mountain belonging to Africa and the Atlantic Islands is

the Lukmanier, although this last can hardly be called a carriage roadway pass. Further east is the Bernardino. The easternmost pass between Switzerland and Italy, is the Splugen. There are as many as twenty passes available for mules and pedestrians between the Splugen and the next carriage road across the Alps, but they are only to be traversed by the knapsack tourist, who combines within himself vigorous health, activity, and endurance.

Kilimanjaro, in equitorial Africa, 20,000 feet high. There are four others more than 15,000 feet high, seven more than 10,000 feet, (among which is the Peak of Teneriffe, 12,205 feet), eight above 7,500, thirteen above 5,000 and eighteen below 5,000; total, 51.

The highest mountain of the American Continent is the Aconcagua, in Chile, 23,910 feet. There are fourteen higher than 20,000 feet, forty-two higher than 15,000, nineteen higher than 10,000, twelve higher than 7,500, twenty-one higher than 5,000, twelve less than 5,000; total, 121.

The highest mountain in Polynesia, Australia, and the Pacific Islands is a volcano, in Sumatra, called Singalang, 15,000 feet high. Volcanoes particularly abound in the groups of these highlands. Thus, while there are only four volcanoes among 169 European mountains, thirteen among ninety-two Asiatic, eleven among fifty-one in Africa and the Atlantic islands, thirty-three among 121 American mountains, there are sixty-three in a total of 109 mountains in Polynesia, Australia, and the Pacific islands. There are twenty-three of them above 10,000 feet, sixteen above 7,500, twenty-nine above 5,000, and forty-one under 5,000.

Thus it appears that there are 524 mountains in the world, of altitudes varying from 1,400 to 29,000 feet, of which 124 are volcanoes. The greater portion of the foregoing information is derived from the very interesting article headed "Physical Geography," in the seventeenth volume of the eighth (and latest) edition of the *Enclyclopædia Britannica*, to which the reader is referred for further details. Writing of mountains reminds us that it was on the Puy de Dome, the summit of which is 4,806 above the level of the sea, that Pascal, for whom M. de Charles has invented the letters by which he has attempted to rob Newton of the honour of having discovered the laws of gravity, first observed the decrease of barometric pressure as mountains are ascended. Honour and reputation enough attach to the name of Pascal, without attempting to add to them by fraud and forgery.

The Stelvio, the highest carriage road in Europe, 9,272 feet at its summit above the level of the sea, is, at that point, nearly 400 feet higher than the line of perpetual snow. It was constructed by the Austrians to give them direct access from Austria proper to Lombardy. The object in making it was political and military, not commercial; and now that not only Lombardy, but Venetia have become Italian, it is probable that a road, which in magnificence of conception and in grandeur of construction, exceeds even the Simplon, and which could only be maintained at great annual cost, will fall into decay.* For all the practical purposes of commerce it is useless, as within a short distance from it is the Brenner, the oldest, and at the same time the lowest carriage road across any of the Alpine passes. It has, in fact, been for centuries the trackway that has connected eastern and southern Germany with Lombardy and Venetia. It likewise can lay claim to the distinction of being the first pass that was made fit for the transport of carriages and of other vehicles, for it was certainly available for them, and was a good carriage road in the early part of the eighteenth

* The *Times* does not take this view, for we find as follows, in one of its leading articles of the 27th of August, 1867 :—"By one of the clauses in the recent commercial treaty between Austria and Italy, it is provided that both countries shall co-operate in the restoration and maintenance of international communication on the frontier. One of the results of this agreement is, that the magnificent military road of the Stelvio, a road which constituted one of the wonders of the Alps, but which Austria, ever since her loss of Lombardy in 1859, had suffered to go to ruin, will be completed and re-established. Italians and Austrians are now hard at work, each on their own side, vying with each other in their endeavours to efface the traces of ten years' neglect, and restoring gradients and galleries, bridges and embankments, to their former condition. It is pleasant to hear of competition in such peaceful pursuits among people who, only twelve months ago, were confronting each other amid those very mountain scenes, bent on mutual destruction."

century. It was just one hundred years later, that is in 1809, that those deeds of daring and devotion were achieved in the defiles of the Brenner, which have rendered undying the name and fame of Andreas Hofer.

With all Austria's *arrierreism* in politics, she is in the foremost rank of continental nations, as regards the world's modern civiliser, the Railway. She was next after Belgium in determining upon their construction, and although Prussia anticipated her as regards actual opening, railway works have been accomplished within the Austrian dominions, the like of which cannot be seen within those of her great rival, no matter whether these dominions belong to her *de jure divino*, or by that of conquest.

To Austria, undoubtedly, belongs the honour of having constructed the first, which until the 18th of August, 1867, was the only iron road traversed by the locomotive through an Alpine pass. At a heavy expense it is true, for the cost of the double line over the Sœmmering was at the rate of £98,000 an English mile. The great line of railway which connects Vienna with its sea port Trieste, now more important and valuable to Austria than ever, is 362 miles long; and at Glognitz, exactly forty-seven miles from Vienna, the pass commences. Although the actual distance from one foot of the pass to the other is not more than sixteen miles, the length of the railway, owing to the numerous twists and zig-zags it was necessary to make to overcome the elevation with gradients that the engine could climb up, is twenty-six miles. Yet, in this short distance, there are no less than twelve tunnels and eleven vaulted galleries, the aggregate length of which is 14,867 feet, or nearly three miles. The longest tunnel—4,695 feet—is at the summit, which is 2,893 feet above the level of the sea. The gradients vary from 1 in

40 for two miles and a-half to 1 in 54 for three miles and a-half. The average gradient is 1 in 47 on the north side, and 1 in 50 on the south. The foot of the mountain is 1,562 feet above the sea. The elevation to overcome was, therefore, only an average of 112 feet to the mile; nevertheless the difficulties in working the traffic have been very great. It was a considerable time before the present form of engine was adopted by M. Engerth, the locomotive engineer of the line. Its total heating surface is 1,660 square feet, its total weight, when filled with water and loaded with fuel, is fifty-five tons and a-half. This unfortunately is a weight most destructive both to rail and to roadway. The cost per train mile run averages 6s. 2d. the English mile *down* the pass as well as up it, whilst the average cost on the ordinary portions of the line is under 3s. per English mile. The time allowed for passenger trains is one hour and fifty minutes, being an average of fourteen miles an hour; for goods trains, two hours thirty minutes, or at the average rate of about ten miles an hour.

There was until just recently, a race running between the engineers at the Brenner and at the Mont Cenis, and it was, until the beginning of August, 1867, uncertain which of them would have the honour of being the second railway upon which the locomotive had crossed the Alps. But the Brenner has won by a length of eight days. The two lines differ in several respects, both as regard construction and working. The Brenner does not take a portion of the existing road for its road-bed. This is formed in the ordinary mode of construction; the company has made its own bridges, culverts, and viaducts, its own embankments and cuttings, its own tunnels and galleries, and in this way it has succeeded in constructing a railway of much less elevation at its summit

than the adjacent carriage roadway. It has done so, however, at great cost, but it is anticipated that the saving in working charges will more than compensate for the additional outlay which this species, as it were, of independent construction has rendered unavoidable. The line will be worked on the ordinary system, that is, with engines and other rolling stock similar to those on the plain, with the exception that the engines must and will be of great additional weight, to give them the power and adhesion required to overcome the very severe gradients they will have to contend against. "The opening of the Brenner Railway," says the *Times*, "places not only Austria, but Bavaria and all Southern Germany, almost in contact with Lombardy, Venetia, and all Northern Italy. It recovers all the importance that the Brenner Pass possessed from the remotest Roman and Germanic ages, as the most direct and easy route across the main Alpine chain, as the natural highway from the Valley of the Inn, to that of the Adige, and which constituted it the key to the strong position of the March of Verona, which the Germans, from its erection into an imperial fief, under Otho I, in the 10th century, denominated 'the Gate of Italy.'" *

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* Here is the first advertisement announcing the intended passage of trains over the Brenner Railway:—

COMPAGNIE DES CHEMINS DE FER DU SUD DE L'AUTRICHE ET DE L'ITALIE CENTRALE.—*Ouverture de la ligne du Tyrol.* (Passage du Brenner).—La Compagnie a l'honneur de prévenir le public que la ligne du Tyrol, section d'Innsbruck à Botzen (passage du Brenner), sera ouverte au transport des marchandises entre l'Allemagne et l'Italie le 17 de ce mois, et au service des voyageurs, le 24 du même mois. Les expéditions de marchandises devront être adressées à Kustein (Tyrol), station frontière du Nord, ou à Ala, station frontière du Sud. Le livret des tarifs et celui de la marche des trains seront, dès aujourd'hui, à la disposition du public. A l'agence commerciale de la Société, à Kustein. A toutes les stations de la ligne du Tyrol. A la direction commerciale de la Société, à Vienne. Les stations d'Italie forment l'objet d'un tarif spécial, qui sera à la disposition du public, dès les premiers jours du mois de Septembre. Jusque là, l'agence commerciale à Kustein donnera tous les renseignements d'expéditions et de prix qui lui seront demandes.—Vienne, 10 Août, 1867.

Later advertisements announce that the express passenger trains between Munich and Verona are to complete the journey in eighteen hours. The

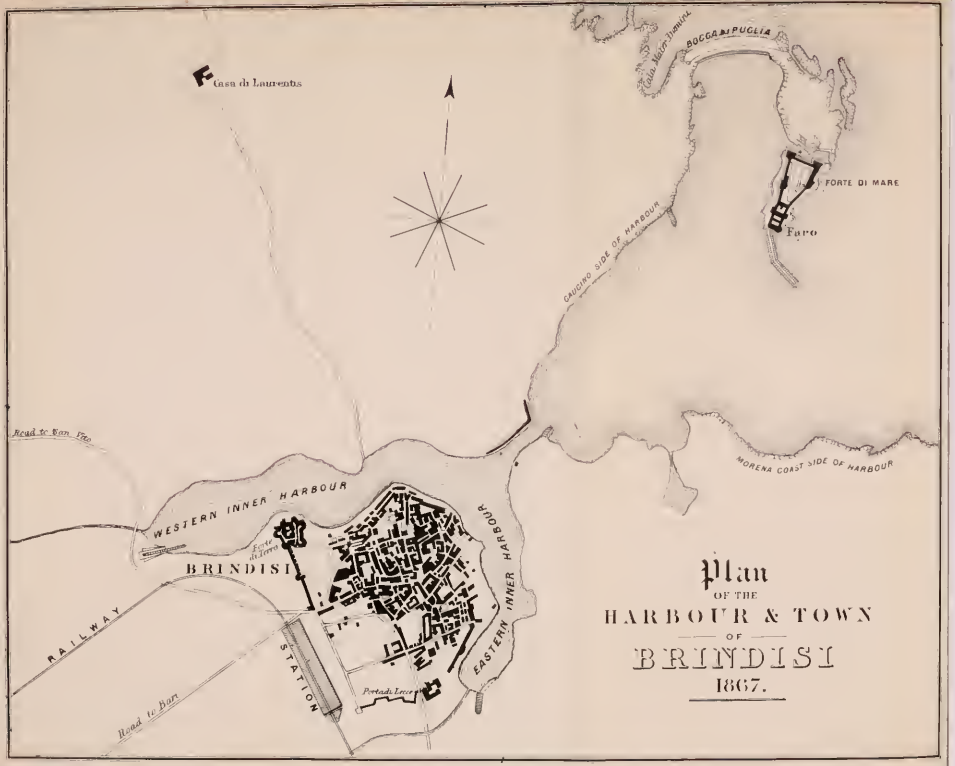
THE ROUTES FROM LONDON to BRINDISI.

VIA THE

MONT CENIS AND THE BRENNER.

DISTANCES FROM LONDON

	Miles
VIA MONT CENIS	
To Paris	296
St Michel	717
Turin	787
Florence	1122
Rome	1355
Naples	1616
Brindisi	1877
Alexandria	2431
VIA BRENNER	
Florence	1054
Rome	1287
Naples	1750
Brindisi	1741
Alexandria	2606
VIA MARSEILLES	
Alexandria	2254
VIA SOUTHAMPTON	
Alexandria	3131


Casa di Laurenta
BOCCA DI PUGLIA
Colle Mon-Tamaro
FORTE DI MARE
Faro
CASINO SIDE OF HARBOUR
MORENA COAST SIDE OF HARBOUR
Road to Bari
WESTERN INNER HARBOUR
Forte di Terra
BRINDISI
RAILWAY
STATION
Road to Bari
Portadi Lecce
EASTERN INNER HARBOUR
Plan
OF THE
HARBOUR & TOWN
OF
BRINDISI
1867.

Previous to describing the Mont Cenis Railway, we will ask the reader to place himself mentally with us in the train belonging to one or other of the two railway companies which, leaving the great British metropolis at four different points, Charing Cross or Cannon Street (South Eastern), Victoria or Ludgate Hill (London, Chatham and Dover), arrives by either route at a point common to both—the Admiralty Pier, Dover, in two hours and five minutes from the time of its departure. The South Eastern Company carries the land mails, both ordinary and extraordinary, as well as the bulk of the passengers; on the other hand, its rival carrying fewer passengers, and the distance being ten miles less, almost invariably arrives first at the Admiralty Pier, and thus enables those whom *she* (ships, trains, and locomotives are of the feminine gender) conveys, to secure some of the sofas, reclined upon which, the ceremony of sea-sickness can (as we know well, by great and varied experience) be performed with far greater ease, grace, precision, and satisfaction, than by him or her who is destined to perform it sitting or standing. At the time that the traveller touches *terra firma* at Calais, he has completed 110 miles of journeying, if he have travelled by the South Eastern Line, ten miles less, if he have committed himself to the London, Chatham and Dover. The original railway distance from Calais to Paris was 236 English miles, but thanks to two shortenings, the first between Creil and Paris, the second

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distance is 295 miles. Verona is 95 miles from Bologna; 565 miles from Brindisi; 178 from Florence; 411 from Rome; 574 from Naples. The following are the distances between London and Munich:—London to Paris, 296 miles; Paris to Kehl (*viâ* Strasbourg), 325; Kehl to Bruschal junction, 59; Bruschal to Ulm, 107; Ulm to Munich, 94—total, 881. Total—London to Brindisi, 1,741 miles; to Florence. 1,354; to Rome, 1,587; to Naples, 1,750.

between Hazebrouck and Arras, by which latter the detour to the neighbourhood of Lille was avoided, the length was diminished to 203 miles; and now, since the opening of the line between Calais and Boulogne, in April of the present year, the mail trains take this route to and from Paris, by which a further saving of seventeen miles is obtained, making the present distance between Calais and Paris 186 miles.

Our mental traveller having arrived at Paris, will need a pause, and whilst he is supposed to be refreshing himself, with a good dinner, at one of the innumerable restaurants to be met with at every corner, we will ask permission to occupy the time by giving, in the first instance, an epitome of the story of four great giants of modern times—the four longest and most important railways that science, practical skill, and money have as yet created on the European side of the Atlantic; and then we propose to show, by a general reference, how wonderfully and rapidly the railway system has already extended, and still continues to extend, in various parts of the globe. Eventually, most railways will have to yield the palm—at all events, as regards wonderful accomplishment—to the Great Pacific Railway, to which, therefore, we beg leave to accord precedence in our descriptions.


MAP OF THE
UNITED STATES
SHEWING THE
CENTRAL PACIFIC RAILROAD.
1867
PROPOSED RAILWAY THROUGH BRITISH TERRITORY
B R I T I S H A M E R I C A
HUDSONS BAY
James Bay
VANCOUVER I
OLYMPIA WASHINGTON
OREGON CITY
O R E G O N
CALIFORNIA
S FRANCISCO
SIERRA NEVADA MOUNTAINS
ROCKY MOUNTAINS
Humboldt Salt Lake
MORMON SETTLEMENT
UNION PACIFIC RAILROAD
U T A H
OMAHA
Platte R
MINNESOTA
IOWA
CHICAGO
JOLIET
KANZAS
MISSOURI
ST LOUIS
Ohio R
Missouri R
KENTUCKY
VIRGINIA
ILLINOIS
INDIANA
OHIO
ELKHART
CLEVELAND
COLUMBUS
CINCINNATI
MARIETTA
BALTIMORE
PHILADELPHIA
NEW YORK
PENNSYLVANIA
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
DETROIT
P SARNIA
TORONTO
KINGSTON
ONTARIO
ALBANY
Ottawa R
St Lawrence R
QUEBEC
MONTREAL
RICHMOND
MAINE
VERMONT
NEW HAMPSH
PORTLAND
BOSTON
MASSACH
CONNEC
RHODE I
SANTA FE
NEW MEXICO
TEXAS
ARKANSAS
Mississippi R
TENNESSEE
MEMPHIS
N CAROLINA
RALEIGH
C HATTERAS
S CAROLINA
MILLEDGEVILLE AUGUSTA
CHARLESTON
GEORGIA
SAVANNAH
ALABAMA
JACKSON
BATON ROUGE
MOBILE
NEW ORLEANS
LOUISIANA
FLORIDA
ST AUGUSTINE
LOWER CALIFORNIA
GULF OF CALIFORNIA
M E X I C O
GULF OF MEXICO
C SABLE
ATLANTIC OCEAN
SCALE OF MILES

CHAPTER II.

UNION PACIFIC RAILROAD—SOUTH AUSTRIAN AND ALTA ITALIA—PARIS, LYONS, AND MEDITERRANEAN—ORLEANS—MILEAGE, COST, AND RECEIPTS OF FRENCH RAILWAYS—LONDON TRAFFIC—LONDON AND NORTH-WESTERN RAILWAY.

From the day that the Americans became masters of California, they had always had it in their heads to join it by the best possible roadway to the old states of the Union; and it was a grand conception, for the distance between the railways of the valleys of the Mississippi and the Missouri, that here had stretched their arms outwards towards the West, were still separated from the Pacific by fully 2,000 miles—as near as can be the distance which intervenes between St. Petersburg and Lisbon. Fremont—then captain, now general—a few years back nearly President of the Republic—son-in-law of Benton, one of America's most worthy sons—traversed, with a few companions, in 1847, the desert that led to the Rocky Mountains, found out the passes through them, as well as those of the Sierra Nevada (the Snowy Mountain), and arrived in California just as his countrymen were taking possession of its territory. It was at the same time that the first golden nugget was discovered. The news spread, and a party of emigrants followed Fremont's footmarks. Those who arrived in California left the bones of many of their comrades to whiten and then to moulder in the desert, and it was nearly six months before the survivors reached the *El dorado*. Similar casualties beset the parties that followed the first gold-seeking pioneers, for the same spirit which makes every American believe that he

may be President of the United States (therefore no American ever commits suicide), made each survivor of each party, as its ranks were thinned by famine, fever, and the attacks of the Red Indians, believe that he, at all events, would be spared and arrive at last at his destination.

But some *did* arrive, and by degrees the perils of the route diminished, although they have never, even at this day, altogether ceased. In less than ten years from the date that Freemont first set out on his expedition, a regular Overland Mail had been established, which completed its journey between San Francisco and St. Joseph, both for passengers and despatches, in three weeks. A grand total distance of fully 2,000 miles, on the average 100 miles in each twenty-four hours, of course some days more some days less, for independent of nature's road on the desert, no less than two mountain passes had to be surmounted, and on these there was not, in the first instance, even a bridle-way. This pace, however, was considered too slow, at all events as regards correspondence. The "Pony Express" was thereupon inaugurated in 1860, by which time the system of eastern railways had extended 400 miles more towards the west than what they were in 1858, consequently diminishing roadway distance to 1,600 miles. This ground was got over in the marvellously brief time of six days, or at the go-a-head, we might almost add "helter skelter," rate of 265 miles a-day! The rider performed no greater journey each day than his horse. The latter set off on a gallop and never ceased his fifteen to twenty miles, except when, as occasionally, although not frequently, happened, Red Skin stopped the way, sent the rider to his long account, and then quietly rode off on the dead man's horse, which he claimed as his trophy. On the 12th of November, 1860, the courier rode

into San Francisco with news from Europe of no longer date than the previous 21st of October. Even this speed did not satisfy; the telegraph was therefore laid the whole way across the American continent; and now, thanks to the Atlantic Cable, and to difference of longitude, the merchant of London can tell his correspondent at San Francisco, events that have happened twelve hours before the same hour has arrived in California. Unfortunately, however, for California, notwithstanding that the normal speed of electro-telegraphy is 280,000 miles a *second*, she is unable to let us know her news here in less than some twenty-four hours after its occurrence.

In 1862 President Lincoln signed the Act of Congress for "The Union Pacific Railroad Company." Forthwith its works were commenced. Where? At two points:—The eastern, at Omaha, near the confluence of the Missouri River, with that of the Platte, or Nebraska, in the state of Nebraska, latitude 41° north, longitude 19° west, of Washington. The line follows the course of the river to the Rocky Mountains, which it climbs up until not far from the summit of the Bridger Pass, due west of Omaha. A tunnel not more than 500 yards in length carries the line into Utah. In this territory it passes by Salt Lake and Salt Lake City, head-quarters of Brigham Young and his Mormons; thence to the state of Nevada, as rich in silver-yielding mines as those in California are in supplying gold. No wonder, then, that its capital—Carson City—should now have a population of 15,000, although, seven years ago, there was not even one inhabitant to boast of. At the passage of the Sierra Nevada there will also be a tunnel 500 yards long. Thence to Sacramento, and from there, it will wend its way close to the river of the same name, and find itself at

San Francisco. This is not only its extreme western, but it is also its extreme southern point, for, in coming west from the Bridger Pass, the latitude changes from 41° to 38° 20′; and it is from San Francisco that the western works commence and proceed easterly to meet, at some point as yet uncertain, those advancing in the opposite direction. They are already at the eastern foot of the Rocky Mountains, 500 miles from Omaha; and on the Pacific side, they have reached the western slopes of the Sierra. Therefore, already more than a third of the whole line is accomplished. On the plain, progress is made at a rate that would astonish the European engineer, for the Americans are satisfied with the road bed such as nature has made it; and thus it is no uncommon thing to lay 2½ miles of the railway in a single day! As the road advances, so do the locomotive and the train, but not always with the most perfect safety, for the Indians have now learned to do wholesale what they only did isolately upon the riders of the Pony Expresses,—witness the following paragraph from the *Times* of no later date than August 31 of the present year:—

"A correspondent of the *New York Tribune* says that the Indians are out in strong force, and have begun the war in earnest. A strong force of savages laid ties on the track of the Union Pacific Railroad, six miles west of Plum Creek, and a valuable freight train was ambushed and upset. The engineer, fireman, two breakman, and three telegraph repairers were killed. The Indians burned eight cars, and completely destroyed a great deal of valuable merchandise, valued at 30,000 dollars. The savages burned the train, killed and scalped seven persons, and threw the slaughtered bodies into the flames of the burning cars. The conductor of the train narrowly escaped, and rushing back along the track, met another freight train, which he signalled. The train was stopped, and he was taken on board, after which the train returned to Plum Creek. The affair has created great excitement, and there is a general alarm along the line of the railroad, now that the Indians have discovered the means of arresting its traffic."

No doubt the alarm is general along the line, but it will die out, for as a writer in the *Revue des deux Mondes,* to whom we are indebted for many of the facts we have just stated, says :—"En beaucoup d'endroits, le terrain a été si bien nivelé par la nature, qu' ou ne voit de quel coté il penche, et que les rails se posent sans aucune fouille sur le sol. Pas de grandes riviers a franchir, pas de torrens impetueux a dompter. Le seul enemi de la voie, est que sur quelques points, heureusement isolés, du desert, ou manquent l'eau et le bois, domine le peau-rouge, vagabond, et chasseur, adversaire-né du colon stable : mais le bois et l'eau, on les apporte, et quant a l'enfant des Prairies, il disparaitra et s'eteindra, bientot, devant l'homme civilisé. C'est la, une des lois fatales du progres ; elle se verifie partout ou se presente l'Europeen." Too true.

And who are making the railway ? On the East they are all Irishmen. As each half-mile of it, or so, is made, they march along with it towards the West, with their wives, their children, their wooden houses rolled along on wheels, and their domestic animals—cats, dogs, goats--the more ambitious, have occasionally a cow, the richest of all can sport a little pony. When the day comes for the meeting of the two railway ends, the Irishmen will find that the fellow-labourers who have come to greet them are to a man "John Chinaman," for none others work on the Pacific side of the railway.

Its total cost is to be £30,000,000 sterling—£16,000 a mile. Of the gross sum, one-third is guaranteed by the United States Government in money, in addition to the concession of immense tracts of land on each side of the railway. The state of Utah, or rather the individual Mormons, are good for £4,000,000, and private speculation furnishes the

remainder. Of the mighty company which carries out these works, General John A. Dix (now United States Minister in Paris) is president; and in Colonel Heine (an *attaché* of the Embassy) the Company has a warm, zealous, and active friend. We have said already that a third of the railway is already accomplished. By 1870, probably—by 1871, certainly—it will be finished in its entire length. New York will then certainly associate itself with Jeddo and Canton by this route; but not so London, Paris, and other parts of Europe. The writer in the *Revue des Deux Mondes* says, that, on the completion of the railway, Europe will only be one month from Canton. Let us see:—London to New York, ten days; New York to San Francisco, 3,000 miles, at 20 miles an hour (all stops and delays included), 150 hours—six days and a quarter; San Francisco is from Canton, even by great circle sailing, exactly 6,900 nautical miles. No paddle-wheel steamer could take coals for such a voyage; a screw vessel of very large size, but depending mainly upon her sails for her speed, might make twelve, but very probably would not average more than ten, knots an hour, yet, at the former rate, her passage would be twenty-five days—total, forty-one days and a quarter; at ten knots an hour, the passage would be nearly twenty-nine days, or a total of forty-five days. The Mail now goes from London to Canton in fifty-two days; in 1871 the journey will be six or seven days shorter. The route to Jeddo *viâ* San Francisco will be quicker than that *viâ* Suez by seven or eight days, even under circumstances the most favourable for the latter route. By great circle sailing, San Francisco is distant from Jeddo 5,600 knots, and it is also eleven degrees farther to the north than Canton. These eleven degrees of north add 600 miles more in favour of San Francisco.

The longest of all European railways is nearly half Italian, and a little more than half "South Austrian." It is called in France "*Sud, Autrichienne et Haute Italie.*" In Italy the two last words are converted into "*Alta Italia.*" The total length is now 2,565 English miles, of which the South Austrian portion measures 1,349, and the Italian 1,216. The two next longest railways of Europe are French. The Paris, Lyons, and Mediterranean Company has a length of railway, *in France,* of 2,234 miles, and in 1864, it adopted a translitoral little son, which is known by the name of the "Algerian Railways." At present the gentle youth is of modest proportions, only thirty-one miles open for traffic, eighty-one to be opened in the present year; and of the remaining 264 which are to constitute its full grown mileage (376 miles), little more work than "*etudes preliminaries*" has been bestowed upon them. At the period of the greatest growth of the Algerian railway, it will never be more than a pigmy as compared with its adopting parent.

The railway that in mileage comes next in succession, is the Orleans Company. Its length is 2,052 miles. The last of the four railway giants, is our own English giant, the London and North-Western. Now, although the length of our countryman is the least of all—only 1,320 miles—it will nevertheless be seen hereafter, that in its other dimensions it is in most respects superior, in none inferior, to its continental brethren, just as the late Mr. Thomas Sayers was less in height and length of arm than Heenan, nevertheless, in the long run, he managed to beat him.

The two extreme western points of the mighty system of the South Austrian and Alta Italia are at Susa, at the foot of the Mont Cenis Pass of the Alps, and Cuneo at the foot of that of the Col di Tenda. Its two eastern are Vienna,

and still farther (by means of its Hungarian net-work to the southward of Vienna), Pesth. Its northern is Kutzen, about a hundred miles to the south-east of Munich. Its southern, Pistoja, is twenty-two miles to the north-east of Florence. It possesses railways across two of the passes of the Alps, the Sœmmering and the Brenner. Its stations are at Genoa, Turin, Milan, Innspruch, capital of the Tyrol, Verona and Venice, Trieste, Vienna, and Pesth. It is equally fitted (as it has proved itself to be) for a great military railway, and for one to be devoted only to commercial and industrial development, but it has its skeleton in its closet,—it is *not* at Florence, capital of United Italy, nor is there prospect of its being there, except by a combination which shall unite with it the whole of the *Strade Ferrate Romane,* of which some particulars will be given hereafter.

The course and direction of the Paris, Lyons, and Mediterranean, of the Orleans, and of the London and North-Western Companies, are, as there can be no doubt, sufficiently known to our readers to render description of them unnecessary. The great port of the Paris, Lyons, and Mediterranean is Marseilles, the Liverpool of the Mediterranean, 537 miles from Paris, and 833 from London. The chief port of the Orleans Company is Bordeaux, 366 miles from Paris, 662 from London.

Before proceeding farther, let us refer, very briefly, to the early history of railways in France.

Neither the French Government nor the French people seemed to feel much interest about their construction until long subsequent to the opening of several hundred miles of them, both in Belgium and in Germany. The nation, was not, however, altogether ignorant of their existence, for tramways had been used in the Mineral Districts of St.

Etienne, and near to the Banks of the Loire, for many years previously. They were, for the most part, worked by horses, but in some few cases by locomotives of the rudest construction, just as happened in our own coal districts in the North of England, previous to the epoch of the Liverpool and Manchester Railway. Dr. Lardner, in his Railway Economy, says that "to M. Emile Pereire is due the honour of having first impressed upon his countrymen the advantages which must arise from the adoption of this mode of transport." With much difficulty he succeeded in forming a Company for making the short line between Paris and St. Germain. The Act for its construction was obtained in July 1835, and it was opened for traffic in December 1837. It was originally, in part, worked as a locomotive line, and partly on what was known as the atmospheric system, but for the last five or six years the traffic is carried exclusively by means of the locomotive. Its length is thirteen miles, and it now forms one of the "*Lignes de Banlieue,*" of the Western of France Railway Company. *(Chemin de Fer d l'Ouest.)*

But it was not until 1837 that the importance of France having a net-work throughout the Kingdom was appreciated. In that year a Royal Commission was appointed, which made its report in 1838, but owing to internal jealousies and other causes, the recommendations of the report were not adopted, and the Government of the day had to submit to defeat upon them.

In 1838, what is now the Great Orleans Company obtained its first concession, which was for a Railway to extend from Paris to Orleans. Powerful and elongated as the Company now is, it had, in its early career, to undergo much financial difficulty and embarrassment, and it was only owing to the Government coming to its aid, by guaranteeing four per

cent. on its capital, that the Company was able to complete and to open the railway for traffic.

A concession was given to the Paris and Rouen Company in 1841. The line was opened for traffic on the 9th of May, 1843.

The Fundamental Law for the construction of French Railways, and for the subsequent administrative surveillance of them by the Government, was passed on the 11th of June, 1842.

By this law France was to possess seven main arterial lines of railway, all of which were to start from Paris as the concentric point. The first was to take the direction towards Belgium, so as to meet the railways then opened in that kingdom, approaching the French frontier. The second, part of which was to be in common with the first, was to proceed towards Calais or Dunkirk; Calais was selected as the most convenient for traffic with England, and the line to Dunkirk, twenty-five miles long, which branches off at Hazebrouck, was not constructed for several years after the main line had been completed. We remember Hazebrouck, a mere road-side stopping place, but it has of late become a first-class junction station, for in addition to the Dunkirk line diverging here, it is also the junction *(bifurcation)* at which the line leading to Lille, and to Brussels separates from those that run to Amiens, one *viâ* Douai (the old road), and the other, *viâ* Bethune, constructed to shorten the distance between Paris and Calais by twenty miles, and also to give railway access to the recently-opened collieries in the vicinity of Bethune, Nœux, Chocques, &c.

The third arterial line was to run towards the ports on the Bay of Biscay, from the Loire to the Gironde. The fourth was to extend to Bayonne and thence, eventually, to the

Spanish frontier. The fifth was to be common to the fourth, and then to follow a course tending towards the Mediterranean, passing through Toulouse and finally arriving at Perpignan, close to the Spanish frontier, and at the foot of the Pyrenees, not much farther removed from the Mediterranean than Bayonne is from the Bay of Biscay. It is but within the last few months that this line has been completed in its entire extent; the line to Perpignan having only been opened for traffic in September last.

The sixth was the great and important arterial line from Paris through Dijon, Chalons, Macon, Lyons, and Avignon, to Marseilles. The seventh, or last, was the important strategic and commercial line that was to connect Paris with Strasburg and the Rhine.

Of course, since the first conception of these seven arterial lines, modifications in the exact direction of several of them have taken place, but in the main they follow the courses originally proposed and afterwards decided upon. It will be unnecessary to record the various difficulties, financial and administrative, which attended the construction of the first net-work of French railways Suffice it, therefore, to say, that by the end of 1847, 1,750 miles had been completed, and that by 1853, the essential parts of the whole system were finished. These have been followed by the "new" net-work, and the total mileage of French railways at present is 14,382 kilometres, or, 8,989 English miles.

This digression finished, we proceed to state the cost at which each of the four European leviathans of the railway world have been constructed. The capital expenditure of the South Austrian and Alta Italia, up to the 31st December, 1866, was £41,763,301, or at the rate of £18,200 a mile. Capital expenditure on the Paris, Lyons, and Mediterranean Company is nearly double that of the South

Austrian and Alta Italia, being £80,922,000, which brings the cost per mile to £36,218. This expenditure is exclusive of £1,740,202, upon the Algerian lines, making the company's total capital expenditure to the 31st December, 1866, £82,662,202.

As the total length of French railways was, on the 31st December, 1866, 14,382 kilometres, or 8,989 miles, and the total capital expenditure upon them to that date was £306,089,000, it follows that the Paris, Lyons, and Mediterranean Company is one-fourth in length, all but twenty-eight miles, of the total railway mileage of France, but its gross cost has exceeded one-fourth of the total cost of French railways by £4,399,500, and its cost per mile, being £36,218, it has exceeded their average cost per mile (£34,051) by £2,167.

The capital expenditure of the Orleans Company has been £42,944,862, or at the rate of £20,928 a mile, which is £13,123 per mile *below* the average cost per mile of French railways. In addition, the company is proprietor of the coal and iron mines, and the Iron Works of Aubin, at a cost of £671,216. 194,694 tons of coal were raised there in 1866, of which 43,200 were used by the company's locomotives, 16,000 were sold to the public, and the balance was consumed in the iron works, which manufactured 22,021 of rails during the year.

The total expenditure on capital account of all the railways of the United Kingdom up to the 1st January, 1866, was £455,478,143.

On the London and North-Western the expenditure on capital account has been £45,576,361, but a subdivision of this capital by the mileage worked by the company would not represent the cost per mile of the railway as the company is subscriber to the capital of other com-

panies (some of which are worked by it and some are not) for £3,556,969, but this amount hardly represents a tenth of the capital expended by those companies. There is no doubt however that the cost per mile of those lines for which the capital was exclusively provided by the London and North-Western Company exceeds £50,000 a mile.

The gross receipts from traffic for the year were, South Austrian, £2,957,713, Alta Italia, £1,738,202, total of the Company, £4,695,915; average weekly receipts, £90,306; per mile per annum £1,932. Paris, Lyons, and Mediterranean, total traffic £8,105,776; average weekly receipts, £155,691; per mile per annum, £3,640. As the total traffic receipts of French railways was, approximately (but the figures are very nearly exact) £24,140,000, it follows that the receipts of this company exceeded one-third of the total railway receipts of the empire by £101,110, and that its average weekly receipts per mile exceed the average weekly receipts per mile of all France (£2,865) by £955.

The traffic receipts of the Orleans Company, for 1866, were £4,401,894; average weekly receipts, £94,267; per mile per annum, £2,189, or £496 per mile per week *below* the receipts per mile per week of the total French railway system. London and North-Western, £6,312,056; average weekly receipts, £120,400; per mile per annum, £4,782.

Owing to the war in Italy in 1866, the tables connected with the passenger traffic of the Alta Italia are defective, but of the 7,858,893 passengers carried on the South Austrian in 1866, 1 per cent. only were first class, but they yielded 5 per cent. of the passenger receipts; 12 per cent. in number were of the second class, they yielded 19 per cent. of the receipts; the third class were 87 per cent. in number and 76 per cent. in receipts.

The number of passengers carried on the Paris, Lyons, and

Mediterranean was 18,443,597, of which about 6 per cent. in number were first class, 13½ second, and 80½ third.

This total number represents between a fourth and a fifth of the gross number carried in France during 1866—about eighty-four millions—and is in no way in accordance with its proportion, either as regards its gross receipts or its gross mileage, the former being, as just stated, more than a third, and the latter one-fourth of the total railway receipts and mileage of the empire; thus showing that the principal traffic of the Paris, Lyons and Mediterranean Company is *long* traffic; in this respect very strikingly resembling the traffic of the London and North-Western Railway Company. According to the testimony of M. Charles La Vollée, furnished in his very interesting work, "*Les Chemins de Fer en France*," *Paris*, 1866, the average distance travelled by each passenger on French railways in 1865, was 40 kilometres (25 miles); average distance of a ton of merchandise, 140 kilometres (87½ miles); but as the average price of passenger travelling of all classes in France is only 5½ centimes per kilometre, equal to 9½ centimes per mile: of goods per ton, 6½ centimes per kilometre, equal to 10½ centimes per mile, it follows that each passenger and each ton of goods travels on the Paris, Lyons and Mediterranean Railway nearly double the average distance on all French railways. According to the investigations of M. La Vollée, the average cost of all three classes of passengers in England is 14½ centimes, or 1⅜d. per mile; goods precisely the same per ton. This gentleman makes the following calculation with regard to the saving effected in consequence of the substitution of railways for diligences in travelling. The latter, he says, sped their way at the rate of 6¼ miles an hour. Railways go at the rate of 25. For each of the 80,000,000 who were carried on French railways in 1865, there is a saving of 10

sous an hour, equal to 112,500,000 francs, or £4,500,000, and upon the transport of goods there would be a saving of ten millions sterling, supposing that all goods now carried by railway were to be carried by road.

The construction of railways cheaply in France is now occupying attention. A railway on this system was opened on the 25th of August last—the line from Fougères to Vitré, on the Chemin de Fer de l'Ouest. Its length is 23 miles, and it has been constructed for £100,000, or at the rate of £4,348 a mile, notwithstanding the fact that it is carried through a difficult country, necessitating numerous heavy works, the greatest of which is a viaduct constructed of granite 120 yards long, and 22 yards high. The rails are Vignoles pattern, 60 lbs. to the yard. The above price includes rolling stock, shops, and their equipment, &c. But everybody received "*argent sonnant*" as the works progressed, and the line was not opened until everything had been settled up and paid for. This is one of the secrets appertaining to the economic construction of railways.

On the Orleans Railway, 9,630,460 passengers were conveyed in 1866: of which 7½ per cent. in number were first class, 14½ per cent. second, and 78 third.

Before quitting the subject of French traffic receipts, a word must be said about a little railway which appertains to the most stately city in France—Lyons—until a few years ago, when Marseilles superseded it,* the second in com-

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*In trade and commerce? Yes—but not yet in population, as will be seen by the following statement, very recently published, of the inhabitants of the ten principal cities in France: Paris, 1,825,274; Lyons, 323,954; Marseilles, 300,131; Bordeaux, 194,241; Lille, 154,779; Toulouse, 126,936; Nantes, 111,956; Rouen, 100,671; St. Etienne, 96,620; Strasbourg, 84,167.

mercial importance, the second also, not long back, in revolutionary susceptibility, yielding only in this respect to the once great head quarters of rebellion, barricades, and insurrection, Paris. As it is some years since our last visit to Lyons, an accident alone put us upon the track of this railway. We looked for some account of it in that great compendium of hotel-keepers' advertisements, *Bradshaw's Continental Guide, (lucus, &c.)*, but, of course, not a word is said about it, and we are bound to record the same omission in the (with this exception) admirable "*Indicateur des Chemins de Fer, et de la Navigation,* published weekly by Messrs. Chaix & Co., of Paris. Thanks, however, to "my Murray," we discover the "Lyons-Croix Rousse" runs from the heart of the city to the Croix Rousse, the former hotbed of insurrection, and "inhabited principally by silk-weavers who live in densely crowded narrow streets, where twelve to twenty families are piled, one above the other, in the lofty houses." But these revolutionary silk-weavers must be a grand moving population, for although the line is stated in the *Moniteur des Interets Materiels,* a weekly journal which treats, according to the words of its title, upon "*tout ce qui a rapport au bien-être general, hormis la politique,*" to be only 587 yards long, it had a daily traffic in 1866 of 666 francs, equal to 243,093 francs, or £9,723 per annum! The company has paid off all its debenture debt, and its modest share capital receives the benefit of all profits. What they are, however, is a mystery, for the directors have, in their wisdom and discretion, never thought fit to publish them.

Our Gallic neighbours lodge their Sovereign, his Empress, and his suite, in palaces replete with magnificence and luxury, and when he travels, they are equally mindful of his dignity

and of his comfort. Witness the following description of the imperial train in which the Emperor and the Empress went from Paris to Salzburg to visit the Emperor and Empress of Austria, in August last. It may well be said that it exceeds in comfort and elegance any previous equipment of a similar nature. It consists of nine carriages, communicating with each other by tastefully decorated bridges. In the middle is a handsome sitting-room, furnished with chairs, ottomans, pictures, clocks, and chandeliers. On one side of this room is the dining-room, and on the other the Emperor's study. In the middle of the dining-room there is a table capable of being extended or contracted at pleasure, with easy chairs placed parallel to the sides of the carriage. The Emperor's study contains an elegant writing-table, a clock in the style of the *renaissance*, a thermometer, a barometer, and a telegraphic apparatus, by means of which telegraphic communication is established with the several apartments of the various court officials travelling with His Majesty. Next to the study is the bed-room of the Emperor and Empress, with two beds placed transversely against the sides of the carriage. Two dressing-rooms are attached to the bed-room. The remaining carriages consist of a kitchen, wine cellar, and the apartments of the imperial suite. There is also a conservatory for the choicest flowers.

Our own gracious Sovereign travels in her journeys to and from Scotland with great comfort, but without the extent of magnificence above depicted.

Proportioned to the passenger traffic of other English railways, the London and North-Western Company is deficient as regards numbers, for although it has on its system Birmingham, Wolverhampton, Manchester, Liverpool, Leeds, and almost all the leading manufacturing bee-hives in the

north of England, it is the sole railway having its terminus in London, that does not encourage short local and *Sunday* traffic. Nevertheless the number of passengers carried on the London and North-Western in 1866 was 20,811,173, which however is less than a tenth (excluding the holders of 97,147 periodical tickets) of the total number (251,862,715) conveyed on all the railways of the United Kingdom in 1865. The returns before us do not enable us to state the relative proportions of classes of passengers carried by the London and North-Western, but, at all events, we know that they exceed two-thirds of the population of Great Britain and Ireland, which, according to the estimate of the Registrar-General, published a few days ago, was 30,157,239 in June, 1867. The estimated population of London and of its suburbs, comprised within a circle of twelve miles from the General Post Office, St. Martin's-le-Grand, is, at present, 3,521,267, which is more than the population of half-a-dozen German Principalities ;* more than half that of Ireland,† and equal to that of all Scotland. Those desirous of knowing the component parts of the metropolitan population, and how it is distributed over its area of 687 square miles, are

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* According to the *Almanac de Gotha* for 1867, the smallest independent state in the world is that of Leichenstein, not quite three German square miles. Population in 1861, 7,994. Its contingent to the German Federal Army was seventy-two men. These were supplied by Austria. The community however was not taxed for them, as the Sovereign Prince paid for their equipment and maintenance out of his own private fortune. Leichenstein has not been swallowed up by Prussia. Next to Leichenstein comes Reuss-Greiz, seven German square miles ; population under 24,000. Prince Henry XXII. came to his sovereign hereditary honours there last year.

† The population of Ireland was at its highest in 1845. It was then estimated to be 8,295,061. It is estimated to be, in June, 1867, 5,556,262 : showing a decrease of 2,738,099 in twenty-two years.

referred to the recently published vigorous and able statistical vindication of the City of London,* by its distinguished and learned Chamberlain, Mr. Benjamin Scott.

Here let us indicate a a few facts illustrating the motive habits of the immense London population. In the twelve months ending the 30th of June, 1867, the number of passengers conveyed on the Metropolitan Railway—4½ miles in length—were 22,458,067, or 1,646,894 more than on the whole system of the London and North-Western Railway in 1866. In the same twelve months, the London General Omnibus Company, which owns about seven-eighths of those vehicles that ply in the metropolis, carried 42,995,910. These, independent of steam-boat passengers, the number of which we are not able to state, our application to the secretary of one of the companies for information not having been replied to; independent also of the persons who travelled in the 6,000 cabs that are licensed for London, and independent, finally, of the persons conveyed in the innumerable vehicles which are unceasingly circulating

* One thing is certain,—it is that the ladies who live within city precincts do as ladies do in all other parts of the world; for we learn that at the meeting of the City Commissioners of Sewers, held at Guildhall, on Tuesday, the 24th of September last, presided over by our friend, Mr. Deputy de Jersey, Dr. Letheby, the Medical Officer of Health, presented his report, in which he stated that there had been 103 births in the city during the previous fortnight, or just at the rate of 2,610 for the twelve months. The Doctor deserves his title, for only 76 deaths (being 9 less than the average for 10 years) were registered in the same period. Reference to death statistics for the whole kingdom shows that the mortality among children under 5 years old is slightly above the average, 31, as against a little under 30, which would be the average on 76 for the whole kingdom. The 14 over 60 years of age who died, are below the average for the whole kingdom; it is about, 18 for each 76 of the population, at the period of death.

during about sixteen hours every day through every portion of the great metropolis.*

Mr. Watkin, M.P., the chairman of the South-Eastern Railway, gave, at the recent meeting of the shareholders of

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* The street nomenclature of London is very extraordinary. Those unacquainted with it would hardly believe that there are as many as 50 King Streets, nearly as many Queen Streets, above 60 George Streets, 60 William Streets, and about 45 "New" Streets. This last name often, as may be supposed, greatly misleads strangers, who imagine that such streets are only of recent construction. Until the modern conversion of the "New Road" into City Road, Euston Road, and Marylebone Road, there were along its entire length places and terraces with every conceivable name, and as many as between fifty and sixty different enumerations of numbers. Nor must it be considered that recently-constructed London is exempt from blemishes of this nature. The word "Westbourne" appears no less than nineteen times in the *Postal Guide*—there are Westbourne Crescent, Westbourne Grove (the Regent Street of Westburnia), and then not only Westbourne Park, but Westbourne Park Cottages, Westbourne Park Crescent, Westbourne Park Place, Westbourne Park Road, Westbourne Park Road West, Westbourne Park Terrace, Westbourne Park Villas, Westbourne Place (Bishop's Road), Westbourne Square, Westbourne Street (Paddington), Westbourne Terrace (Bayswater), Westbourne Terrace (Bishop's Road), and Upper Westbourne Terrace—so far for the northern side of Hyde Park; but on the southern there are—Westbourne Street, Pimlico (to distinguish it from Westbourne Street, Paddington), and Westbourne Place, Eaton Square. Finally, the list winds up with Westbourne Road, *Holloway*.

Not so numerous in its locations, but equally puzzling and unsatisfactory, is "Kensington." Besides that name, there are—Kensington Crescent, Kensington Road, Kensington Gate, Kensington Gore, High Street, Kensington; Kensington Hall, North End, Fulham, and Kensington Square on the south side of Hyde Park. Kensington Palace and Kensington Palace Gardens are situate between Kensington and Bayswater, Kensington Gardens Square is in Paddington, Kensington Gardens Terrace is in Bayswater Road, Kensington Park Gardens and Kensington Park Terrace are at Notting Hill.

It is needless to dwell upon the inconvenience and trouble to which such nomenclature gives rise. Sir John Thwaites, Tite, M.P., Ayrton, M.P., and other your colleagues of the Metropolitan Board of Works, to the rescue!

that company, a very striking illustration of the motive habits of the metropolitan population. During the half-year ending the 30th June, 1867, the total number of passengers conveyed on the South-Eastern Railway was 9,700,000, but of these 7,200,000 came into or went out of its three London stations (Charing Cross, Cannon Street, and London Bridge—the traffic of the last immensely diminished since the opening of the two first), yet the total length of the South-Eastern is 330 miles, and in the usual proportion of stations to mileage on English railways (one for each $3\frac{1}{4}$ miles) the number of stations is 101. Although we have not the exact figures before us, we believe the same proportions, as regards passenger traffic, holds good on the London, Brighton and South Coast, the South-Western and the Great Western Railways, and nearly so on the Great Eastern and the Great Northern.

The rolling stock of the South Austrian and Alta Italia consists of 963 locomotives, 2,663 passenger carriages, in which are included 11 for the exclusive use of royal personages, 19,182 waggons, in which are included 57 for the service of the Post. Its total mileage of train engines 10,451,870. The amount of rolling stock of the Paris, Lyons, and of the Orleans Companies is not stated in their reports, but the total engine mileage of the former company in 1866 was 17,271,502 miles, of which 9,656,690 were for passenger trains, and 7,614,812 were for goods, cattle, and coal trains; of the Orleans Company 10,715,458, of which 5,878,010 miles were for passenger trains, and 4,837,448 for goods, cattle, and coal trains.

We are not able to state the total mileage of the trains of French railways, but it will be seen by reference to the *Annuaire des Postes de l'Empire Francais,* published on the 1st of January, 1867, a work analagous in its character to

the Annual Reports of the Postmaster-General of England, that the postal service of France upon railways was, in 1865, 27,730,000 kilometres, equal to 17,331,250 miles. The British Post Office does not avail itself of all the railways of the United Kingdom for the transmission of mails. Thus the total mileage of British railways on the 1st of January, 1866, was 13,289 miles, but the Post Office only sent mail bags over about 12,000 of them. The Post Office Railway Service is 60,000 miles a day, equal (deducting for Sundays) to 18,780,000 per annum, or about 1,450,000 per annum more than the postal mileage on French railways.

Before proceeding to describe the present position of the London and North-Western Company as regards locomotive and rolling stock, a short epitome of what it was twenty years ago, may not prove uninteresting.

On the 30th June, 1847, the total length of railway worked by the company was 670 miles. The number of its locomotive engines was 504, or an engine for about each three-quarters of a mile of railway. The engine mileage was—

For passenger trains.....	4,649,556
For goods trains	2,882,674
Total.....	7,532,230

On the 30th of June, 1847, there were 1,018 passenger carriages, and so little encouragement was given by the company at that time to travellers of the humbler classes, that out of the 1,018 only 75 were third class. The Company had also 8 travelling post offices, and 13 post office tenders, 210 horse boxes, 183 guards' break and parcels vans, 4,874 goods waggons, 612 cattle and sheep trucks, 653 coal and coke waggons. The total number of passengers conveyed in the year 1848, was 6,001,576. Tons of goods conveyed

(estimated) 1,811,000. At that period the conveyance of coal by railway was in its infancy.

On the 31st December, 1866, the London and North-Western Company possessed 1,347 locomotive engines, which is rather more than an engine a mile, the average for the whole kingdom being just over one-half of one per mile. It had 2,237 passenger carriages, 46 travelling post offices and post office tenders, 408 horse boxes, 418 guards' break and parcel vans, 22,483 goods waggons, 1,703 cattle and sheep trucks, 2,069 coal and coke waggons, and for shunting carriages and waggons, and other work at stations, no less than 619 horses, all of good breeds, well-fed, intelligent, and *well-tutored*.

Its engines ran, in 1866, 21,637,163 miles, of which 10,613,324 were for passenger trains, and 11,023,839 for goods and minerals: average mileage of each engine for the year, 16,063; per day, of 365 to the year, 44, but, as the average number of working days of an engine in a year is about 250, the average mileage of the year, so divided, is 64. This seems an extremely low average. Besides the passengers already referred to, the company conveyed 15,425,119 tons of goods and minerals. These exceed the amount carried on the Paris, Lyons and Mediterranean by 1,803,405 tons, and they are very nearly three times as much as those conveyed by the Orleans Company (5,216,879 tons). Although the length of the London and North-Western system is not at present more than a tenth of the total mileage length of the United Kingdom, its receipts are a little more than a sixth of those earned by all British and Irish railways. Its income, in fact, is just three times what Lord Macaulay tells us, in the fourth volume of his History of England, was the total national revenue at the time that William III. ascended the English throne.

CHAPTER III.

RAILWAYS OF THE UNITED KINGDOM—COAL AND IRON.

Thanks to the very valuable tables of railway statistics prepared by Mr. John Cleghorn, the secretary of the North-Eastern Railway, and compiled from the returns of the Board of Trade for the years from 1859 to 1865, both inclusive, we are able to present to our readers, in an abbreviated shape, a number of details respecting the railways of the United Kingdom, of a very interesting and instructive character.

Prefacing them with the remark that on the 31st December, 1852, the capital invested in British railways was £264,165,672, yielding a gross revenue of £15,710,554, we proceed to state that on the 31st of December, 1859, the amount of capital paid up was £334,362,928, and that there were then 10,002 miles opened for traffic. The number of passengers carried in 1859, exclusive of journeys made by 49,856 holders of periodical tickets, were 149,757,294, of whom 19,204,151 were first class, 44,351,903 were second, and 86,201,240 were third. The receipts from passengers, luggage, parcels, horses, carriages, dogs, and mails, were £12,537,493. Merchandise, 22,005,737 tons; minerals, 51,756,782 tons; live stock, 12,805,613 head. Receipts from these sources, £13,206,009. Total receipts, £25,743,502. The number of miles run by passenger trains was 49,753,344; by those for goods, minerals, and cattle, 43,762,452; total, 93,516,796. The Board of Trade did not furnish returns of working expenses for 1863, but we know that their proportions to receipts were about 45 per cent.

On the 31st of December, 1860, the capital paid up was £348,130,327. Miles opened for traffic, 10,433. Passengers conveyed in 1860 (exclusive of 47,894 holders of periodical tickets), 163,435,678, of whom 20,625,851 were first class, 49,041,814 were second, and 93,768,013 were third. Receipts from passenger traffic, &c., £13,085,756. Merchandise, 29,470,931 tons; minerals, 60,386,788 tons; live stock, 12,083,503 head. Receipts from these sources, £14,680,966. Total receipts, £27,766,622. The miles run by passenger trains were 52,816,579; by those for goods, minerals, and cattle, 49,427,113; total, 102,243,692. The total working expenses were £13,196,368; their proportion to receipts, 47 per cent.

On the 31st December, 1861, the capital paid up was £362,327,338. Miles opened for traffic, 10,869. Passengers conveyed in 1861 (exclusive of 52,079 holders of periodical tickets), 173,721,139, of whom 21,917,936 were first class, 51,146,672 second, and 100,656,531 third. Receipts from passenger traffic, &c., £13,326,475. Merchandise, 30,638,893 tons; minerals, 63,604,434 tons; live stock, 12,870,683 head. Receipts from these sources, £15,238,880. Total receipts, £28,565,355. The miles run by passenger trains were 54,055,476; by those for goods, minerals, and cattle, 51,085,964; total, 105,141,440. Total working expenses, £13,843,337; their proportion to receipts, 48½ per cent.

On the 31st December, 1862, the capital paid up was £385,218,438. Miles opened for traffic, 11,551. Passengers conveyed in 1862 (exclusive of 56,656 holders of periodical tickets), 180,429,071, of whom 23,105,351 were first class, 51,869,239 second, and 105,454,481 third. Receipts from passenger traffic, &c., £13,911,985. Merchandise, 30,256,913 tons; minerals, 63,405,864 tons; live stock,

12,885,003 head. Receipts from these sources, £15,216,573. Total receipts, £29,128,558. The miles run by passenger trains were 57,542,831; by those for goods, minerals and cattle, 50,518,966; total, 108,061,797. Total working expenses, £14,268,409; their proportion to receipts 49 per cent.

On the 31st December, 1863, the capital paid up was £404,215,802. Miles opened for traffic, 12,322. Passengers conveyed in 1863 (exclusive of 64,391 holders of periodical tickets), 204,635,075, of whom 26,086,008 were first class, 57,476,669 second, and 121,072,398 third. Receipts from passenger traffic, &c., £14,521,528. Merchandise, 32,517,247 tons; minerals, 68,043,154 tons; live stock, 13,029,675 head. Receipts from these sources, £16,663,869. Total receipts, £31,156,397. The miles run by passenger trains were 61,032,143; by those for goods, minerals and cattle, &c., 55,560,018; total, 116,592,161. Total working expenses, £15,027,234; their proportion to receipts 48·23 per cent.

On the 31st December, 1864, the capital paid up was £425,719,613. Miles opened for traffic, 12,789. Passengers in 1864 (exclusive of 76,499 holders of periodical tickets), 229,272,165, of whom 27,701,415 were first class, 65,269,169 second, and 136,301,581 third. Receipts from passenger traffic, &c., £15,684,040. Merchandise, 34,914,913 tons; minerals, 75,445,781 tons; live stock, 13,673,786 head. Receipts from these sources, £18,331,524. Total receipts, £34,015,564. The miles run by passenger trains were 66,555,219; by those for goods, minerals and cattle, 62,575,724; total, 129,130,943. Total working expenses, £16,000,308; their proportion to receipts, 47·03 per cent.

On the 31st December, 1865, the capital paid up was

£455,478,143. Miles opened for traffic, 13,289. Passengers conveyed in 1865 (exclusive of 97,147 holders of periodical tickets), 251,862,715, of whom 29,663,205 were first class, 70,783,241 second, and 151,416,269 third. Receipts from passenger traffic, &c., £16,572,051. Merchandise, 36,787,638 tons; minerals, 77,805,786 tons; live stock, 14,530,937 head. Receipts from these sources, £19,317,475. Total receipts, £35,890,073. The miles run by passenger trains were 71,206,818; by those for goods, minerals and cattle, 68,320,309; total, 139,527,127. Total working expenses, £17,149,073; their proportion to receipts, 48 per cent.

The length of the railways in Ireland is 1,948 miles. In Scotland it is about 2,350 miles, with gross traffic receipts of about £4,200,000, whilst the income derived from Irish railways did not exceed £1,800,000 in 1866. Thus the mileage of the Scotch railways is about a sixth of the total mileage of the United Kingdom; its receipts about a ninth, the total amount of British railway receipts for 1866, being about £37,800,000.* The proportions for Ireland are about a seventh of the total mileage—less than a twentieth of the total receipts. There are 35 separate Boards of Railway Directors in the sister kingdom, an average of 55½ miles of railway for each Board to attend to, but, inasmuch as the aggregate length of the nine longest Irish railways is 1,354 miles, it follows that the average length of each of the remaining 26 companies' lines is not quite 23 miles. Each company has, besides its separate Board of Directors, its separate Secretary, separate Traffic Manager, separate En-

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* Judging by the appearance of the traffic receipts published for the first thirty-eight weeks of 1867, it is probable that their total amount for the year will not fall short of £41,000,000.

gineer, separate Locomotive Superintendent, and separate Accountant. Could the London and North-Western manage to sub-divide itself after the fashion of Irish Railway Companies, it would require a staff of 73 of every one of these officers. It is to be deplored that railway animosity* is, in its sphere, as intense in Ireland as that which has so-called religion, for its basis. Both inflict a fearful amount of injury upon the material interests and development of the country.

One of the most objectionable features in Irish railway management is the high rates of fares charged to passengers, but especially to those of the third class; in fact rendering third class carriages in a great measure unavailable for the persons for whose use they were specially intended by the Legislature. We are happy, however, to perceive a better, a larger, and a more liberal view is beginning to be taken in

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* Here is one of a great many instances that might be quoted, from the Irish correspondence of the *Times* of no later date than the 1st of October, 1867.—"The necessity for having some efficient government control of railways, apart from the question of purchase, is illustrated by the unsatisfactory relations now subsisting between the Great Southern and Western Railway and the Kilkenny Junction line, which joins the former at Maryborough. The Great Southern are naturally unwilling to facilitate an opposition line, and pursue a policy of obstructiveness, which the directors conceive to be legitimate and expedient for the protection of their own interests, but which the public cannot quite understand, and find extremely inconvenient. Passengers are exposed to the risk of missing the train to Dublin on reaching Maryborough, and at Kilkenny the Great Southern Company will neither allow their waggons to come on the rival line with goods nor to enter the store of the Kilkenny Company. The consequence is that goods and cattle have to be taken out of the waggons at one part of the same track and placed in other vehicles at another part to resume their journey. It is hardly, perhaps, to be expected that companies should be disposed to assist competitors, but the interests of the public require that the intention of Parliament to afford increased accommodation shall not be frustrated."

Ireland on this subject, for at the meeting of the shareholders of the Midland Great Western Railway—the second of Irish railways in extent and importance, the Chairman made lengthened reference to the subject. "It was," said Mr. Ralph Cusack, "a bold policy to adopt a scale of fares unusually low, to establish a system of excursion trains every week to and from distant points, and to hold out special inducements to the very humblest classes to avail themselves of the facilities of railway travelling." This policy, nevertheless, was adopted, but it will not be matter of surprise that it did not find favour at the Boards of Direction of other Companies, it being alleged to be totally unsuited to the circumstances of Ireland, even where the population is numerous and tolerably prosperous. The result, however, has been that, notwithstanding peculiar difficulties arising from the embarrassed circumstances of the railway previous to the present directors coming into office, the experiment has already been successful, and will be more so. As the chairman truly said, "people require to be educated in travelling, and that could only be done by holding out inducements that would draw the masses to the railways." It is to be hoped that the thirty-four other boards of directors will adopt this liberal and enlightened policy. It will, we are convinced, prove alike beneficial to shareholders, and to the material interests of the country.

The Board of Trade did not obtain returns of rolling stock from the companies until the year 1860. On the 31st December of that year they possessed 5,801 locomotive engines. By the 31st December, 1865, they had gradually increased to 7,414. The proportions have invariably been a little more than one engine for each two miles of railway open. On the London and North-Western, as already stated, the proportion

is a little more than one engine a mile. The passenger carriages on the 31st December, 1860, were 15,076; but there must have been a great demolition of them in 1861, for on the 31st of December of that year they were only 14,609. However, they speedily recovered their numbers, for at the end of 1862 there were 15,366, and on the 31st December, 1865, 17,997, just a shade over a carriage and a third for each mile of railway open. "Other vehicles attached to passenger trains,"—these comprise break and luggage vans, travelling post offices and post office tenders, horse boxes, and carriage trucks. Their number at the end of 1861 was 5,737; on the 31st December, 1865, 6,853, a little less than one for every two miles. The use of carriage trucks has greatly diminished upon railways, but the use of horse boxes has not diminished, partly because in recent years all over England, wherever there is hunting, a "horse and his rider" can go to the field, each with his return ticket, thirty, forty, and even fifty miles, making an early start in the morning, and returning in the evening in time, at all events, for the rider's dinner. The other "partly" is, that horse boxes have for some years been employed in a traffic for which they were not originally intended; for the Time books of many of the railways contain notices that they are available for the conveyance of the remains of persons to their last homes and resting places; and they are frequently used for this purpose.

Waggons, which comprise vehicles for the conveyance of every description of goods and minerals, timber waggons, cattle waggons, gunpowder waggons, bullion waggons, salt waggons, milk waggons, covered waggons, high-sided waggons, low-sided waggons, in short the *genus* waggon of every possible shape and conformity, were 188,623 on the 31st December, 1860, and on the 31st of December, 1865, they had

increased to 226,407, or nearly 16¾ for each mile of railway.

The foregoing figures furnish matter for much consideration. They show, incontestably, how unceasingly the railway system of the United Kingdom, taken as a whole, continues its development. As new miles of railway are opened, and notwithstanding that they are situated principally in districts where both population and traffic are light, as compared with the population and traffic of the districts in which railways were first constructed, the total average of receipts throughout the United Kingdom, only receded three times. Thus, the average receipts per mile in 1852 were £2,141. In 1853, £2,346. In 1854, £2,510. In 1855, £2,597. In 1856, £2,659. In 1857, £2,660. There was a considerable fall in 1858 to £2,516. In 1859, they advanced to £2,574. In 1860, they were £2,661. In 1861, £2,628. In 1862, they fell to £2,523. They increased slightly in 1863, to £2,528. In 1864, they rose to £2,651 ; and, in 1865, they were the highest during the fifteen years, £2,691, or £550 a mile higher than in 1852.

Although the number of passengers has increased very greatly in the seven years, the principal increase has been, as will be seen presently, in those of the third class. As the average distance which each third-class passenger travels is much less than the average of one of the second class, and still less comparatively than one of the first class, it cannot be a matter of surprise, that the average money value of each railway passenger should have fallen from 1s. 6d. in 1859, to 1s. 2d. in 1865, and that of the total increase of receipts between 1859 and 1865 (£10,146,611), the receipts from passengers *only* has not increased more than £3,606,223, whilst the increase from goods, minerals, and cattle, has been

£6,111,466. Minerals come in for the larger share of this augmentation. In the shape of quantity, the advance has been 26,049,004 tons, or 50 per cent. In cash earned the advance has also been about 50 per cent. The amount in 1859, was £4,223,002; in 1865, £6,496,402. No doubt conveyance of coals by railway is gaining rapidly upon conveyance by water. This is every day becoming more evident, especially as regards London. In fact, we have by us a return showing that during the first six months of the present year, the sea-borne coal to the Metropolis has decreased 32,480 tons, as compared with the same period of 1866; whilst coal carried by railway has increased 154,453 tons. In the last few years the quantity of coal carried by railway to London, has been gradually creeping up. Last year it was equal to that borne by water, at present it exceeds it; and henceforward, a large increase may be looked for, as the Midland Railway being now completed to London, that Company will be able to carry very fine qualities of coal from collieries which are at the shortest distance from the Metropolis of all the coal-fields of England. This will, no doubt, diminish to some considerable extent the metropolitan coal traffic of the London and North-Western Company. It now carries about two-fifths (about one million tons) of all the coal brought by railway into London.

And here, as so much has recently been said about the enormous strides that have been made in the coal extraction from our collieries in the United Kingdom, a few words on the subject may not be deemed inappropriate. It is true that, as will be seen from the subjoined summary, extracted from the *Times* of the 13th of September last, its production has increased with very great rapidity during the last twelve years. In 1855 it was 64,453,679 tons; in 1856, 66,645,450

tons; in 1857, 65,394,707 tons; in 1858, 65,008,649 tons; in 1859, 71,979,765 tons; in 1860, 80,042,698 tons; in 1861, 83,635,214 tons; in 1862, 81,638,338 tons; in 1863, 86,292,515 tons; in 1864, 92,787,873 tons; in 1865, 98,150,587 tons; and in 1866, 101,630,544 tons. But is there any real reason for the uneasiness that has been created about failure of supply in a century or so? We believe not, and our reasons are explained in the foot note.*

And now it will not be uninteresting to see what has become of all these coals. In the first place our export of

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* During 1866 the coal produce of the various districts of the kingdom was as follows:—Durham and Northumberland, 25,194,550 tons; Cumberland, 1,490,481 tons; Yorkshire, 9,714,700 tons; Derbyshire, 4,750,520 tons; Nottinghamshire, 1,600,560 tons; Leicestershire, 866,560 tons; Warwickshire, 775,000 tons; Staffordshire and Worcestershire, 12,298,580 tons; Lancashire, 12,320,500 tons; Cheshire, 895,500 tons; Shropshire, 1,220,700 tons; Gloucestershire and Somersetshire, 1,850,700 tons; Monmouthshire, 4,445,000 tons; South Wales, 9,376,443 tons; North Wales, 2,082,000 tons; Scotland, 12,625,000 tons; and Ireland, 123,750 tons; making the total 101,630,544 tons above stated. It will gathered from that statement that Durham and Northumberland have furnished one-fourth of the total yield of the kingdom. It is said that the coal-fields of these counties are gradually lessening; no doubt they are, although it will be probably three centuries before coal production there will cease to be profitable. But on the other hand, it is but a few years since the coal trade of South Wales assumed important proportions; still later, those of the Forest of Dean and of South Yorkshire. The coal-fields of Derbyshire are of vast extent, and extraction from them bears no proportion to what it can be in three or four years, owing to the opening of new and extensive collieries, especially in the Southern part of the county. Leicestershire also abounds in very good coal, the yield of which can, and no doubt will, be rapidly stimulated by means of the Midland Railway. We are surprised to see it figured for so small an amount in the above statement.

The estimated value of the 101,630,544 tons of coals raised in 1866 was £25,407,635, at the places of their production. There were 3,188 collieries at work, being an increase of 373 since 1855.

them to all parts of the world was not very large, 8,733,327 tons in 1865, and 9,622,324 tons in 1866.* Secondly, they warmed (with the addition of some turf and a little wood), cooked, and made gas for the 30,157,239 persons who, according to the most recent returns, constitute the present population of the United Kingdom. Thirdly, we supplied with fuel, in 1865, some few foreign, and 2,718 British steam vessels, of which 1,745 were over fifty tons register, and 973 were fifty tons each and under; united, they represent a gross burden of 825,533 tons.† Fourthly, we furnished the principal consumption of coals for the engines of our iron-clads and our wooden-clads. Fifthly, our railway locomotives ran, as we have seen (in 1865), 139,527,127 miles, and taking the average consumption at about 35 lbs. a mile, which includes lighting up‡ and time that engines are standing in steam, waiting for duty, or acting as "pilots" (reserve and station engines), the total amount is 2,625,000 tons; and to this amount may be added the consumption in the

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* Of these, France took 1,586,327 tons in 1865, and 1,841,335 tons in 1866. In 1865, Austria took 97,226 tons; Belgium, 21,810; Prussia, 577,183; Russia, 477,033; Spain, 409,497; the "Zolverein," 586,507. The Coals imported from England into Belgium are used exclusively in the manufactories of Ghent and its neighbourhood.

† In 1866 many magnificent vessels were added to our mercantile steam fleet. In fact all the great steam navigation companies have increased their tonnage, so that no doubt at the present time the total steam tonnage of the Empire cannot be less than 900,000 tons. It is to be remembered that in computing registered tonnage in steam vessels, the space occupied by the engines, boilers, and coal bunkers are not included. This tells in a very marked manner in the smaller vessels, especially in tugs, in which the object is to have as much motive-power as possible, and in which all other space is comparatively useless.

‡ It requires a consumption of from 8 to 9 cwt. of fuel before an engine is in steam and ready for service.

locomotive and carriage shops, stores, and stations, 1,375,000, making the direct railway consumption 4,000,000 tons. Sixthly, independent of the coal used in the reduction of our other minerals to the state of metal, we produced, by means of 613 blast furnaces, in 1866, from 9,665,012 tons of iron ore, raised during the year, 2,576,928 tons of pig iron in England, 952,123 in Wales, and 994,000 tons in Scotland; total, 4,223,051 tons, which consumed at least 6,000,000 tons of coal; and, by means of some 6,000,000 more tons, we kept at work, in 1866, 256 iron works, in which there were 6,239 puddling furnaces, and 826 rolling mills.* Seventhly, our agricultural steam cultivation is beginning to count for something. And lastly, our coal assisted in the manufacture of most of the articles of our dress, and of most of the articles we require in our domestic economy. It is by means of the coal that we raise that we are able to manufacture the greater portion of the articles we export to every part of the civilised or uncivilised world. Thanks mainly to disembowelled coal, and to its noble adjunct, iron,† combined with the unceasing

* It was at one of these rolling mills that was produced, within the last few weeks, an astounding armour plate 15 inches thick. Two years ago 6-inch plates were considered not difficult of production; 7-inch might be produced, but anything beyond it was impossible!

† King Iron!—*Vide* speech of the Right Hon. William Gladstone, M.P., at the opening of the Barrow Docks, on the 19th of September, 1867. The following magnificent article from the *Times* of four days later gives, in the compass of half a column, the most life-like picture that could be penned of the grandeur of England in former times, and of her Titanic power in the present:—

"Within living memories,—'Lancashire-over-Sands'—a couple of score of inhabitants represented its population; and when the operations at Barrow, now consummated, were first commenced, a dozen dwelling-houses were as many as could be counted: yet in ten years Barrow has become a flourishing town, with a population of, at least, 20,000, and such prospective wealth and

and undying energy of Englishmen, the money value of our exports has risen from £115,821,092 in 1854, to £188,827,785 in 1866. The returns for the first half of 1867 show a slight falling off as compared with those for the first half

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importance as have earned for it a municipal charter. The explanation of the marvel is contained in two words—iron and coal. Beneath the desolate soil of this savage district lay beds of rich iron ore,—the ore brought the miners, the miners brought the railway, the railway brought the docks; and now the docks, the railway, and the mines together are represented in a borough as populous as the old city of Lincoln. When the Furness Railway was first projected, a person experienced in such matters estimated that a traffic of 60,000 tons would be near the mark. The result affords an instance of how calculations of this kind have uniformly been exceeded by realities. Within three years the quantity of ore exported from Barrow exceeded 150,000 tons; this amount had risen in five years to 250,000; and in ten years, to nearly 500,000.

"This is the simple history of the rise and growth of Barrow. In other parts of the north similar miracles of progress have occurred during the present generation—one a place where there was one farmhouse thirty years since, is now a town with 30,000 inhabitants. But the truth is, that all these examples, down to the very latest here commemorated, do but express the continuous displacement of wealth, industry, and population which has been effected by the development of mineral riches in the north of England. If any reader will peruse Lord Macaulay's description of the Northern Counties in the 17th century, and with that picture contrast the scene of the present day, he will see at a glance what a revolution has been accomplished. England began in the south, and Winchester was its capital. The south was still England, until mining called the north into place and power. It was not that the north-country people lacked energy or intelligence,—far from it; but they had no manufactures, and, for want of them, they were left behind in numbers, riches, civilisation, and all that confers social and political importance. Such elements of grandeur as the country possessed were those of a backward state. Its great feudal nobles were unmatched in power. The three northern earldoms—Northumberland, Cumberland, and Westmoreland, represented by the great families of Percy, Clifford, and Neville—were like little principalities, and their rulers could combine to alarm the Government and defy the authority of the Crown. The bishopric of Durham was a Palatinate, almost a sovereignty, and its cathedral church was as grand as that of Winchester

of 1856. Nevertheless, they were £88,000,000. Our colonies take between a third and one quarter, and of that proportion India alone takes a quantity approaching to one-half. To be sure, India has a gross area of 1,553,282 square miles, with a population of 193,100,963, of whom 144,674,615 belong to British India, 47,909,199 to native and independent states, 203,887 to France, and 313,262 to Portugal. Aus-

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itself. The great northern abbeys—Fountains, Rivaulx, Bolton—could compete in magnificence with the most famous foundations of the south, but all around these wonderful piles reigned solitude and poverty. At last came the mighty change not unforeseen even in the days of the Stuarts. As soon as coal was brought into use, the iron manufacture left the south for the north—the exhausted forests of Sussex for the productive mines of Newcastle. The woollen trade gradually flitted from Exeter to Leeds, and the cutlery craft from Salisbury to Sheffield.

"All this is the work of coal and iron, and Barrow is the most recent product of the forces in operation. Mr. Gladstone observed with characteristic ingenuity that, whereas iron is by far the most useful of all metals—'perhaps more useful and more necessary than all the rest put together'—it is at the same time, or rather it was till coal was discovered, the hardest to obtain. Iron is rarely found in a virgin state. It is obtained only in the shape of ore, which must be reduced and purified by fire. The great forests which once covered the whole county of Sussex supplied the necessary fuel to former generations of manufacturers, but that material was easily exhausted, and, except for the development of coal mining, our iron industry would never have been known. Put coal and iron together, and the result is wealth, trade, population, power. These mighty agents turn a barrow into a borough. They attract labour as surely as gold-fields, and it is by their instrumentality that the displacements of modern society have been accomplished. What fire and water effect in geology iron and coal effect in social history. Mr. Disraeli remarks in one of his novels, that men who sneered at the antiquity of Damascus had great faith in the future of Birkenhead. There is reason for such faith, and it is to be found in the history of England for the last two centuries. Trade is the making of cities. It will be the making of Barrow, just, indeed, as it was the making of Tyre. Furness is now drawn from its obscurity, and, for anything that we can tell, may, in a few years' time, win a name as great as Winchelsea has lost."—*Times*, 23rd September, 1867.

tralia took from us £13,662,650 in 1866, being an increase of £323,409 over 1865, when her population was 1,599,580, an increase from 1861 of 333,148. In short,—let us say it again,—thanks to coal, energy, and iron, we deal with forty-eight independent states, and twenty-two of our colonies.* These seventy countries constitute, with our own little islands, practically every portion of the inhabited globe.†

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* But while we are advancing, let it not be forgotten that other nations are also progressing, some of them marvellously. Take for example France. M. de Vinck, one of its ablest statisticians, has recently summarised the commercial state of the country since 1851, and the following are several of his figures converted from French to English values. In 1851 the imports of France were £43,760,000, exports £60,200,000, total £103,560,000. In 1865, imports £141,120,000, exports £163,480,100, total £304,600,000. In 1851 the number of French and foreign vessels which entered or left the French ports was 34,436. In 1865 the number was 51,156. In 1851 the miles of railway open were 2,187. In the end of 1866, 8,750. In 1851 the telegraph services possessed 1,875 miles and 100 stations, by means of which 10,000 messages were sent in the year, In 1866 it possessed 19,700 miles and 2,100 stations, by means of which 2,500,000 messages were transmitted. The charges on messages have been reduced 70 per cent. between 1851 and 1866. In 1851 the number of letters carried was 65,000,000, in 1865 329,000,000, and in the interval the postage has been diminished about 20 per cent. In 1851 the indirect taxes and those on consumption were £29,529,680, in 1866 £51,290,720.

† The *Times* concludes a recent article upon our exports with the following valuable words of advice and of admonition. "To maintain our trade we must zealously maintain our industry. We undertake, it may be almost said, to clothe the world; our exports represent, in the main, cotton, linen, woollen, and worsted manufactures; our imports are the raw materials required for this industry, and the food to sustain us in the work. What other countries grow we make up for use, taking at the same time the abundance of their harvests, to compensate the deficiency of our own. That, in a few words, is a summary of our national trade. We are keeping our position pretty well, but it should not be forgotten that our rivals are now more numerous, more energetic, and more confident than in former times, and that we must prepare ourselves for a competition far more severe than any we have hitherto experienced."

The percentage of the working expenses of railways to the receipts was, for 1865, according to the returns of the Board of Trade, 48 per cent.; in 1862 it was the highest of the seven years, 49 per cent. But we fear that these returns are not very strictly accurate; recent inquiries and investigations have tended to show that some of the items charged to capital in the half-yearly accounts should have been debited to revenue. No doubt there has been exaggeration in several of the statements, which professional accountants have submitted to the committee of investigation by whom they have been employed. But whether this be so or not, the time has come when all charges must either be made against revenue or remain unpaid. Capital can no longer lend its friendly aid and assistance; therefore, in a year or so it will be seen how far the percentages hitherto published have been based on fact or on the fictions that have been alleged against them. The subject of working expenses is an important one, as affecting materially the question of dividend to shareholders. We therefore will give more detailed information respecting them when we connect them, in subsequent pages, with receipts and profits. In the meantime, we give, on the over-leaf, a return that has just been prepared from the three last half-yearly reports and statements of accounts published by the twelve following companies. We are aware that as regards one company, the London, Brighton and South Coast, the working expenses have been stated by the present board of directors at 10 per cent. higher than those we now publish, but we believe that these latter approach the nearer to correctness of the two.

Statement of Working Expenses on Receipts, for the eighteen months ending 30th June, 1867.

Name of Company.	Rate per cent.
London and North-Western	46·63
North-Eastern	48·05
Great Western	48·65
Midland	47·26
Lancashire and Yorkshire..	44·87
Great Northern..	52·68
Great Eastern	53·96
Manchester, Sheffield and Lincoln	45·24
London and South-Western	53·63
South-Eastern	52·68
London and Brighton	58·86
Bristol and Exeter	49·76

We need not, at the present day, discuss the abstract question of the value of railways to the community, but it will be well to record some of the advantages which the population of Great Britain has obtained by their establishment. Let us begin with passenger traffic. Previous to 1837, the year of the opening of the line between Birmingham, Manchester and Liverpool, the speed of stage coaches did not average eight miles an hour. The speed of mail coaches was a little under ten. It is true that in former times we were proud, as we ought still to be, of the roads which the skill and ingenuity of our engineers had, by means of what were then considered vast excavations, extensive embankments, bridges, viaducts, and other works, carried through the country. In one grand respect British roads differ from those magnificent constructions of a similar nature which Imperial Rome had accomplished when in the

zenith of her splendour. Those were made without the slightest view to commercial objects. The power which it gave her to transport her legions from one extremity of her dominions to another was the sole consideration with her in inducing the formation of those great causeways, the remains of which have excited the admiration of succeeding generations, even to the present day.

In 1837, there were fifty-two mail coaches, and about 500 stage coaches. If we allow to each of them the full complement of passengers that it was authorised to carry, we shall probably arrive at a tolerably correct estimate of the number of persons who then used to travel daily in the United Kingdom. It is true that the average loads of mail and stage coaches was not considered to exceed two-thirds of their number when complete, but they should be considered as carrying full loads, to allow for passengers travelling only short stages. Thus viewed, the number of persons travelling by these conveyances throughout the Kingdom was (mail coaches seven, stage coaches fourteen, exclusive of guard and coachman) 7,364, or at the rate per annum (of 365 days) 2,687,860. If to these be added 25 per cent., as representing aristocracy with post horses, and plebiscity in waggons, and a few in canal boats, we arrive at a gross total of 3,359,825. To this number may be joined, say over a million who were passengers in river and coasting steamboats.* Every other traveller went by the means of locomotion beneficently granted to us by the all-wise and ever-provident Creator of all things human and divine.

In 1837 the population of the United Kingdom was

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* We omit these in our subsequent comparisons. No doubt their numbers have increased very greatly in recent years.

25,650,426 persons, so that, assuming our calculation to be correct, the number of travellers journeying only by road was little more than an eighth of its population. As already stated, seven years previous to 1837, the Liverpool and Manchester Railway (31 miles long) had been opened for traffic. But during all that period it was simply a local line unconnected with any places except its two termini, and its then comparatively unimportant intermediate stations. Nevertheless, by the substitution of steam for horse power, the number of passengers (about 21,600 per annum), previous to the opening of the railway, at once quadrupled, notwithstanding that the speed had only increased in the ratio from nine to seventeen miles an hour, the number of trains being six a day in each direction.

By 1837, when the average speed had increased to 25 miles an hour, this quadrupling had increased seven-fold: at the present time the maximum running speed on this portion of the London and North-Western Railway is forty miles an hour—the average speed of trains is about twenty-seven miles, and on week-days there are sixteen trains in each direction, on Sundays six. Yet there are now three competing lines to that of the London and North-Western between Liverpool and Manchester.

Adding the 604,000 passengers of the Liverpool and Manchester Railway, the proportion of land travellers to the whole population of the kingdom, in 1837, was not quite a sixth. The passengers who travelled on only thirty-one miles of railway were nearly one-sixth of all that travelled by all the mail coaches, stage coaches, post cars, post chaises, private carriages with post horses, waggons, and canal boats, over all the high roads, post roads, and the canals of the United Kingdom.

Observe the onward progress of land passenger development. No railways of the slightest importance were finished between 1830 and 1837, but by the year 1843—two years and a-half after the Great Western line had been completed between London and Bristol—1,902 miles of railway had been opened for traffic, and in the year terminating at that date, 23,466,896 passengers were carried by railway. These were, of course, exclusive of those conveyed by mail and stage coaches, and other conveyances. Their numbers could not have diminished, on the contrary, they must have increased, seeing that these conveyances then began to be used in subordination, as it were, to railways, and not as the arterial and leading means of passenger communication. Travellers went shorter distances by them—nevertheless what used to be called the "post horse duty," that is the tax levied upon public conveyances and horses employed in passenger traffic, never diminished—on the contrary, it increased slightly during several years. For some time past it has been modified in many of its features, so that a comparison between its amount, and what it was in 1837, cannot be instituted. But the fact is notorious, that even now, with upwards of 14,000 miles of railway open throughout the kingdom, many more horses are employed in connection with passenger traffic than there were in 1837.

The number of persons who travelled by railway in the year ending 30th June, 1843, was 23,466,896: the number estimated by road, 3,359,825, total 26,826,721.

As the estimated population of the United Kingdom in June, 1843, was 27,033,692, it follows that it and the number of persons who had travelled in the previous twelve months, both by rail and by road, were not far from equal. In fact the number of persons who travelled by railway

may be considered to represent the *excess* of travelling in 1843 over that in 1837. Let it here be noted, that in 1843, the third class passengers formed not more than a fourth of the total number carried, they being 6,891,844. We shall see presently how marvellously these numbers have progressed, not only absolutely, but in comparison with the travellers of the two other classes.

Twelve months more, on the 30th of June, 1844, with 2,050 miles open, the railway passengers exceeded the total population of the kingdom by 407,799; the numbers being respectively 27,763,602, and 27,355,803, and third class passengers had risen to be almost exactly one-third of the whole. We exclude travellers by road, not because they were less numerous than previously, but because their numbers become every year less important in comparison with the total passenger movement of the empire. For any purposes of computation that may result from these statements, they may fairly be taken for what they were in 1837, 3,359,825.

It was in 1848 that the greatest number of miles in any one year were opened for traffic,—1,191; the nearest approach to it was in the previous year,—780. In 1863, the number was 771. The smallest number was in 1843,—91 miles. The following year, 196; and in 1855, 236. The average from 1837 to 1866, both included, has been 690.

In the twelve months ending the 30th June, 1848, with an estimated population of 28,015,685, the number of persons travelling by railway had increased to double that of the population, 57,965,071, of whom 29,083,782 were third class,—1,068,097 more than the population, and a few more than one-half of the whole number carried.

"The cause of this augmentation of third class passengers is," says the late Dr. Lardner, in his treatise upon Railway

Economy, edition of 1850, "easily explained. Previous to 1846, the carriages provided for third class passengers were frequently without roofs or windows. The third class trains were started at inconvenient hours, and were transported at a comparatively slow rate. In fact, the companies appeared to study the means which were most likely to discourage the use of these cheap trains, prompted, apparently, by the apprehension that the more affluent classes* resorting to them, the revenue and profits from the other trains would be diminished." By these means the humbler classes were, no doubt, deprived in a great measure of the benefit of railway transport. An Act, however, was passed in 1845 for the establishment of at least one third class train a day in each direction, in accordance with a time bill to be previously approved by the Board of Trade, the speed to be not less than twelve miles an hour, and the fare for conveyance—in carriages, the dimensions, seating accommodation, and size of windows of which must be sanctioned by the Board of Trade—not to exceed a penny a mile. Without such approval and sanction, a train is not considered, what is known in railway language, as a "parliamentary train" within the meaning of the Act. The company offending, therefore, is not allowed

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* There is no doubt that in many instances persons for whom third class carriages were never intended travel in them. There is a well-known railway story of a banker in a large agricultural and commercial town, who was asked, with a look of surprise, by an acquaintance that he met on the platform, if he were going to travel third class. "Oh, yes," was the reply, "it is too bad of the company, they took off the fourth class only last week." Two ladies, one with an expensive black satin dress; the other, with one of Swiss muslin, very elaborately got up, and both with very pretty bonnets, once complained to the author, of the conduct of a railway guard, for having put a bricklayer "with his dirty clothes on" in a compartment with them.

a remission of the duty on the passengers conveyed by such train, to which it would be otherwise entitled under the certificate of the Board of Trade, and it is liable to penalties for non-fulfilment of the terms of the Act. In two or three cases these penalties have been enforced and recovered by decisions obtained in the courts of law.

The very great development of third class traffic, by means of cheap parliamentary trains, has produced a marked change in the feelings of railway managers upon this subject in the last few years. Now, almost all the time tables show, specifically, the trains by which they can be conveyed, and by reference, among others, to the most recent monthly guide book of the London and North-Western Company, it will be seen that third class passengers are now conveyed from London to Liverpool by one particular train in six hours and a-half; to Manchester in five hours and twenty minutes. At the institution of parliamentary trains the time by them from London to both those cities was fifteen hours. But this was just half the time that the coaches took in the olden time between London and Liverpool, and it was also at just half the cost as regards fare, irrespective of the fees to guard and coachman.

In the three last years, both the Metropolitan and the London, Chatham and Dover Companies have carried the principle of cheap fares for the labouring classes much beyond the penny-a-mile system. These companies issue what are called "workman's tickets." It will be seen by the subjoined notice* contained in the monthly time books of

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* *Workman's Trains.—From Penge, Sydenham Hill, Dulwich, and Herne Hill.* The privilege of travelling with Workman's Tickets is now accorded to artisans, mechanics, and daily labourers residing in the vicinity of the above

the London, Chatham and Dover Company, that there are two classes of workman's tickets. The distance from Victoria Station to Penge is $7\frac{1}{4}$ miles.

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stations. The charge for a Weekly Ticket is Two Shillings. These tickets will for the present be available to travel to Victoria, Ludgate Hill, or any other intermediate station by the following up trains:—

Penge	dep.	7	6	a.m.	7	36	a.m.	or	8	6	a.m.
Sydenham Hill	„	7	11	„	7	41	„	„	8	11	„
Dulwich	„	7	14	„	7	44	„	„	8	14	„
Herne Hill	„	7	18	„	7	48	„	„	8	18	„

and to return by the trains leaving Victoria at 5·15 p.m., and Ludgate Hill at 5·44 p.m., and by any later third class train. On Saturdays these tickets will be available by the train leaving Victoria and Ludgate Hill at 2·25 p.m., or by any later third class train for the above stations.

The Metropolitan Extension. Trains for the use of artisans, mechanics, and daily labourers now run every day in each direction, between Victoria and Ludgate Hill. The charge for a Weekly Ticket will be One Shilling. These tickets are only available in the morning by one of the advertised workman's trains, which leave Victoria at 4·0 a.m., 5·0 am., and 6·5 a.m., or Ludgate Hill at 5 a.m., and 6·5 a.m., and the holders of such tickets may return by any of the ordinary loop line Metropolitan trains which leave Victoria or Ludgate Hill after 5·30 p.m., or on Saturdays by any similar train starting from either Victoria or Ludgate Hill after 1·0 p.m.

Conditions upon which the above tickets are issued,—

These tickets are issued subject to the conditions contained in the Company's Act, 27 & 28 Vict. cap. 195, and use by the holder is evidence of a special contract upon those conditions. Tickets for these trains can be obtained at the booking office of any station between Victoria, Ludgate Hill, and Penge inclusive, upon personal application only. The christian and surname, address, and trade, of the applicant may be required, as well as the name and address of the employer. Each ticket will be available for Six Days, from Monday to Saturday inclusive, and for one journey only in each direction on each day whilst in force, and by the advertised Workman's Trains only. The tickets will have to be given up to the company's ticket collector on the Saturday on which they expire, and even if issued on a later day in the week than Monday will still be available only up to and including the following Saturday. Each subscriber will be allowed to carry, at his or her sole and exclusive risk, a basket, not exceeding 28 lbs. weight, containing trade tools, so packed as not to be inconvenient or dangerous. No other luggage of any description will be allowed to the holders of Workman's Tickets.

With such facilities it cannot be a matter of surprise, that whilst in the seven years, between 1859 and 1865, both inclusive, the first class passengers increased 10,459,054, an average yearly increase of 1,494,122; the second 26,431,338, an average yearly increase of 3,775,905; those of the third class rose 65,215,029, an average yearly increase of 9,316,432. But this is not altogether the way to look at it, for whilst the increase of third class passengers, in the four years 1859-60-61-62, was 19,253,241—a yearly average of 4,893,310, the increase of 1863 over 1862 was 15,617,917; 1864 over 1863, 15,229,183; and 1865 over 1864, 15,114,688.

In 1865 the total number of passengers carried (exclusive of 97,147 residential ticket holders) was 251,862,715, thus composed—first class, 29,663,205; second class, 70,783,241; third class, 151,416,269. But to the total number have to be added the journeys taken by the periodical ticket holders. If 100 journeys be allowed for each such holder (a number much below reality), it adds 9,717,400 to the gross amount, of which two-thirds should be attributed to first class, and one-third to second. *Per contra,* a deduction of about 5,000,000 must be made for passengers "booked through"—that is, passengers conveyed in a single journey over the lines of two or more companies. For instance, a passenger booked from London to Limerick, is carried, independent of his water conveyance, over the lines of four railway companies, and in the returns to the Board of Trade he is included as a passenger upon each of those lines as if he had taken a ticket upon it, yet, in reality, he takes but one journey, although it is a long one, 464 miles. Deducting say 5,000,000 on this account, it makes the total number of paying railway passengers about 256,500,000. In twenty-eight years, population and land-conveyed passengers have completely reversed their positions. In 1837 population was eight times as many

as passengers, and in 1865 passengers were more than eight times as many as population.

As to the speed at which railway passengers are conveyed, we shall speak when referring to what our railways have done for postal service.

"Forty shillings a ton for goods between Liverpool and Manchester." Yes; that was the price paid just a hundred years ago, and nobody could reckon upon having them in less than a week from the time of consignment. But the opening of the Duke of Bridgewater's Canal diminished the price to six shillings a ton, and the time to three days. Now-a-days, the cotton spinner of Manchester would "spin a yarn" of formidable dimensions to a goods manager of a railway that dared to keep his goods more than a couple of hours on the road, with four or five hours more added for loading, unloading, and delivery. Not forty years ago, the charge was 1s. 1d. a ton a mile for goods, no matter of what kind or quality, conveyed by waggon. Thus, if any were weak enough to send a ton of goods from London to Manchester, the tariff rate would be £5. 1s. 4d., although probably the carrier, as an act of amiable condescension towards his customer, and in hopes of future favours, might take off the odd shilling and the level fourpence, and be content to carry for an even "fiver." He would proceed at the top-gallant speed of fifteen knots a day, and he would reach his port, if all were well, in eighteen to twenty days from the time of his heaving anchor.

In process of time, the canal owners and lessees managed to more than double the charge for the conveyance of cotton between Liverpool and Manchester, and also to more than double the time for its delivery. They did more; if any of their customers happened to displease or offend them, their

goods were put under ban. Canal managers were the trade unionists of those days. Nevertheless, the quantity of cotton carried was six times as much in 1824 as it had been in 1795.

The goods traffic of the Liverpool and Manchester Railway commenced on the 4th December, 1830, with a train of eighteen waggons, the weight of each of which was a little over 1¼ tons. The eighteen waggons carried a paying weight of 51½ tons of goods, the tender, water, and fuel weighed 4 tons, and, with the fifteen persons in the train, there was a total weight of 80 tons, which was drawn by an engine weighing 7½ tons, in two hours and fifty-four minutes, just 10½ miles an hour.

The development of goods traffic of our first-born English railway, although it was rapid and important, was not so striking as that of passengers; nevertheless, it increased from 1,432 tons in the first month to 5,104 tons in the fourth month. The coal traffic, from which much was expected, was practically *nil*; it did not become an important item of receipts until years afterwards. In fact, the Goods and Mineral Traffic of railways scarcely developed itself in the early period of their history, and, until about the year 1840, the relative proportions of passengers to goods was as 85 to 15. A striking illustration of this fact is afforded by the London and Birmingham Company; in its estimates of traffic submitted to Parliament in 1833, it was calculated that the goods traffic would produce £340,000 in the first year after opening. It barely realised £90,000, and it was twelve years before it had attained the sum of £340,000. But since 1840 the change has been gradually working. In 1847, with an average length of 3,426 miles open for traffic, 16,460,599 tons of goods of all kinds (in which are included minerals) were carried, and 3,709,030 head of cattle. All

this traffic may be considered a *new traffic*, created solely through the influence of railways, precisely as the passenger traffic of railways, enormous as it is, is the *excess* of traffic over that conveyed by road-way. Between 1830 and 1837 it was often predicted that the canals of the kingdom would be ruined by the competition of railways, yet in 1846, seven to eight years after the main lines of railway which would come into competition with canals were opened, the latter were paying the following per-centages on their capital:—Grand Junction 6, Oxford 26, Coventry 25, Old Birmingham 16, Trent and Mersey 30! Have canals suffered since then? Certainly not; they carry millions more tons of goods per annum than they did thirty years ago, and if they have to carry at a cheaper rate than formerly, competition has sharpened speed in transit, as well as despatch in collection and delivery; and not only is more business than ever done on the canals, but there is much more money made for distribution among shareholders.

In order to show the present state and estimation of canal property in England, we have extracted from the *Investor's Manual* for August last, a publication issued monthly in connection with the *Economist* newspaper, a statement of the dividends that canals now pay to their shareholders. Commencing with the least profitable, and gradually ascending, we find that the Gloucester and Berkeley pays 2 per cent. in addition to paying 5 per cent. on its preferential stock; the Sheffield $2\frac{1}{2}$; the Warwick and Birmingham 3; the Lancaster is leased to the London and North-Western Railway, at $3\frac{5}{8}$; the Barnsley Canal pays 4; the Macclesfield Canal is leased by the Manchester, Sheffield, and Lincolnshire Railway Company, at $4\frac{1}{4}$; the North Staffordshire Railway Company leases 116 miles of canal, which under the

terms of the lease have recently paid 4¼ per cent., it has been as high as 4½. By comparing the canal receipts of the first half of 1865 with those for the corresponding period of 1866, it will be seen that the former were £45,414, the latter £52,488. The Grand Junction pays 4½, in addition to a 6 per cent. preferential capital, on exactly the same amount as the ordinary capital; the Rochdale pays 4¾; the Stratford and Avon is guaranteed 5 per cent. by the Great Western Railway Company; the Peak Forest pays 5; the Regents Canal, with its very large capital, pays 5¼; the Kennet and Avon, 6; the Forth and Clyde, 6½; the Oxford, 8¼; the London and North-Western guarantees the Birmingham Canal 10; the Coventry pays 13; the Stourbridge paid 14½ in 1864, but since then its profits have diminished, nevertheless it pays 11½; the Staffordshire and Worcestershire's dividend was 21½ per cent. in 1864, but it has now fallen to 15½,—strange to say, the only canal in the whole list of canals that does not pay any dividend is close at hand, the Worcester and Birmingham; its capital is £450,000, the sum per share paid up is £78. 8s., yet the shares must have intrinsic value, as their price is quoted 12 in share lists. The last and the highest is the Liverpool and Leeds, notwithstanding that for about a third of its length it runs parallel to three railways, and for about two-thirds to two; its goods traffic is leased to the London and North-Western, the Lancashire, and the Midland, until 1871 at the rate of 28 per cent. per annum. Of course the profits of the Bridgewater and Elsemere Canals, being private property, cannot be stated, but they are known to be very large.

If we step from 1847 to 1859, we find that goods of all descriptions have in railway accounts become separated from minerals. Of the former, the 10,002 miles of railway that

were open for traffic at the end of 1859, had carried 27,005,737 tons, and they had yielded a receipt to the companies of £8,373,283, so that each ton of goods carried was worth 6s. 2¼d. to them. We shall not stop to tell the particulars of intermediate years up to 1865; suffice it to say, that every year not only has the gross tonnage increased, but also the amount realised upon each ton of goods carried. This item which, as we have just stated, was 6s. 2¼d. in 1859, had risen steadily up to 6s. 7¼d. in 1865, and at the same time the number of tons carried had increased 9,781,901 tons, the number in 1865 being 36,787,638. In like manner the money received for goods increased £3,784,956, the amount in 1865 being £12,158,239; but, just as with third class passengers, the main increase has been in the years 1863, 1864 and 1865. It was at the rate of about 2,000,000 tons a year, and nearly one million sterling.

We have already referred so fully to coals and other subterranean products, at pages 48 *et seq.*, that we only add here, that the average value to the companies of a ton of minerals was 1s. 7½d. in 1859, and that, with occasional fluctuations, it had increased to 1s. 8d. in 1865. This is a low average, and it looks as if the profits to the railway companies from mineral traffic must be very slight indeed.

The carriage of cattle of all kinds increased from 3,709,030 head in 1847, to 12,805,613 in 1859, when each head was worth 11¼d. There was hardly any change or fluctuation until 1863, when the number increased to 13,029,675 head. In 1865 they were 14,530,937 head, but their value had risen to 11½d. a head.

The conveyance of cattle by railway reminds us how enormously all the great centres and bee-hives of our popu-

lation are indebted to the iron road and the iron horse for their daily consumption and sustenance. "Give us this day our daily bread," is in the prayer that all Christians should offer up, morning and evening, and the railways do give it in a way the stoppage of which for two or three days would cause a famine in the land. Dr. Wynter, in the article "London Commissariat" of his *Curiosities of Civilization*, gives the marvellous statistics relating the daily supplies of food which come to London. But since Dr. Wynter wrote, the population of the Metropolis and of its outskirts has increased a fifth. Yet the great London mouth is fed, and the great London stomach is replenished with the same regularity as ever. As it is with London, so it is with every other concentration of souls in the land. Demand is always increasing, yet supply keeps pace, and never fails to be hand and hand with it. For we have the consolation of knowing that what we are unable to produce at home we have not the slightest difficulty in finding abroad. In addition to the 14,000,000 of cattle of all kinds that we conveyed, last year, from our green pastures to our slaughter-houses, we imported 237,739 oxen, cows, and calves; and as each of these animals, as he or she steps on shore, is, according to Board of Trade computation, worth £18. 14s. 5d., it follows that John Bull has paid for them, in meal or malt, in money or money's worth, £4,092,941. 790,880 was the number of foreign sheep and lambs that came among us last year; and, as the Board of Trade put a value upon each of them of £2. 10s. in 1865, which value has not been diminished in 1866, the score against us on this account would be, according to arithmetic as practised in the Statistical Department of that branch of public service, £1,504,312; but according to the arithmetic as

known elsewhere, it is £1,977,200. The former sum could only be correct if the value were £1. 18s. ½d. per head.*

But we must not continue the subject in anything approaching detail; suffice it is to say, that among other articles from abroad, we had meat in the shape of bacon, beef, and pork, to the extent of about 1,000,000 cwt. in quantity, and £3,000,000 in value. Of butter and cheese we had 2,000,000 cwt., of the value of £9,000,000. The use of coffee among us is diminishing. In 1852 it was 42,000,000 lbs., in 1866, it was 10,000,000 lbs. less; but the home consumption of Tea has risen in the same period from 54,713,000 lbs. to 102,265,000 lbs.,† nearly double; but on

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* There is another mistake as regards 1865, the number of sheep and lambs imported was 914,170; the value for that year is stated at £2. 10s. a-head. At that value 914,170 make £2,285,425, not £1,787,866 as set forth in the Statistical Abstract of the United Kingdom, issued in August last. We have occasionally observed other errors in Board of Trade Returns. They are not absolutely to be depended upon.

The following curious paragraph is from the journal of the Financial Reform Association of April last—"Since 1851 there has been published annually a return professing to give number and tonnage of vessels and customs' revenue at twelve principal ports of the United Kingdom. In the Commons on Friday, March 15th, Mr. Candlish stated that only seven of these ports were properly described, the other five being far below Cardiff, Sunderland, Hartlepool, Swansea, and Grimsby; and that, whether as regarded shipping, commerce, or revenue, the return was grossly inaccurate in all particulars.—Mr. Cave, Vice-President of the Board of Trade, said that for some particular reason or other, he knew not what, the return had been moved for almost beyond the memory of man, and had since been continued year after year, for which he was very sorry, since it added needlessly to the great expense of unnecessary returns, and was entirely inaccurate from beginning to end."

† The total amount of Tea imported into the United Kingdom in 1866, was 139,610,044 lbs., but 37,355,044 lbs. being exported, leaves the amount above stated as the total of British consumption. Its aggregate cost to the consumers was about £18,500,000, or about 12s. 4d. for each unit of the population.

the other hand the duty we paid for the lesser quantity was more than double what we paid for the larger, £5,900,625 in 1852, but happily only £2,658,716 in 1866. Of foreign corn we received, for home consumption, 23,000,000 cwt. of wheat, 8,000,000 cwt. of barley, 9,000,000 cwt. of oats, 14,000,000 cwt. of maize, and 5,000,000 cwt. of wheat flour, the aggregate value of corn amounting to £30,000,000. Of the important article of sugar, we received 10,500,000 cwt. The strong beverages came to us to the value of 2¼ millions for spirits, and not far short of five millions for wine. We are fond of spices and seasonings also, 130,000 cwt. of pepper, and 24,000 cwt. of cinnamon, cloves and nutmegs, and 1,100,000 cwt. of raisins and currants. But the article of all others in the list, the importation of which, in 1866, seems the most marvellous is that of eggs, 438,878,880! 14½ per annum for each inhabitant of the kingdom, ranging from "the infant mewling and puking in the nurse's arms" to "the last scene of all that ends this strange eventful history, second childishness and mere oblivion, sans teeth, sans eyes, sans taste, sans everything," and all these, independent and exclusive of all the eggs that all the true born English, Irish, Scotch and Welsh hens lay all over the kingdom. Truly we must be the most egg-eating nation in the world. Housekeepers of Great Britain! we wish you to know that the President of the Board of Trade assesses the value of each egg, when brought into the country, at a little less than $2\frac{2}{5}$ farthings, or about 7¼d. a dozen. The difference between this price and the minimum of "16 a shilling warranted" constitute the charges and profits upon them between the time of their landing and their arrival in your kitchens. Fifteen years ago (1852) our importation of eggs was not a fourth of its present amount—it was 108,281,233.

CHAPTER IV.

RAILWAYS AND THE POST OFFICE—SPEED ON RAILWAYS.

Passengers, luggage, horses, carriages, dogs, merchandise, minerals and live stock constitute the whole of the traffic, as well as the whole of the receipts of railway companies, with one only exception. That exception is an important one: it is the conveyance of mails by railway.

From the day that railways were opened in England, the Post Office has resorted to them for the conveyance of its mails. The Liverpool and Manchester railway was opened for traffic, as already stated, on the 14th of September, 1830; on the same day the Post Office commenced using it, and mails were conveyed on it four times a day in each direction. The same happened at the opening of the Grand Junction between Liverpool, Manchester and Birmingham on the 6th July, 1837; upon the completion of the line between London and Birmingham, on the 20th September, 1838, and so in succession with every leading railway throughout the kingdom.

The Post Office soon became jealous of the power and position of railway companies, and the expression of its jealousy culminated in the introduction, at its instance, of a bill into Parliament, in 1838, "for the conveyance of mails by railway." The bill proposed to give power to the Post Office to run its own trains upon any line of railway open for traffic, without payment of toll. It was further to be authorised to remove all obstacles in the shape of passenger or other carriages out of the way of its trains; pains and

penalties were to be amerced on the servants of companies if the "lawful commands" of the postal officials were disobeyed. The aid of the railway plant and of railway officials was commanded, and the remuneration to the companies for these services was to be this much, and no more—*the cost of the wear, tear and deterioration that Post Office trains inflicted upon the rails!*

Mr. Labouchere, now Lord Taunton, introduced the bill, and in doing so said that the country was at the mercy of railway companies which had bound the land in bonds of iron—bonds from which it was necessary that the land should be freed by the action of Parliament. Mr. Rice, afterwards Lord Monteagle, prince of jobbers, and for many years enjoying the sinecure and emoluments of Comptroller of the Exchequer, an office abolished at his death, warned all railway directors to beware of opposing the bill, threatening them, on the part of the Government, of which he was then a member, with more stringent measures, if they were so ill-advised.

The bill, nevertheless, met with vigorous opposition; at its head was Mr. George Carr Glyn, chairman of the London and Birmingham Company, and then, as now, the honoured member for the Borough of Kendal, whom Mr. John Francis truthfully describes in the dedication of his History of the English Railway*, as "one of the earliest, as well as one of the most efficient allies of the system."

The effect of the opposition was that an act was passed which differed essentially in character and conditions from the bill that had been presented to Parliament. The chief

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* A very valuable compendium of the history of English railways from 1820 to 1849. It was published in 1851.

power given to the Post Office was that the railway companies were bound to convey mails at such hours as the Postmaster-General should direct; if required, they were to apply separate carriages exclusively to their conveyance, and remuneration was to be according to agreement between the Postmaster-General and the Directors, but in case of difference recourse was to be had to arbitration.

The era of postal reform commenced on the 10th of January, 1840. In the year previous to it, the number of letters circulating through the post was 82,471,000. In these were included 6,563,000 franks. The estimated number of newspapers conveyed by the post in 1839 was 44,500,000. In 1840 there were about 1,300 miles of railway open. What had before been an advantage to the Post Office, and to the letter-writing public, by the gain of speed which railways afforded, at once became a necessity to the department, in consequence of the sudden increase in the weight and the bulk of the mails. The number of letters delivered in the United Kingdom, in 1840, was more than double that of 1839. They were 168,768,000, and there was every indication that they would increase, if not in the gigantic ratio of the first year, at all events very rapidly; such was the case, for the number carried in 1841 showed an increase of nearly 28,000,000. Newspapers increased about 500,000 in 1840. It would have been supposed that the Post Office would have entered into negotiations, in a friendly spirit, with the officials of the railway companies; this, however, was not the case: on the contrary, from the earliest period of postal reform until recent years, the railway has experienced nothing but hostility and reproach from the department. Personal and friendly communication with its heads became out of the question, for the demeanour of one high official

(whose name, without being mentioned, can easily be surmised) to many of the leading railway officials was such, that several declined to meet him; recourse was then had to arbitration, in accordance with the powers conferred on the Post Office by the provisions of the Act of Parliament. The result of references, many of which were very protracted, and in the course of which very minute and elaborate evidence was adduced on both sides, was that decisions were given much more favourable to the railways than the Post Office had expected. The proof that the demands of railway companies did not justify the appellations which the Post Office attributed to them was, that they were not much above the amounts awarded. But as regards the Post Office, the payments proposed by it, and those awarded differed very widely. This, however, did not make any difference in the crusading energy of the department. Long before the issue of Postmaster-General's reports,* whenever

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* The first of these reports was issued in 1855. Of the eleven reports since issued, two, the tenth and eleventh, bear no date at all, whilst the twelfth bears the comprehensive one of "March 1866." These three reports, as well as the three that precede them, are signed by Lord Stanley, of Alderley; of the others the Duke of Argyll signed two, the late Earl of Elgin one, the late Lord Canning one (the first), and Lord Colchester one. That for 1867 (the thirteenth) is signed by the Duke of Montrose. His Grace has dated it.

The last person, not a Peer of Parliament, who was Postmaster-General, was the Right Hon. Henry Frederick Carteret, who was appointed on the 29th January, 1771, joint Postmaster-General with Lord Despencer. He became Lord Carteret on the 29th January, 1784, and continued as joint Postmaster-General with Lord Walsingham until the 19th September, 1789. On the death of James, Marquis of Salisbury, on the 13th June, 1823, Thomas, Earl of Chichester, who had been one of the two Postmasters-General since the 5th of May, 1807, became sole Postmaster-General, and there has not been more than one Postmaster-General since that date. Lord Chichester finally retired from office on the 17th September, 1827.

an opportunity offered, either in giving evidence before a Committee of Parliament, or in furnishing information, there was sure to be an insinuation, an innendo, or a more open attack upon the railway authorities who had succeeded in not allowing the Post Office to have it all its own way.

The Postmaster-General's First Report partakes more of the character of an historic document than of a record of the transactions of an official year. There are, therefore, only some few unimportant remarks in it upon the subject of railways. It was otherwise in the second, as will appear by the following somewhat lengthy extract :—

"Undoubtedly great advantage has arisen from the employment of railways in respect of rapid conveyance. Between districts which, even in the best days of the mail coach system, were, postally speaking, two days apart, the letters now pass in a single night.

"The facilities thus afforded to commerce, and to the business of life in general, can hardly be exaggerated, nor is there any doubt that they have tended largely to increase the amount of postal correspondence, while in return cheap postage has equally tended to increase railway traffic.

"Again, the service has been most materially promoted by the introduction of travelling Post Offices,* *i. e.*, carriages in which the mail bags are opened and

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* The first travelling Post Office was placed on the Grand Junction Railway (the connecting Railway between Liverpool, Manchester and Birmingham) on the 6th of July, 1837. On the 1st of January, 1839, the travelling Post Offices commenced running through, between London and Liverpool. The first travelling Post Office in Ireland was established on the Great Southern and Western Railway, between Dublin and Cork, on the 1st of January, 1855. They are now on every important line of railway in the United Kingdom, but they are not available as the travelling post offices are over almost all Europe, for the receipt of letters as they arrive at and stop at stations. In France, Belgium, Holland, all Germany, Austria and the Austrian dominions, Switzerland and Italy, there are letter boxes and receiving apertures on each side of them, into which letters can be thrown until the very moment that the trains to which they are attached are leaving the stations; no late fee is necessary for such letters, in fact a late letter fee is not known on the Continent, with one

made up, the letters being assorted while the train is in progress; an arrangement which not only obviates the necessity of the stoppages which would otherwise be required at certain 'forward' offices, but has greatly tended to reduce the number of mail bags and accounts, and to simplify the whole system.

"Against these great advantages, however, there is an important set-off in increased expense; for, strange as it may seem, that change, which to the public at large has so much reduced the charge for the conveyance, whether of persons or of goods, has had precisely the reverse effect as respects the conveyance of mails.

"No doubt this result is attributable partly to the necessity for running certain mail trains at hours unsuitable for passenger traffic; but even when the Post Office uses the ordinary trains established by the companies for their own purposes, the rate of charge, especially considering the regularity and extent of custom, is almost always higher than that made to the public for like services.

"It is important that these facts should be correctly understood, especially by those who may have to arbitrate between the Post Office and the Railway Companies, because from time to time great efforts have been made to represent the service as underpaid.

"The total payments to the companies for the year 1854 were £392,600, which it may be observed, exceeds by £83,000 the five per cent. passenger tax for the same period. The above points are fully discussed in an able report by Mr. Edward Page (Inspector General of Mails), which will be found at page 45 of the appendix.

"To this report I would also refer for an investigation of the claims frequently made by the railway companies for compensation on the ground of

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exception—Paris. In that city, since the 9th of May, 1863, letters can be posted at the *Bureaux d'Arrondisement* until half an hour after the general closing of the boxes, and until an hour after their closing at the *Grand Bureau*.

The travelling Post Office staff of the United Kingdom consists of 53 clerks and 147 sorters. These are exclusive of mail officers at some railway stations, and of 89 mail guards and 40 mail porters. The average daily journey of each travelling Post Office employé is 170 miles, and the average time of his duty is between 5 and 6 hours.

The "*Service Ambulant*" of France is much more comprehensive, as by means of the travelling offices a large amount of sorting is performed, which is the work of the ordinary post offices in England. The staff of the French travelling post offices was, on the 1st of January, 1866, composed of 518 "*Agents*" and 654 "*Sous Agents*;" total of the staff, 1,172.

alleged injury by the book post. The report clearly shows: first, that the service which is alleged to be an injury, is, in reality, a benefit; second, that even if it were otherwise, the law relieving newspapers from the compulsory stamp, must have had the effect of transferring from the mail bags to the companies' vans a weight of newspapers many times exceeding that which the book post is erroneously alleged to have withdrawn from the companies' vans to the mail bags."

The foregoing is in the body of the report, what follows appears as a foot-note.

"As nearly as it can be estimated it appears that, while the whole number of book packets conveyed annually by the Post Office is probably over stated at three millions, the number of newspapers* passing through the post has decreased by about twenty-five millions, or by more than eight times the number of all the book packets. Besides this reduction in number, there has been a decrease in the average weight of the newspapers sent through the post; and the combined effect of these changes has been to reduce the total weight of the newspapers by an amount more than nine times as great as the total weight of all the book packets.

There never has been anything to show, either at the time those paragraphs were written, or subsequently, that cheap postage has tended to increase railway traffic. We are therefore at a loss to understand why such an assertion should be adduced as an argument. The same remark applies to the connection attempted to be set up between the amount paid by the Post Office for the transmission of mails through the country, and the tax which railway companies pay to the Government as their contribution to the fiscal burdens, unavoidably and of necessity imposed upon industry by the State: and it must also be considered strange that the

* "Newspapers and book packets liable to detention if posted in pillar boxes within three miles of St. Martin's-le-Grand."—Postal Guide. *Passim.* Why? Let us also ask, does "detention" mean forfeiture or delay? Such a penalty, whichever it may be, does not, we believe, exist in any other part of the Kingdom with regard to newspapers and book packets posted in pillar boxes.

Post Office should make a Postmaster-General's Report the medium of conveying to arbitrators its opinion as to the mode in which they should arbitrate between it and the companies.

However, we pass over these minor and insignificant points, to come to the very serious misrepresentation which is embodied in the foot-note. If the reader will be so good as to read it again, he will see words, which, if they mean anything, mean that the number of newspapers circulating through the post was 25,000,000 less in 1855, than it was in 1854, the object being to show that although 3,000,000 of book packets were carried through the post in 1855, railways were not sufferers thereby, as these packets only formed one-eighth of the number of newspapers that had been withdrawn from postal circulation, owing to the abolition of the compulsory stamp duty. Now we know that in consequence of the reduction in 1836 of the Stamp Duty upon newspapers,* from nominal 4d. and real 3¼d. each, to 1d., the num-

* It is to Sir Edward Lytton Bulwer, Bart. (now Lord Lytton), that the public is indebted for the Newspaper Duty Reduction Act of 1836; and it is to Mr. Milner Gibson, M.P., that is mainly due the distinction of having effected, in 1855, the abolition of the "Tax upon Knowledge" as the Newspaper Duty was then designated.

In 1835 the number of newspaper stamps issued was 32,874,632, and the number of newspapers conveyed by the post was nearly the same. In 1854, the last complete year before the abolition of the compulsory stamp, it was 107,052,053, of which about 37,000,000 were for London newspapers. About 70,000,000 were transmitted through the post. It is now of course impossible to do more than estimate the circulation of newspapers, but the London morning papers alone may be taken at 400,000 a-day, or 125,000,000 per annum; the daily papers published in all other places at as many more, and weekly papers at 250,000,000: total 500,000,000. If these figures be approximatively correct, the issue of newspapers has increased five-fold since 1854, but not more

ber posted had steadily increased each year. Therefore, if the assertion of the foot-note were correct, newspapers posted would have suddenly fallen, in 1855, to 46,000,000, that is to only 1,500,000 more than they were in 1839; yet at page

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than about a seventh of them circulate through the post. In fact there has been scarcely any increase in the number of newspapers through the post since 1854.

The effect of comparatively high newspaper, as contrasted with low letter postage may be thus illustrated:—the chargeable letters delivered in the United Kingdom have risen from 75,907,562 in 1839, the year before the penny postage, to 720,467,007 in 1865, whilst newspapers, 44,500,000 in 1839, have (including book post packets, of which there were none in 1839), advanced in 1865 only to 97,252,766.* In France, in 1847, the year before the reduction of inland letter postage (one penny in each town or *commune*, twopence throughout France and Algeria, which latter, for postal purposes, is considered as France), the chargeable letters were 126,480,000, newspapers, printed matter, and pattern post 90,275,466. In 1856 the newspaper postage rate was reduced to four centimes per copy, not exceeding an ounce and a third, with one centime for each additional third of an ounce, and these rates are diminished one-half when a newspaper is posted and delivered in the same department. In 1865 the number of chargeable letters was 314,817,000, newspapers, &c., 275,317,880. Thus the chargeable letters only exceeded newspapers, &c., by 39,499,120. In Great Britain the excess was 643,814,241.

There is no doubt that the Post Office charge upon newspapers, especially with the facilities which the railways now afford to the department of transmission to any extent, is much too high. This is particularly so as regards the smaller, general, as well as many of what are called "class" papers, several of which do not exceed an ounce or so in weight. The author has given much attention to this subject, as also to the reduction of postage upon local letters not exceeding a quarter of an ounce in weight, to one half-penny each, but neither of these questions can be entered upon here. It may, however, not be inappropriate to say at present, that "local letters," that is, letters which never leave the district of the office in which they are posted, are those that yield by far the largest revenue per letter to the Post Office; in fact, a very considerable

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* This is the number stated at page 2 of the Postmaster-General's Twelfth Report, but at page 15, it is 97,250,000, a difference of 2,766. The difference between the number of letters, as stated at pages 2 and 15 of the same report, is 7,007; of packets by pattern post, 6,116.

19 of the identical Second Report, it is stated that 71,000,000 of newspapers were posted in 1855. Thus at page 15, to serve one purpose, figures are given which would show that only 46,000,000 were posted, but four pages farther, to serve another purpose, that of showing how postal business has increased, they are stated at 71,000,000.

Let us now turn to the Third Report. At page 10, the number of newspapers transmitted through the post in 1856, is stated to be 71,000,000. If this statement be correct, it would show, either that the number transmitted in 1855 had in reality been about 71,000,000, or that, on the mechanical principle of action and reaction being equal and contrary, there

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portion of the total net revenue of the department is derived from them. The history and development of London local letters since the commencement of the present century is curious. In 1801 they were estimated at about 3,200,000. In 1803 they had increased to 6,000,000; and in 1813, to 9,400,000; but in the following ten years they had advanced only to 10,500,000, that being the estimated number in 1823. They were almost stationary during the next ten years, notwithstanding the increase of population; indeed, they rather retrograded, their number in 1833 being estimated at only 10,200,000. In 1835 they rose to about 11,200,000. In 1839, the year before the introduction of the penny postage, they were 12,480,000. In 1840, they bounded suddenly to 20,372,000, and in 1844 they reached 27,000,000. In nine years afterwards (1853) they were 43,000,000. In 1855 London was divided for postal purposes into ten districts, by which very much more rapid delivery was obtained for local letters. The consequence was, that, in 1858, the third complete year after the alteration, local letters had risen to 58,404,000; and in 1862, to 71,961,000. In 1865 they were about 90,000,000, of which upwards of 16,000,000 were delivered in the districts in which they were posted. At the present time the average delivery of letters in London is about 560,000, of which about half are local and half from the provinces and abroad. The daily number of newspapers and book packets delivered is about 55,000. If London correspondence continue to increase as it has in recent years, it will soon be necessary to have half-hourly collections and deliveries during certain parts of the day.

had been a fall of 25,000,000 in 1855, and that precisely the same rise had taken place in 1856. This rise in one year would have to be considered all the more remarkable, inasmuch as the total number, not only of newspapers, but of *book post packets* transmitted in 1865, was 97,250,000 according to one statement, 2,766 more according to another. Owing to the unceasing changes in the mode of imparting information to the public by means of the Postmaster-General's reports, the number of newspapers, exclusive of book post packets, cannot be given, but, including these latter, there was, according to the Postmaster-General's Twelfth Report, an increase of only 26,250,000 in ten years, as against an alleged fall of 25,000,000 in one year, and a recovery to the same amount in the next.

We come now to deal with the Report, dated the 29th February, 1856, by Mr. Edward Page, an excellent officer within the limits of his duties as Inspector-General of Mails, as well as a courteous and agreeable gentleman. He is consequently much esteemed and respected.

But before going farther, let us premise that the late Mr. Robert Stephenson, in the course of the inaugural address which, as President of the Institution of Civil Engineers, he delivered on the 8th of January, 1856, made the following observations upon the connection between the Post Office and the railways :—

"The facilities afforded by railways to the Post Office are, no doubt, of the highest public consequence. The speed which is attained in the transmission would appear, at first, to be the greatest item in the catalogue of those facilities; but it may be doubted if it is the most important. What is really of the greatest value to the Post Office, is the facility afforded for conveying bulk. It is not too much to say that without railway facilities, the excellent plans of Mr. Rowland Hill, for the reduction of the rates of postage, could not have been carried out to their full extent. The first essential to the success of those plans

would have been wanting; for there would have been no sufficient means of conveying the greatly-increased mass of correspondence necessary to be carried in order to render the reduced rates of postage profitable. The old mail coaches were never planned for bulk, which would, indeed, have been fatal to that regularity and speed, upon which the Post Office could alone rely as the means of securing to the Government the monopoly of the letter carriage of the nation. The aggregate weight of the evening mails despatched from London in 1838, in twenty-eight mail coaches, amounted, as was shown by the Report of the Select Committee on Postage, to only 4 tons 6 cwt. or an average of about $3\frac{1}{4}$ cwt. per coach. But now on a Friday night, when so many thousands of weekly papers are sent into the country, the Post Office requires, on the London and North-Western Railway, not only the use of the travelling post-office which is provided for its convenience, but it occupies also six or eight additional vans. It is obvious, therefore, that if the existing system of the Post Office had been in operation, with the present results, in the days of mail-coach communication, not one mail alone, but fourteen or fifteen mails, such as were used in those days, would have been needed to carry on, with regularity, the Post Office traffic between (say) London and Birmingham. Nearly every coach that ran in 1830, between Birmingham and London, would now have been needed for Post Office purposes, if the London and North-Western Railway had not been brought into existence. The expenses would, consequently have been so large, that a universal penny postage would have entailed a certain loss. For the great blessing, therefore, derived from cheap postal communication, the nation is, in a great degree, indebted to the facilities offered by railways. It must be borne in mind here, that the boon conferred upon the public is not limited to written correspondence. Viewed in reference to the postal facilities they afford, the railways are the great public instructors and educators of the day. Contrast the size of the *Times*, in 1830, and in 1856. Do you suppose that the huge mass of paper, which you are permitted to forward by to-night's post, would have been conveyed upon the same terms, if the means of conveyance had remained limited to the mails and its four horses? Look at the immense mass of parliamentary reports and documents, now distributed, every session, amongst all the constituencies of the Empire, at almost a nominal charge. To what do the public owe the valuable information embodied in those documents, but to railways? except as parcels, by waggons or by canal boats, they never could have been conveyed prior to the existence of the railway system; and if they never could have been distributed, we may rely upon it they never would have been printed. The reasoning which applies to the *Times* and to State Papers, applies to newspapers generally, and to the distribution of the prices current of merchants, and of magazines, monthly

publications, and bulky parcels of every description. Without railway facilities they would probably never have been circulated at all. Certainly they never could have been circulated to the extent necessary to make them profitable. Hence, the railway, as before observed, is the greatest engine for the diffusion of knowledge."

These words called forth Mr. Page's Report, and, as the public usually feels interested in matters relating to the Post Office, we have given it in full as an Appendix. We also have done very nearly the same with the Reply to Mr. Page, which Mr. Stephenson read to the Institution on the 20th of May, 1856. Combinedly these documents are long; nevertheless, we think they will repay perusal; at all events, our readers, if they choose to read, will get both views of the question, about which we also wish to say something.

Mr. Page, as it will be seen, passes by "bulk," and deals, in all his arguments, with weight only. Yet the difference between them, even in the case of mails, the most favourable for the Post Office is very great indeed. Let us, for illustration, take the case of our Eastern mails; being all conveyed in parallel-sided boxes,* filled to the uttermost their inner dimensions will permit, they pack closely, and there is no loss of space, as must be in the case of bags, which, even when full, do not lay compactly together. Thus, the weight of one mail conveyed from Southampton to the East, in 1864, was 46 tons; its measurement was 99 tons, and the weight of the heaviest Eastern mail conveyed *viâ* Southampton, in 1865, was 49½

* In March of the present year the Post Office commenced sending the Eastern mails in bags, but no doubt the department will not be able to continue their use. When cholera prevails, like as it has done during the present year, Eastern mails contained in bags are said to be certain conductors and disseminators of the subtle poison.

tons; its measurement 106¼ tons. Weight to bulk in mail *bags* is nearer to 1 to 4 than to any other quantity. Had the weight (or bulk) of chargeable letters only increased about eight-fold between 1839 and 1855, no doubt the addition to the mails would not have been considerable. But Mr. Page, "no doubt without any intention whatever to mislead," omits from his calculations matters which it is surprising that an officer of his intelligence and experience should have allowed to escape him. In the first place, he omits the fact that "chargeable letters" were very different in their character in 1855 from what they were in 1839. Then chargeable letters were, as has been stated by Mr. Page, about 7 per cent. of the total weight of the mails, but in 1855 letters quite equal in weight to the weight of those chargeable, viz., parliamentary and official franks, are excluded from Mr. Page's calculation. It is well known that the correspondence of all the public departments has largely increased in the last thirty years, because, owing to the increased magnitude of the business of the nation, the number of clerks in the old offices has been greatly added to, and because several new branches of the public service have been created. To take a few examples at random. The Steam branch of the Admiralty consisted in 1838 of five or six persons; now, owing to rapid and frequent additions, an immense staff is necessarily connected with it. The Railway and the Navigation, the Education and the Scientific Departments of the Board of Trade, "Science and Art" and South Kensington, the Civil Service Commissioners, &c., have either been created or the staff of each has been added to. So that the substitutes for franks should be included among the letters of the general public, and it is quite certain

that the weight and bulk of official letters has kept pace with the weight and bulk of ordinary letters. Between 1839 and 1855, notwithstanding the foot-note about newspapers at page 15, of the Postmaster-General's Second Report, the number circulating through the post had increased from 44,500,000 to 71,000,000, and although the weight per newspaper had slightly diminished in the interval, still the increased weight of newspapers to be carried by the mails was nearly 50 per cent. over that of 1839.

So far as regards the long established articles of conveyance by the Post Office. Let us now come to those of more modern date. The year before the commencement of the penny postal system, the number of money orders issued was 188,921. In 1855 they had risen to 5,807,412. Now, taking the advices that must be sent to each office upon which an order is issued, the returns that are forwarded daily to the accountant's office in the metropolis of each part of the United Kingdom in which each Post Office Order has been issued, the remittances unceasingly sent from the provincial offices to the metropolis, and from the metropolis to the provincial offices, the receipts for these remittances and the correspondence which they entail, the weekly advices that are sent to London, and the correspondence connected with them, there were at least twelve millions more of letters or documents from this source in 1855 than there were in 1839. None of these letters or documents does Mr. Page bring into calculation, although, each being official, the certainty is that they are heavier in weight and greater in bulk than a like amount of chargeable letters; all these are carried free in the letter bags. And it is a question that it is not necessary

to discuss at present, whether they and the letters and documents (we shall see presently that these are enormous in number, and very great as regards weight) connected with the new services and functions which the Post Office performs, should not be brought into account as a postal charge against the department. The other revenue departments, such, for instance, as the Customs, Inland Revenue, &c., transmit large masses of documents necessary in the transaction of their business with their sub-offices all over the kingdom; but these documents are each subjected to postal charges which are regularly debited in the account of the transmitting department.

In 1839 all expenditure was made by the postmasters throughout the kingdom, and the voucher for each item was retained in their offices.

In 1855 the expenditure was made as heretofore, and as it now continues to be, but instead of the vouchers being retained, every tradesman's bill and every other item of expenditure that is incurred at a provincial office, no matter how small the item may be, is, with the voucher, sent up to its metropolitan office. To specify the number of these documents would be impossible, but there must be tons weight of them through the post every year.

In 1839 there were no postage stamps. In 1855 the gross revenue of the Post Office was £2,716,420. Taking about a fourth of this amount, or, say £700,000 as the value of those sent through the post for distribution in every post town in the kingdom, their number (in penny stamps) 168,000,000; their, dead weight (packed) would be about ten tons, not including the weight of materials in which they were packed, and excluding from the calculation the very considerable

number of post office envelopes sent all over the empire, one of which envelopes would weigh as much as two dozen stamps*

At the commencement of the new postal system, the number of post offices throughout the United Kingdom was 4,028, of which about a fourteenth, or 300, were head post offices, that is offices sending bags to and receiving bags from London. In 1855 there were 10,498 post offices in the United Kingdom, of which "920† were head post offices and 9,578 sub post offices or receiving offices." Therefore not only had the number of bags going from or coming to London from this one cause been trebled in number, but for the reasons just stated the weight in them had also trebled. In

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* We recently had twenty shillings' worth of penny postage stamps weighed; with the border all round the sheet, 240 stamps weigh a little more than half an ounce; without the border, the weight is a little less than half an ounce. Consequently £32 worth weigh one pound, £3,584 one cwt., £71,680 one ton, £716,800 ten tons.

† It is at times very difficult to understand the statistics of the department as given in consecutive Postmaster-General's reports. For instance, in the report (the third) following that from which the figures in the text are taken, we find that the number of the post offices was increased by 368 in 1856, "making the whole present number 10,866," of these 845 are head post offices (75 less than in 1855). In the Fourth Report, although the post offices of the United Kingdom were increased in 1857 to 11,001, the number of head offices is stated at 810, or 35 less than in 1856 and 110 less than in 1855. In the Fifth Report, 134 post offices were added during 1858, making 11,235, but the head offices were 4 less than in 1857. In 1859 the head offices became 825. In 1860 they were 818. In 1861, 813. In 1862, 808. Since 1862 the generic terms, "receptacles of letters" are, in the Postmaster-General's reports, applied to all places at which letters can be posted. By a Parliamentary return issued on the 1st of October, 1867, it appears that there are 11,282 post offices in the United Kingdom, of which 814 are head offices, and 10,468 are sub-offices and receiving offices. These numbers are irrespective of about 7,000 pillar boxes all over the kingdom.

1839 there were four or five day mails to and from London. In 1855 upwards of fifty, all of which required bags for working them, and their tributary cross posts in every part of the kingdom, but as Mr. Page's arguments have reference principally to night mails, let them be excluded.

As London is the depôt from which the immense and unceasing supply of new bags for the whole postal system of England and Wales (as Dublin is for Ireland, and Edinburgh for Scotland) is furnished, every one of the bags for the night mails, the day mails, the railway mails, the mail coach mails, the mail cart mails, the horse mails, the foot mails, and the private bag mails, required, in no matter what part of the Kingdom, are considered by the Post Office as postal matters, and are sent post-free accordingly, and when bags are dilapidated or injured they find their way to London, just in the same inexpensive manner as new bags find their way from it. "The supply and repair of mail bags" in England and Wales involve an annual cost of nearly £6,000, exclusive of the cost of supplying and painting the 22,000 to 25,000 mail boxes per annum required for the despatch of our Eastern mails; and one man is borne on the books of the establishment for no other purpose than, as the estimates tell us, to label mail bags. In Ireland there is an annual outlay of £800, in Scotland of £900, for new bags and mendings. In short, empty mail bag transit must have been in 1855 a quarter of all that, whether filled or empty, of 1839.

In 1839 there was one departure a month of the East India mail *viâ* Marseilles and one *viâ* Southampton, yet the weight of the mails by the two routes was under five tons, in bulk about twelve tons. In 1855, with two departures a month *viâ* Marseilles, and two *viâ* Southampton, the Eastern mails

were about twenty tons weight. In 1839 the West India and Brazilian mails were despatched once a month, in the notorious ten-gun "coffins"; yet although the letters were then always sent in triplicate, because the certainty then was that one in three would be lost, and the chances were it might be one in two, nevertheless the letters were only about 200,000 a year; in 1855 they had risen to 700,000. In 1839 letters between Great Britain, the United States, and Canada were conveyed by the American "Liners," they were under a million per annum; in 1855 they had risen to about 2,500,000, besides letters "in transit" between the United States, Europe, India, China, and Australia.

In 1839 the community had not the benefit of a "British Postal Guide,* containing the Chief Public Regulations of the Post Office, with other information, published Quarterly by command of the Postmaster-General." The first number was issued on the 1st of July, 1855, seven months before Mr. Page wrote his Report. The cost of each number for two or three years was Sixpence. As we learn by the cover that they are "Printed, Published, and Sold by George E. Eyre and William Spottiswoode, Printers to the Queen's Most Excellent Majesty," and that they are "to be had also of all Booksellers and the Principal Postmasters in the United Kingdom." It therefore follows that these Postal

* The Postal Guide, although containing a great deal of useful information relating to postal matters, is not a work implicitly to be relied upon. Recently the author pointed out, in addition to many other errors and modes of imparting information calculated to mislead the public, 146 errors upon one subject only. These first appeared in No. 44, published on 1st of April 1867, and they were repeated in No. 45, published on the 1st of July. In the reply of the Post Office, all these errors were designated "minor points." The *amende*, however, was made in subsequent communications, and improvements promised in the October edition. The promise has been, in a large measure, fulfilled.

Guides were, from the date of their first appearance, transmitted by the Railways in the Post Office bags all over the Kingdom. We have seen them, from the earliest period of their publication, exhibited and advertised at the post offices in Manchester, Liverpool, Edinburgh, Glasgow, Belfast, Dublin, Cork, and other places, and almost every postmaster receives one or more copies for the use of his office. Each number contains 234 pages at present, besides the pages devoted to advertisements, and they cost 2d. each for transmission if sent by book post. In 1858, the price per copy was raised to 1s.; but in 1864 it was reduced to 6d., and the sale has become very great.

But whatever their number or weight was in 1855, it escaped Mr. Page's recollection to mention them in his comparison between the weights transmitted in that year, and those of 1839.

The foregoing items supply some of the omissions made by Mr. Page in his calculations, and furnish reasons for dissenting from his assertion, that whilst "in 1838 the gross weight of the night mails despatched from London was 4 tons 6 cwt. 1 qr., the total weight of the night mails despatched in a single evening at the present time, *may be stated* (the italics are ours) at about 12 tons 4 cwt. 3 qrs."

Mr. Page estimates the gross weight of mails per annum for the entire Kingdom, including guards, clerks, &c., as being considerably under 20,000 tons, "a large portion of which was not conveyed by railway at all." Mr. Page adds, "Assuming, however, that the whole of it had gone by the railways, it would appear that the Post Office paid $\frac{1}{25}$ part of the total earnings for the conveyance of less than a $\frac{1}{100}$ part of the total weight." Mr. Page must excuse us for asserting that the total *weight* of mails in 1855 was nearer to

80,000 tons than to 20,000, and that by bulk it was nearly 200,000 tons, of which more than half was carried by railway.

Until September 1838, fifty-two horses started every evening from London, with thirteen mail coaches behind them, to convey the mails that are now carried by the Scotch Limited Mail. The weight of mails carried by the coaches was about four tons, their bulk about ten tons measurement. The horses travelled gallantly up hill and down dale over first-class roads at the rate of more than ten miles an hour, and at the end of six or seven miles they were replaced by others of the same mettle. They were guided by thirteen first-class "whips" of the olden time, and no matter what the weather was, or how rough any portion of the road might be temporarily, the great ambition was, not to be a second after time at appointed places. In charge of these four or ten tons, as the case may be, were thirteen guards, to whom the custody of the mails was entrusted. They were responsible for their safe and faithful transmission between St. Martin's-le-Grand and their destinations.

Each mail coach was considered to require a horse a double mile, to maintain its contract time. As Stafford is 133 miles from London, 133 multiplied by 13 gives the number of horses required, 1,729. The average weight which each mail coach carried was 4 cwt., taken as bulk it was half a ton. The maximum weight that, by the terms of the contract, could be imposed upon it was 15 cwt., a total, for thirteen mails, of 195 cwt.—five less than five tons.

In 1867 *one* horse—of the railway the iron-clad—invented, not conceived, not created—a living, but lifeless thing—yet withal of terrible power, draws, in addition to the same number of passengers that the fifty-two horses could draw,

the mails which are to be carried to Stafford and beyond it. Instead of the weight being four tons, it is often nearly *twenty*, and instead of bulk being ten, it is seldom less than forty, often fifty, and sometimes it mounts up to even four or five tons further. But no matter, the iron horse is ready to take its load, and does take it at speed four times as great as the speed of thirty years ago.

If we had to go back to mail coaches, and each were only to carry the average of 1837, we should require 100 mail coaches and 13,300 horses; but if each were loaded to its Post Office maximum of former times, then *only* 27 coaches and 3,591 horses would be requisite. At what cost for 27 coaches? Certainly, the former average of 2½d. a mile would no longer be attainable. More than double would be demanded. 13s. 6d. a mile per diem for 133 miles, multiplied by 365 days, is £32,785. Yet the highest price that the London and North-Western ever had for its night mail service was 4s. the double mile, £9,709.

This is one answer to the assertion of Mr. Page in his report, "Not only, therefore, would penny postage without railways have been both practicable and remunerative, but it would have been even more profitable* (assuming the increase of letters) than it is now."

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* We think we shall be able to show clearly in a work on the Post Offices of England and France, preparing for publication early next year, that the penny postal system only began to be profitable to the nation about the time that Mr. Page wrote his report, notwithstanding that the statements of net revenue given in Post Office reports would make it appear to be otherwise. Until 1860, the charges for mail packets and contract mail steamers were borne on the Naval, and not on the Post Office Estimates, and the Postal Department debited itself specifically, for several years, with a charge for packets of about £4,500 a year! Last year, the total amount voted for our Ocean Postal

We learn from Mr. Howell, the Secretary of the Peninsular and Oriental Steam Company, that on Australian mail mornings the weight of mails is 46 tons; to carry these at the rate of 15 cwt. per mail coach from London to Southampton, 78 miles, it would be necessary to have 61 coaches and 4,758 horses, besides guards and coachmen. As mails, although not near so heavy as the Australian, are continually arriving at and departing from Southampton, it would be necessary to keep up at least the above stock both of bi- and quadru-peds for these 78 miles, at a cost of about £30,000 a year; but reference to the Post Office estimates will show that the annual payment made by the department to the London and South-Western Company is £21,950, and for that sum the Post Office has the right not only to receive and depatch its sea-going mails, but to use every one of the Company's trains over the 503 miles which constitute its system, for Post Office inland business. How, it may be asked again, can any officer of the department assert in a report (designated by the Postmaster-General "an able report") that the penny postage "would have been even more profitable without railways than it now is"?

There is a point in connection with this subject that may as well be referred to here. The Isthmus of Suez Railway*

Services and Packet Establishments was £821,163, of which £90,601 were for water conveyance of mails between different parts of the United Kingdom. Eight-ninths of it (£79,900) were for the mail service between Holyhead and Kingston. The vessels employed in this service are the finest and fastest afloat; they usually perform 63 statute miles in three hours and forty minutes, or at the rate of 17 miles an hour. The passages have, on some few occasions, been performed in three hours and twenty-five minutes, or over 18 miles an hour.

* We perceive by recent advertisements in the French papers, and by a letter from Mr. Daniel A. Lange, the "English representative of the Suez Maritime Canal Company," inserted in the *Times* of the 26th September 1867, that the

was opened for traffic in 1858, the same year that the Australian mail service by way of Egypt was commenced. The India and China mails had increased very rapidly during the few previous years, and the greatest trouble and difficulty were experienced in getting them accross the desert. The addition of the Australian mails would have overwhelmed the service, but for the opening of the railway. For let it be asked, What number of camels would be required, or what time would they require to take some fifty tons of mails (adding to the transmissions *viâ* Southampton, those from England and France *viâ* Marseilles, and from Germany *viâ* Trieste) across the desert? By means of the Suez Railway, the cost to this country for the conveyance of the mails outwards and inwards through Egypt is £8,000 a year, and eight Janissaries accompany the mails in both directions, for which they are paid £750 per annum. The cost of a combined *army* of camels, camel drivers and Janissaries would be at least £60,000 a year, and it would be simply impossible to perform the service satisfactorily.

We think we have demonstrated that even in 1855 the

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company proposes to raise £4,000,000 of capital by means of debentures, in addition to the £12,000,000 it has already expended. It is stated that the Great or Grand Canal will, by means of this loan, positively be finished by the first of October 1869. The debentures issued at £12 each, bear interest at the rate of 8½ per cent. per annum, and are to be paid off in the usual manner adopted in France, that is by lottery at the rate of £20 each. The original capital of the Suez Canal Company was fixed, at its formation in 1858, at £8,000,009. The length of the canal, when finished, is to be 100 miles, whilst the railway is 250. The reason is that Cairo is only about eight miles less distant from Alexandria than the Mediterancan mouth of the canal is from that of the Red Sea. Suez and Cairo are, practically, in the same latitude, but when the railway running nearly due south from Alexandria reaches Cairo, it makes a right angle towards the east to reach Suez.

Post Office services of the country must have totally broken down, were it not for railways. But between 1855 and 1865 the postal business has increased enormously. The number of receptacles for letters* has risen from 10,498 to 16,246, the number of letters delivered from 456,276,176

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* In France the number of receptacles for letters is nearly three times as great as in the United Kingdom. On the 1st of January, 1866, they were over 43,000, counting the receiver in each railway *bureau ambulant* as one. The staff of the French Post Office is also greatly in excess of that of the United Kingdom. On the 1st of January, 1866, the latter consisted of 25,082 persons, in which are included "rural messengers." At the same date the French staff was 27,749, exclusive of 16,406 rural messengers. Total men, 44,155. The system of rural posts in France is of extreme interest. For the first thirty years of the present century, out of 38,000 *communes* 35,587 were without direct relations with the Post Office. To obtain a letter it was necessary to send, in many districts, distances varying from fifteen to twenty-five miles. By a law passed in May, 1829, every *commune* of the kingdom was to be afforded, from the 1st of April, 1839, postal communication, not less than every second day, with every other part of France. The service commenced with the appointment of 11,036 rural postmen, and the system has gradually extended to the employment of 16,406, for there is not at present a *commune* in France that has not a daily collection and delivery. "These 16,406 rural postmen," says M. A. De Camp, in the *Revue des deux Mondes*, of January, 1867, "start every morning from 4,700 post offices. They travel through every *commune*, village, and hamlet, they convey correspondence to the most remote and to almost inaccessible houses and cottages. Every *commune* has, at its '*Chef lieu*,' a letter-box, which is opened by the rural postman. The letters which he finds in it are delivered by him if they are addressed for any place in his walk; if not, they are conveyed by him to his post office, whence they are despatched every evening *en route* for their ultimate destinations." So complete and penetrating is the system, that immediately after the annexation of Savoy, and of its Alpine regions, the rural postmen were installed, and now they present themselves daily at every habitation in the mountains, whenever there is a letter or even a newspaper to be delivered. "Let," says a pleasant writer in a French periodical, "but an Englishman afflicted with '*le splene*,' or any other man, but take up his permanent residence on the highest Alpine peak on French territory, it matters not Monte Rosa, Monte Cervino, or Monte Bianco,

to 720,467,007, of newspapers and book parcels,* from 71,000,000 to 97,252,766; samples and patterns, an item of Post Office transmission introduced in 1863, 1,286,116. The amount, in money, of the Money Orders issued has increased from £11,009,279† to £17,829,290. With the increase comes the concomitant increase of transmissions through the post. The weight of the Eastern mails has risen from 250 tons a year to nearly 2,000.

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the rural postman of the mountain will be bound, if necessary, to visit him daily."

The rural postmen of France walk an average of sixteen miles each,—a total of 267,600 miles *daily*. Of their number, 5,248 walk seventeen miles a day and "upwards." In this last word is included a certain number who complete twenty-five miles, "a fact," as M. Vandal informs us in the *Annuaire des Postes* for 1866, "of melancholy notoriety."

"His visits," continues M. Vandal, "are solicited with ardour and received with gratitude." But his remuneration is not on a par with these feelings. There are 673 whose pay is only £12 a year, 996 who receive £14, 2,970 between £14 and £20, 9,988 between £20 and £24, and only 1,779 who receive higher than £24; the average is only £21. 4s. per man. They are allowed, however (as is the case in England), to supplement their postal pay by performing certain little commissions and conveying small parcels for the inhabitants of the districts in which their services are employed.

Belgium possesses a rural postal system as extensive and penetrating as that just described, but, although food and rent are cheaper there than in France, the average pay of Belgian rural postmen is £30 a year, just 2 francs a day.

* There are no official means afforded of distinguishing between the number of newspapers and of book parcels sent through the post. A writer in the September number (1862) of *Fraser's Magazine* (said to be Mr. M. D. Hill, brother to Sir Rowland) states, that, in that year, the number of book parcels was 12,000,000. The circulation of newspapers through the post is, we apprehend, decreasing, but the diminution is more than compensated for by the increased number of book parcels.

† From 1839 until 1862, the *number* of Money Orders issued was regularly stated in the appendices to the annual reports. Half the value of the returns now issued is lost through the omission of this information, especially as it was in 1862 that the limit of an Inland Money Order was raised from £5 to £10.

In 1861, the operations of the Post Office Savings Banks commenced, and by the 31st December, 1865, 3,321 banks had been established all over the kingdom. The total number of persons who had become depositors from the commencement was 857,701, of whom 245,882 had closed their accounts, leaving 611,819 on the books. The total number of deposits received had been 3,895,135. The total withdrawals 1,011,379. Without railways, the operations of those banks could never have been attempted. See what they have to carry? Every person on making his first deposit receives gratis, a numbered book, in which all deposits are to be entered. The weight of this book is about three quarters of an ounce; advice of each deposit is to be sent on the day of its receipt, by the Postmaster to the Post Office, London. The amount of the deposit is to be acknowledged, and the acknowledgment is to be transmitted by post to the receiver. Every depositor's book must be forwarded each year (even from the remotest part of the kingdom), on the anniversary of the day on which the first deposit was made, to London, in a cover to be obtained at any savings bank. This cover exempts the book from postage charge, and it is also returned free from the London office to the depositor. Every necessary letter of inquiry respecting deposits in savings banks, and their replies are carried by the railways, and travel free of postage. If a depositor want to withdraw a part or the whole of the amount to his credit, he must make application on a form a copy of which can be obtained at any savings bank. It is sent free to London, as also the warrant from London payable at the place named by the applicant. The warrant when paid and receipted is returned by the Postmaster to London.

If the reader will be so good as to multiply the amount of correspondence caused by one depositor, by the total number, viz., 857,701, he will then be able to estimate what is the annual amount of work that is involved in the carrying out of the Post Office Savings Bank system, and also how completely it depends for its success upon railways. It is pleasant—it is more than pleasant—it is deeply gratifying and satisfactory, to know that the business increases, and will continue to increase, for the reason that the humblest classes of the community have now learned to appreciate the facilities which these institutions offer for the safe and fructifying deposit of their little earnings. To Mr. Gladstone is due the honour of their introduction. It was on the 8th of February, 1861, that he presented to the House of Commons the resolution that affirmed the principle upon which they are based, and both Houses of Parliament responded so promptly, that by the 17th of May following, an Act, the title of which is, "An Act to grant additional facilities for depositing small savings at interest with the security of the Government* for the due repayment thereof," received the Royal assent. Mr. Gladstone, you have done many great

* We trust there is no doubt whatever upon this point, yet two cases have recently occurred which cannot fail to awaken much apprehension in the minds of depositors. In each it appears that a fraudulent person got hold of a depositor's book and withdrew the sum to his credit. The Post Office denied its responsibility on the ground that it had already discharged its obligation. Machinery to prevent the repetition of such a fraud could, we apprehend, be easily instituted, which would protect the Office, and at the same time not interpose unnecessary delay or impediment to the withdrawal of deposits. For some few years after the establishment of money orders some frauds were successfully practised upon the Post Office, but there do not appear to have been of late even attempts at fraud, yet the money order system is much more simple now, as regards the public, than it formerly was.

and many good acts in your time, but you have never done one greater or better than this.*

The Government Insurance and Annuities Act, which received the Royal assent on the 14th July, 1864, enables persons proposing to effect insurances on their lives, or to purchase deferred monthly allowances, to transmit their proposals, and to send and receive all correspondence between themselves and the Post Office relating to their proposals free of all postal charges. The Postmaster-General is compelled to admit, in his Twelfth Report, that the proposals, from their bulk, "present a somewhat formidable

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* Since the commencement of the present century the idea of making the machinery of the Post Office available as a means of carrying out the saving bank system, was occasionally in the minds of benevolent persons, and the idea so far took shape, that in 1806 Mr. Whitbread brought into the House of Commons, a bill for the purpose of effecting this object; but the nation was then too deeply immersed in war and in considering the ways and means for its sustainment to give attention to philanthropy. The bill was rejected at an early stage of its career. In 1817 the first comprehensive Savings Bank Act was passed, but it does not appear that during its progress through Parliament, any effective efforts were made to connect the Post Office with the system.

On the 31st December, 1865, 3,321 Post Office Savings Banks had been opened throughout the United Kingdom. Since then the number has been considerably added to. They have had some but not a very marked effect upon the savings banks on the old system, for whilst the "capital" of these latter, that is, the amount of money to the credit of depositors at the end of each year, was, on the 31st December, 1861, 41,546,475, it had fallen to £36,307,019 on 31st of December, 1866, but on the other hand, the "capital" of the Post Office Savings Bank was, at the last date, £8,121,175, making the total of savings bank capital £44,428,194, an increase of £2,881,719 since the end of 1861. It is to be remembered that this last named sum is principally, it might very nearly be said, altogether due to depositors of the humblest classes and of the smallest means who, until the establishment of Post Office Savings Banks, were never able to, at all events did not, avail themselves of any depositories for their earnings. The subject is one of deepest interest, but it cannot be perused further in these pages.

appearance." But, thanks to railways, these formidable-looking documents go free through the post. So do also their acknowledgments from head quarters; the numerous and minute inquiries made to friends and medical referees as to the proposer's age, health, habits, and occupation, likewise the replies to all these inquiries. If these replies are deemed satisfactory, a letter is transmitted to the proposer, post free, directing him to present himself for examination to a medical man, and the report of the latter often leads to much correspondence, all of which goes without postal charge. If the proposer be rejected he is informed accordingly by a free letter, and there is an end of the matter; but if he be accepted, the insurance or annuity contract is sent to the Post Office at which the proposer desires to receive it, and he is apprised to that effect by another free letter. The system is in its infancy as yet, but the postal transmissions which it will involve, even at its greatest, will never be of the same extent as those connected with the Post Office Savings Banks. Nevertheless, they will be considerable, for every payment to an annuitant, and every receipt of money from a person assured, must be transmitted either from or to London, as the case may be. So that, in addition to the proposals of the "somewhat formidable appearance," thousands of documents per annum in connection with that business will find their way into the mail bags.

Let us hark back to say that no rejoinder to Mr. Stephenson's answer was ever given. Nevertheless, the answer, complete and conclusive as it was, had no effect on Post Office intentions, for during the session of 1857, the Duke of Argyll,* then Postmaster-General, was induced by the per-

* The Duke of Argyll is equally distinguished as a senator, a politician, and a man of letters. The *Quarterly Review*, vol. 84, page 79, reviewin his

manent officers of the establishment to introduce a bill into the House of Lords for making "further Provision for the Conveyance of Mails by Railway." Mr. William Lewins* tells us, in his book called *Her Majesty's Mail,* that His Grace

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"Presbytery Examined," (published in 1848, when His Grace was not twenty-five years of age), thus speaks :—

"Every peer who employs the opportunities furnished by his high position, together with his natural gifts, in conscientious labour for the public good, is now, more than ever, an ornament and a bulwark to the State, and a blessing to the people. It is therefore, with unfeigned satisfaction, that we find another of our nobles, one of the highest in rank, and not the least wealthy in traditional fame, adding himself to the number who are pledged in the face of the world, by early efforts, to a life of continued labour. The Duke has not entered the field of ostensible authorship with any light or frivolous aim, nor has he incurred the heavier responsibility of handling subjects of deep moment to human destiny, for the purpose of displaying his intellectual gifts. The theme he has chosen is one of extended interest, and has points of contact with a wider sphere, while his pages bear throughout the marks of an earnestness not to be mistaken; besides, they present specimens of acuteness and of eloquence full of promise for his literary fame."

Of the Duke's last work, the "Reign of Law," four editions have gone rapidly through the press. It is described respectively by the *Times*, the *Spectator*, and the *Examiner*, as "a very able book," "a masterly book," and "a very remarkable volume;" whilst the *Pall Mall Gazette* says of it,— "The aim of this book is lofty, and requires not only a thorough familiarity with metaphysical and scientific subjects, but a breadth of thought, a freedom from prejudice, a general versatility, and sympathetic quality of mind, and a power of clear exposition rare in all ages and in all countries. We have no hesitation in expressing an opinion that all these qualifications are to be recognised in the Duke of Argyll, and that his book is as unanswerable as it is attractive."

* Mr. Lewins, one of the senior clerks, we believe, in the Post Office, has written a very pleasant and amusing book upon the British Post, but he naturally looks upon St. Martin's-le-Grand as perfection. The Post Office has produced several literary men. Allen, who was the inventor of Cross Posts, introduced in 1720, by which he amassed considerable wealth, although not an author, was a great patron of literature, as well as a most benevolent man. He was the

deserves the gratitude of his country for introducing it. But it was well known that His Grace, like most of the Post-masters-General who have preceded him during the last twenty years, took but little interest in the working of the department over which he nominally presided, and knew little, probably nothing, of the bill, the obnoxious contents of which he was called upon to father.

It was, however, justly viewed with great apprehension by all the railway interests of the kingdom, and in consequence of the hostility excited by its appearance, it was withdrawn before it reached a second reading. In the very lame defence of it, given in the Fourth Annual Report, we find it mildly stated, that "taken as a whole, the bill certainly cannot fairly be represented as a measure opposed to railway interests." Whether this be correct or not, at all events it can be stated that the department has never since proposed any similar enactment. From 1858 it has also ceased to use language such as "experience has satisfied me, that as the law now stands, it is impossible either to secure regularity in the conveyance of the mails, or to have that full use of the railways which the public

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friend of Fielding, Warburton, and Pope, the last of whom has celebrated his benevolence in the well known lines,—

> "Let humble Allen, with an awkward shame,
> Do good by stealth, and blush to find it fame."

At the present day, there are Anthony Trollope, Edmund Yates, besides many who adopt the anonymous, and are contributors to our magazines and reviews, and occasionally to comic periodicals. But there is one man who, if his duties, first as Accountant-General, and now as one of the secretaries of the Post Office, had not been so unceasing and absorbing for many years, would have been, in another sense, among the most distinguished men of letters of his day. Mr. Frank Ives Scudamore's "People that One Never Sees" and his essays "On Dreams," are amongst the most brilliant and exquisite little conceptions that pen has ever committed to paper. Mr. Scudamore finds "sermons in stones," and sweetest harmony also.

demand, which the department is anxious to afford, and which would be beneficial to the companies themselves."* The relations between the companies and the department have been amicable during the last seven or eight years, and there is now scarcely a railway in the kingdom upon which mails are conveyed that has not adopted a system of general contracts. The Post Office acquires, by means of them, the right, for a fixed gross payment per annum, of using *all* the trains of the company for the transport of mail bags. There are certain trains which of course must be run for the convenience of the Post Office, such as the night mail trains to and from London, with their branch trains and ramifications. The same as regards Dublin, and, in a lesser degree, Edinburgh. But the expenses of these trains to the companies is considered in coming to a decision as to the total price to be paid. These arrangements are based altogether upon the voluntary principle, but when agreed to, they are necessarily embodied in legal contracts.

We have no earlier return of postal railway mileage than 1855; that was at the height of the antagonism with the Post Office. The miles run were then 27,109 per diem, but so rapidly had friendly arrangements been entered into, that in 1862 (the last year for which a mileage return is

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* The following very seriously meant paragraph is contained in the Postmaster-General's Fourth Report:—"I think I am safe in stating, as a general fact, that those boards of directors of railway companies which have evinced the greatest readiness to meet the wishes of the Post Office, and to convey mail bags by frequent trains, and at moderate rates, are, at the same time those boards which have been most successful in promoting the interests of their companies, as shown by the market value of their shares!" The company which the writer had specially in view when framing the foregoing paragraph, was the London, Brighton and South Coast. The note of admiration is ours.

published) it had risen to 49,782 miles per diem. Had these returns been continued to the present time, they would have exhibited an increase to 60,000 per diem, for in 1863, there were three hundred and ninety-three towns having a night and day mail from London, fifty having 3 mails daily from London, seven having 4, three having 3, and three having 4. But in 1865, the number had increased as follows: four hundred and ten having a night and day mail from London, fifty-seven having 3 daily from London, nine having 4, and six having 5.

The gross sum paid by the Post Office to the railways of the United Kingdom in 1866 was £570,500, only £170,500 more than, as Mr. Page states, were paid to railways in 1855; but at that time the Post Office, with only few exceptions, did not run more than one day and one night mail train in each direction on the greater portion of the 8,280 miles which then constituted the railway system of the kingdom; but on the first of January, 1866, the railway system was 13,289 miles, over about 12,000 miles of which, the Post Office was able by its contracts, to send mail bags by whatever trains, whether goods or passenger, they chose to select from. At the present time (as already stated) the railway service of the Post Office cannot be less than 60,000 miles a day*.

The following statement exhibits the amount paid by the Post Office to the Railway Companies of the United Kingdom in 1866, together with the mileage length of most of them. Of the total sum of £570,500, the London and North-Western, with its 1,320 miles of

* This is the amount stated in evidence before the Royal Commissioners on Railways.

railway, naturally earns the largest share, £132,997. The other railways come as follows:—Great Western (1,311 miles), £50,789; North Eastern (1,229), £41,397; North British (732), £8,696; Great Eastern (710), £22,357; Midland (695), £44,600; Caledonian (574), £29,101; London and South-Western (503), £21,950; Great Northern (441), £9,805; Lancashire and Yorkshire (403), £6,500; South Eastern (330), £23,571; London, Brighton and South Coast (320), £1,977; Manchester, Sheffield and Lincolnshire (246), £2,618; North Staffordshire (144), £1,000; Bristol and Exeter (134), £9,888; Cambrian (130), £2,413; South Devon (110), £7,485; London, Chatham and Dover (94), £268; Brecon and Merthyr (68), £50; Cornwall (66), £5,500; Taff Vale (63), £1,000; Shrewsbury and Hereford (51), £2,030; Llanelly (46), £39; Monmouthshire (44), £147; Birkenhead (43), £2,500; North Union (40), £4,878; Maryport and Carlisle (28), £841; West Cornwall (27), £1,500; Isle of Wight (12), £31; Whitehaven Junction (6½), £363. There were not any contracts in 1866 with the Furness Company (85), the Somerset and Dorset (66), nor with the Metropolitan Underground (4¾), but the Post Office has recently entered into contracts for the conveyance of mails on the first and the third of the three.

The foregoing, with some payments to minor companies, make the total which the English and Welsh Companies receive from the Post Office, £407,512. Some of these minor companies, however, are not over-handsomely paid; for instance, the Colne Valley, 6½ miles long, receives the modest sum of £15 a year; the Tenbury, 5¼ miles long, which nevertheless has a Board of Directors consisting of seven members, and is presided over by a noble Baron, receives

only £7. Never having heard of the Pontop and Jarrow Railway, we looked in all the usual sources of information without success, but we perceive by the Post Office estimates that the company earns £5 a-year for the services it renders to the department. If the amounts paid by the Post Office to English Railways be divided by its total mileage, it makes the average payment per mile per annum to them a little less than £58.

The Irish railways receive £84,508 per annum from the Post Office, of which the Great Southern and Western (420 miles), obtains £29,500; the Midland Great Western (261), £14,920; Irish North-Western (145), £1,540; Dublin, Wicklow and Wexford (107), £4,700; Ulster (106), £5,800; Belfast and Northern Counties (100), £2,950; Great Northern and Western (83), £2,349; Waterford and Limerick (77), £3,150; Dublin and Drogheda (75), £4,700; Dublin and Belfast Junction (63), £6,000; Londonderry and Enniskillen (60), £3,150; Belfast and County Down (44), £206; Londonderry and Coleraine (36), £1,300; Cork and Youghal (34), £1,150; Waterford and Kilkenny (31), £486; Cork and Limerick direct (25), £50; Cork and Bandon (20), £757. There are three companies that only receive £30 each, and two have twice as much as the Pontop and Jarrow. They have £10 each. The average Post Office payment per mile (assuming that the Post Office sent mails by all the railways in Ireland, which is not the case) is about £44. 10s.

The Scotch railways receive £78,482, of which the North British and Edinburgh and Glasgow (748) has £8,696; Caledonian (573), £29,101; Scottish Central and Scottish North-Eastern (459), £22,136; Great North of Scotland; (257), £3,830; Glasgow and South-Western (249), £3,436;

the Highland Railway (245), £10,454. The average per mile per annum paid to Scotch railways by the Post Office, assuming that it availed itself of the whole of them, is £36.

There is no branch of the connection between the railways and the Post Office in which the former has gained more conspicuously than in that of speed;* and precisely the same may also be said with respect to the general community.

As has already been stated, the average speed of mail coaches was a little under ten miles an hour in 1837, that of stage coaches under eight, that of waggons two; and that the latter were used in the middle of the last century, at all events, we have pictorial evidence, through the pencil of Hogarth, and written testimony from the writings of his contemporaries, as well as from those of subsequent men of letters.

The opening of the Liverpool and Manchester Railway, substituted between its two termini an average speed of 17 miles an hour. Speed has increased steadily year by year, as we shall now endeavour to make manifest.

In 1842 the night mail train left Euston Station at 8·30 p.m., and reached Lancaster (241 miles) at 7·0 a.m. Since the 1st of October, 1860, the Scotch Limited Mail leaves Euston Station every evening at 8·35 p.m., it arrives at Perth at 8·59 a.m. the next day; the distance is 449 miles, and it is performed, including ten stoppages, at the rate of 37½ miles an hour. There were more stoppages for mail trains in 1840 than since 1860, but, apart from this fact, the

* Some persons have odd notions of the speed of railway trains. Some few years ago, a jockey who had missed the express to Newmarket, was anxious to have a special train, but on being informed of the cost, he earnestly asked an officer of the Company "if he did not think the express might be overtaken if he followed it *in a cab!*" The express train was running on the Eastern Counties.

time that the mail train required to complete 449 miles is the same as that which it required to complete only 15 miles more than half that distance, twenty years previously.

The Irish express mail completes the journey from London to Holyhead (263 miles), with three stoppages only, for passenger accommodation, in 6 hours 40 minutes, or at the rate of 38½ miles an hour.

For a short run, involving only one stoppage for the engine to take water, the most rapid on the narrow gauge * in England is between London and Dover, by the South-Eastern Railway, 88 miles in 2 hours and 5 minutes, 42 miles an hour. But on Australian mail nights (the 26th of each month), the Post Office employs, in addition to the ordinary "down" mail, a special one for the conveyance of such bags and boxes as can be got ready by 7 p.m. This train travels between London and Dover in 1 hour and 45 minutes. There is one stop for water. The rate of speed, including the stop, is a little over 50 miles an hour, excluding it, the rate is 54.

There is a train on the Great Western, which although not carrying mails, is the fastest in England. It completes the distance from London to Exeter, 194 miles, with 4 stops, amounting to 20 minutes, in 4½ hours; or at the rate of 43 miles an hour. A little more than a quarter of the time occupied by the "Quicksilver" Mail in the olden days; but the "Quicksilver" only went over 160 miles, the road-

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* The "narrow" gauge, the gauge all but universal through England, Scotland, Wales, and Europe generally, is 4 feet 8½ inches; the "broad," or Great-Western gauge, is 7 feet. The New York and Erie Railway gauge is 6 feet; the other American railways are the same as in England and Europe. The Irish gauge is 5 feet 3 inches. The Canadian and Indian 5 feet 6 inches.

way distance between London and Exeter, or 24 miles less than by the Great Western and Bristol and Exeter Railways.

The grandest exceptional run ever made on railways was on the 5th January, 1862, the occasion being, when answers were brought to the despatches sent to Washington, requiring the surrender of Messrs. Mason and Slidell, who had been taken out of the "Trent," Royal West India Mail Steamer, by orders of Commodore Wilks. The steamer arrived at Queenstown at 10·5 p.m.: at 11·28 p.m., Irish time,* the special train started from Cork, and accomplished the journey to Dublin (166 miles) in four hours and three minutes; or at the rate of 41 miles an hour, including stoppages. The mail steamer "Ulster" arrived at Holyhead at 8·15 a.m. The special train started at 8·28, and it is from this point that the most remarkable part of the express journey was accomplished. The run from Holyhead to Stafford, 130½ miles, occupied only 145 minutes, being at the rate of 54 miles an hour, and although so high a rate of speed was not attempted over the more crowded parts of the line approaching London, the whole distance from Holyhead to Euston was performed by the London and North-Western Company in exactly five hours, or at a speed of 52¾ miles an hour—a speed unparalleled for so long a distance on a line crowded with traffic. By means of the invention for supplying the tender with water from a trough *in transitu*, respecting which details will be given in a subsequent page, the engine was enabled to run from Holyhead to Stafford without pulling-up to take water. This is the longest run

* There is a difference of twenty-six minutes between London and Dublin times, London being to the east, is the earlier; thus when it is for instance 9 o'clock, it is 9.26 in Dublin. Dublin time has now become universal time in Ireland.

ever made by an engine without stopping; but the engines of the Irish Limited Mail Trains, owing to this trough, run twice a day in each direction without stopping, between Holyhead and Chester, 84½ miles. The weight of these trains, exclusive of the engine and tender, is fully 80 tons; but the weight of the American special express, exclusive of engine and tender, did not exceed 20.

A few words with respect to the fastest trains on the Continent. Previous to the 1st of April of this year, the mail trains between Calais and Paris completed 203 miles, with 15 minutes of stoppages for passenger accommodation, in 5 hours and 50 minutes, about 33¼ miles an hour. Since the opening of the railway between Calais and Boulogne, the mail trains go to and come from Paris *viâ* Boulogne. The distance is shortened to 186 miles, and the journey is performed, 15 minutes of stoppages for passenger accommodation being allowed, in 5½ hours, or at the rate of 34 miles an hour.

The "Rapide," the night mail train from Paris to Marseilles, completes 537 miles in 15 hours 45 minutes, or at the rate, for this long journey, of 34 miles an hour. The day mail train from Paris to Bordeaux takes 10½ hours, a distance of 366 miles, or at the rate of 34¼ miles an hour. It is the fastest mail or express train in France that goes over a large extent of railway mileage, but its pace is 3¼ miles an hour less than the Scotch Limited Mail as far as Perth, 4¼ less than that of the Irish Express Mail, and 8¾ less than the express train of the Great Western from London to Exeter.

There is, however, one train in France that travels more rapidly for a short distance,—the 1·0 p.m. express from Paris to Rouen. It completes 85 miles without a stoppage

in 2 hours 22 minutes, or at the rate of 35½ miles an hour. Comparing this speed with that of the London and Dover express mail trains, it is less by 6½ miles an hour.

There are two express mail trains in Belgium analagous to those between London and Dover. They are the fastest in that kingdom. They complete the 78 miles between Brussels and Ostend in 2 hours and 17 minutes, with 3 short stoppages, or, at the rate of about 34¼ miles an hour.

There is a double daily postal service between Cologne and Berlin. The distance, 391 miles, is accomplished in 12½ hours, or at the rate of a little more than 31½ miles an hour, including stoppages for the refreshment of the passengers, amounting to nearly an hour on the whole journey.

It is a fact well known to railway officials of all grades, but not appreciated by the public, that it is much more difficult to keep time with trains stopping at many stations, than with express trains. Yet the explanation is very easy. People who travel by stopping trains are of totally different habits from those who travel by express. The greater part of the passengers of the former belong to the agricultural classes; and it is just this,—the farmer is not accustomed to be hurried, and he won't be hurried, neither are the farmer's wife, the farmer's sons, the farmer's daughters; the tradesman in farming towns and villages is like the farmer, he won't be hurried, and it is the same with the tradesman's wife, his sons and his daughters; neither will the workman, nor the workman's wife, nor his sons, nor his daughters, be hurried and flurried. In fact, no one is ever in a hurry, except in large towns and cities. The country was not made for people who are always in a hurry, therefore it is impossible to get country people in and out of trains with the same speed as railway servants can manage with town and city people, and the effect of all this is, a stopping train is,

much more frequently than "fast" or express trains, unpunctual, and it is especially so when it exceeds very much its ordinary amount of traffic. It is then sure to be very late, solely from circumstances beyond the control of the company, but of course the company gets all the discredit of the delay. On the other hand, express trains call only at a few first-class stations, and all the passengers' business can be satisfactorily and comfortably accomplished in the time that the train is compelled to stop while the engine is taking in fuel and water. Let it not be imagined that in this respect "they manage things better in France." It has been occasionally our misfortune to travel by stopping trains, not only in France, but in other parts of Europe. There is one of two undeviating and unvarying rules with regard to them. Either they are unpunctual, or they are timed for so slow a speed, and with such delays at stations, that unpunctuality by them is impossible. There are many passenger trains on the continent that do not average a running speed of more than fourteen or fifteen miles an hour.

CHAPTER V.

RAILWAYS AND THE POST OFFICE, CONTINUED.

We had written, in the previous chapter, all that relates to the Post Office, in the belief that the relations between that department and the railways had been, during recent years, of an amicable character. We regret however to find that, in this respect, we have been mistaken. The amicable relations exist, on the part of the Post Office, on the surface only, no deeper. The same antagonistic spirit flourishes, at all events in the minds of some of the officials, as resolutely as ever.

Our readers will perhaps remember that, on the 11th March, 1865, a Royal Commission was issued, nominating the Duke of Devonshire, the late Earl of Donoughmore, Lord Stanley, M.P., the Hon. E. F. Leveson Gower, M.P., the Right Hon. Robert Lowe, M.P., Sir Rowland Hill, Messrs. Roebuck, M.P., Dalglish, M.P., G. C. Glyn, M.P., Ayrton, M.P., Colonel Douglas Dalton, R.E., Mr. E. T. Hamilton, and Mr. J. R. Mc Clean, C.E., to make various inquiries respecting railways.

On the 19th of December following, a new commission was issued in substitution of the previous one, Mr. Monsell, M.P., being added to the number of Commissioners. The Earl of Donoughmore died shortly after it was issued; and, in consequence of Lord Stanley having become Secretary of State for India, he did not act for more than a short time. The report, dated the 7th of May, 1867, is therefore not signed by His Lordship.

It will not be necessary to follow this report, or to refer to the general recommendations contained in it. Some are very

good, and would no doubt be readily agreed to by most railway companies, if they were to take the shape of legislative enactment. Others are impracticable (such as that suggested for ensuring punctuality of trains), and like impracticable notions and ideas at all times, they "fret their little hour on the stage," and then cease to be heard of afterwards.

The evidence taken is voluminous; some of it is of a very desultory character, several of the witnesses having seized the occasion to vent their own peculiar theories, and, *sicut eorum mos est*, to inculcate the adoption of their specific or nostrum as the infallible remedy. The appendices, notwithstanding the introduction of much matter that is irrelevant for all large and practical purposes, contain a great deal of useful information.

The great and main recommendation in the report is contained in the 74th clause; it is therefore given *in extenso*. "On the various grounds we have mentioned, we cannot concur in the expediency of the purchase of the railways by the State, and we are of opinion that it is inexpedient at present to subvert the policy which has hitherto been adopted, of leaving the construction and management of railways to the free enterprise of the people, under such conditions as Parliament may think fit to impose for the general welfare of the public."

"As regards the purchase of Irish railways," the Commissioners add, at clause 80, "having come to the determination that it is inexpedient that the railways should be purchased by the State, we consider there is not sufficient reason for excepting Ireland from this general conclusion; but, as it has been the established policy to assist Irish railways and other public works in Ireland, we recommend that when Parliament thinks fit to make advances to Irish railway companies, the money should be lent for a fixed period of

considerable length, so as to enable the company to develop its resources before it is called on for repayment."

The Commissioners add, that these advances or loans should never be made to Irish railway companies on condition that their rates and fares should be reduced, that being a matter, the decision upon which should rest exclusively with the executive of the company.

The two dissentients from the report were Mr. Monsell, M.P., and Sir Rowland Hill. Mr. Monsell being of opinion that the Irish railways should be purchased by the State, and to this extent agreeing with Sir Rowland Hill, whose opinion is that the railways of the whole kingdom should become, by purchase, the property of the nation.

Sir Rowland Hill gives various reasons in recommendation of this suggestion, and summarises in his report, written, as we learn by its first paragraph, "in a growing expectation of dissent," his reasons with the following language :—

"In short, experience has now shown that railways are essentially monopolies; consequently they are, in my opinion, not suitable objects for ordinary commercial enterprise, in which each party, while striving for its own interests, generally contributes, perhaps in the best possible way, to the interest of all. It seems to follow that they cannot be advantageously left to independent companies, who, of course, manage them with exclusive reference to their own interests, but that they should be in the hands of those who will control the management of them with a view to the interest of the country at large, that is to say, in the hands of the Government.

"Proposing this, however, I do not mean to recommend that any Government Board should take upon itself, in the gross, the duty now performed by railway directors. For the direct management of the lines, I propose to provide by leasing them out, in convenient groups, to companies, partnerships, or individuals, as the case may be. An opinion in favour of leasing the lines will be found in the evidence given by Mr. Bidder before this Commission.

"What I recommend is, that either a department of Government should be created, or the superintendence of railways committed to one of the existing departments, and that the controlling power, thus established, should act as a lessor, not only in granting leases, but in fixing suitable terms and enforcing due observance of contract."

As Sir Rowland Hill was the only person of the fifteen Commissioners who subscribed to the doctrines advanced in the foregoing paragraph, it will be an unnecessary occupation of time to comment upon them.

The two chief witnesses upon whom Sir Rowland Hill relies are, his brother, Mr. Frederick Hill, an Assistant Secretary of the Post Office, and Mr. Edward J. Page, the Inspector-General of Mails. A considerable portion of Sir Rowland's plan is quoted as forming part of the evidence of Mr. Hill, and we shall only say of that gentleman just at present, although we shall have much to say to him presently, that if he had even a tyro's knowledge of the working of railways he would not have put forward the string of the assumed "benefits" which he asserts will be realised by his views being adopted.

To us, however, it appears very clearly, that if we lay aside all arguments, reasoning, plans, and suggestions but one, we will come to the real reason for Sir Rowland Hill recommending the purchase of railways by the State. It is that the Post Office may thereby acquire that complete control, and that complete mastery in respect of railways which the rights of property can alone give it over them. Mr. Page aids him by his evidence and assertions, in a manner that has compelled us to state in the opening paragraph of this chapter, that the friendly relations existing between the Post Office and the Railway, are, as regards the department, on the surface only. In its heart (if the Post Office have a heart) its feelings of rancour are just as uncompromising as ever they were.

But let us state, in the first instance, what are the opinions of the Royal Commissioners on the relations between the Post Office and the Railways. They are contained in the following extract from their report:—

"134. In connection with the passenger traffic we have to consider the question of postal communication.

"On the continental railways, as we have observed, the Government has conceded the lines to the companies on the condition that the mails are to be carried free. On the railways of this country, Parliament has reserved to the Post Office the right of requiring the railway companies to carry the mails as the Postmaster-General may direct, but has reserved to the railway companies the right to be paid for such service at a rate to be fixed by arbitration. The Postmaster-General is also at liberty to send a Post Office guard with a weight of mails equal to the luggage of an ordinary passenger, at the fares charged for such ordinary passenger, any extra weight being paid for according to the ordinary rates of the company.

"The Post Office authorities complain that the price they have to pay, under many of the arbitrations, for services rendered, is in excess of what individuals pay for such services, and that if guards are sent in charge of the mails as baggage, the railway companies insist that the guard can only carry the baggage from one end of his journey to the other, without intermediate receipt and delivery, and that, therefore, when they desire to use the trains by sending a guard with mail bags, without putting the trains under the statutory notice, the demands of the railway companies are exorbitant. They also state that they cannot require a company to run a train exclusively for their use, and that the law is defective as to the speed they are entitled to require, and as to the provision of apparatus for exchanging mail bags without stopping.

"The railway companies, on the other hand, complain that whilst by law the award should bind both parties for three years, the Post Office practically possesses the power of at once putting an end to it, if they consider it too high, by requiring some alteration of service, which may be a mere nominal alteration, and thus the Post Office may go on asking for fresh arbitrations until they get an award to their liking. The Post Office authorities deny that there has been any abuse of this power. The railway companies further complain that, by means of the book and parcel post, the Post Office has entered into competition with the railway companies for an important branch of their traffic.

"The Post Office is anxious that a fixed tariff for the conveyance of mails should be introduced into Acts of Parliament. The experience which has been already acquired must, by this time, suffice to enable a fair and remunerative tariff to be affixed to every service required to be rendered by the ordinary trains of the company, and the only reason why some fixed scale does not appear to have been adopted by some general Act is, that the Post Office has never urged it upon the consideration of Parliament on a satisfactory basis for legislation.

"It is quite clear, however, that at the present time legislative interference in this question has either gone too far or not far enough. If the Post Office had originally been left free to make its bargains with railway companies, it would probably have obtained greater facilities at lower rates than it now possesses, for the railway companies largely benefit by postal communication, and the feeling of the directors would obviously be to assist it; but the fact of the service being compulsory, to some extent neutralises such a feeling.

"We recommend, as the best course under existing circumstances, that a general Act of Parliament be passed to define all those points which have given rise to difficulties between the Postmaster-General and the railway companies; but we do not deem it expedient to enter into the details of the arrangements to be embodied in the Act. We merely point out that these services may be classed under two heads, viz.,—first, services analagous to services rendered to the public; secondly, services in trains to be run at special hours to be fixed by the Postmaster-General.

"The first class, viz.: services by trains when railway companies fix the time of starting and stopping, may be grouped under the following heads, viz.,—first, mails in charge of railway companies without Post Office guards; second, mails in charge of guards on Post Office responsibility; third, compartments, or one or more carriages.

"For this class of services a tariff might be fixed by a general Act. And if the Postmaster-General were to enter into communication with the railway companies, we see no reason to doubt that an equitable scale for these services would be agreed upon.

"For the second class of services, viz.: where the Postmaster-General fixes the time of starting or stopping, or requires an exclusive or limited train, the question of the proper remuneration for the service performed should still be left to arbitration.

"We have no evidence that the provisions of the Act which we have quoted in a former part of our report, allowing the Postmaster-General to override an award which is otherwise binding on a railway company, have ever been abused by him. We think such a power necessary for the public interests, and have not, therefore, suggested any alteration of the law in this respect.

"Another branch of traffic carried on in passenger trains, is the conveyance of parcels. The railway companies complain that the Post Office abstracts from them a large portion of this class of traffic, by means of the parcel post. The Post Office contend that the necessity for extending the parcel post has arisen from the inefficient way in which the railway companies have performed the parcel service; and the services which the Post Office under its Acts of Parliament is entitled to perform, seem to be limited to printed and written matter, and patterns.

"We think that there is a plain and obvious distinction between the service rendered by the Post Office in the conveyance of letters and printed matter, and that rendered by railway companies in conveyance of parcels. The Postmaster-General not only enjoys by law an exclusive monopoly of the conveyance of all letters, but he is also entirely protected from all responsibility for any default in the service which the Post Office undertakes to render to the public, and correspondents are left to rely, in the last resort, on the protection of the severe penal laws against the servants of the Post Office.

"We do not think it would be possible to apply this principle to the conveyance of parcels throughout the country.

"There is this further consideration, that the weight of letters received and delivered in each separate packet is exceedingly small, both in weight and bulk, as compared with the bulk and weight of railway parcels, which extend up to 112 lbs., and require, therefore a different organisation for receipt, delivery, and forwarding.

"So long as a railway company is paid a reasonable rate for the transmission of mails, they have no reason to complain of the extension of Post Office service.

"The expense lies in the collection and delivery, and it is quite competent to railway companies to organise a system of collection and delivery, and to compete with the Post Office by carrying parcels on the same terms.

"It is, moreover, to be remarked, that railway companies are not bound to carry parcels, nor is there any tariff for parcels, fixing charges for collection and delivery, in Acts of Parliament. The public is, therefore, at their mercy. We consider that a separate tariff should be laid down and published to govern the conveyance as distinguished from the collection and delivery of parcels, so as to enable the rates of charge to be kept down by the free action of individuals acting as carriers by railway.

"It is, however, apparent that the parcel service so far as interchange is concerned, can never be efficiently performed for the public until railway companies co-operate through the clearing house, to improve their arrangements for parcel traffic. Looking at the extent to which the railway system has now reached, we consider that the time has arrived when railway companies should combine to devise some rapid and efficient system for the delivery of parcels. We do not feel called upon to suggest the precise manner in which this may be carried into effect; but the employment of a uniform system of adhesive labels for parcels, somewhat similar to that now in use on some of the northern lines for the conveyance of newspapers, is one of the most obvious methods for facilitating payment and accounting. If the railway companies do not combine voluntarily, it may be necessary at some future time for Parliament to interfere to make the obligation to carry parcels compulsory, at a rate to be prescribed by law.

"On the companies effecting such an arrangement, we recommend that a general Act should be passed limiting their liability for each parcel to a certain amount, unless a greater value be declared and paid for, according to a settled scale, at the time of transmission, and that such further provisions should be made as may be found necessary to enable the companies to carry out their arrangements."

It will thus be seen that ten of the Royal Commissioners—the members of the Commission who would not be likely to be influenced by what may be called a departmental view of the subject—whilst stating the case both for and against the railway companies, as well as for and against the Post Office, limit their recommendation to the passing of a general Act to define the points which have given rise to difficulties; to which, at page 59 of their report, they add that "in cases where the Postmaster-General fixes the time of starting or stopping, or requires an exclusive or limited train, the question of the proper remuneration for the service should still be left to arbitration."

And the Commissioners, whilst very clearly denying the expediency of the Post Office becoming carriers of railway parcels, some of which "extend up to 112 lbs., and require therefore a different organisation for receipt, delivery, and forwarding," confine themselves to recommending railways to "combine for devising some rapid and efficient system for the delivery of parcels."

A correct view certainly. We are now desirous of offering some remarks upon the part of the recommendations of the Royal Commissioners which refers to a tariff being fixed by a general Act for the various classes of services required of railways by the Post Office. It would, we are convinced, be impossible to pass an Act of this class that would be of the slightest practical value, because the circumstances of every railway company, certainly of every district of country

through which a railway passes, are of constant variance. We need not go farther for evidence of this fact, than in the successive annual reports of Postmasters-General. Until 1862 each of them contained statements of the railway, horse, and foot mileage employed by the Post Office, and each item was subdivided into maximum, average, and minimum, not only for the United Kingdom, but for each component part of it. As may be imagined, the difference between maximum price and minimum on railways, were not only very striking, but they are also equally striking for the two other means of locomotion, especially so for foot messengers; these last varied—no doubt still continue to vary—from a farthing a mile (not enough we should have thought to pay for sole, to say nothing of upper-shoe-leather) to sixpence a mile. To this let be added what any person who reads Post Office documents will see constantly quoted, that before the opening of the railway from Carlisle to Glasgow, the proprietors of the coach that carried the mail between these two places, *paid* £200 a year for the privilege. It was because there was then a violent, and as it turned out to be, destructive competition on the road, but at the time it lasted, the Post Office was paying as high as, if we recollect correctly, 1s. 3d. a double mile for mail coach conveyance in another part of the country.

The Commissioners recommend arbitration in case of difference, when the Post Office requires an exclusive or limited train, and it seems that the extension of the principle to all matters of negotiation, when the parties cannot agree, affords the best means of arriving at a just and equitable solution. Arbitration, however, with the railways has always been the *bête noir* of the department.

Mr. Frederick Hill, having informed the Commissioners that he anticipates ("anticipations" to which Sir Rowland

Hill says, "I concur") "greater securities against accidents, and *also*, against assaults and robberies on railways (*query*, in railway trains?), by the establishment of a uniform system of signals (!), and by clauses in the leases imposing penalties for unpunctuality and other irregularities (what?), and requiring that means should always be provided for enabling passengers to communicate readily with the guard," winds up the list of "benefits" which the nation is to obtain from purchase as follows:—"Additional facilities for the conveyance of the mails, with a consequent increase in the number of posts, and in the celerity of communication, and the removal of the chief difficulty in the establishment of a parcels post."

If the reader will please to refer *ante* to page 106, he will see the number of postal services there are daily only between London and other post towns. Their name is legion, and we are indebted for the information given upon this subject exclusively to Post Office documents. In Liverpool,* there are

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* At page 6 of the Ninth Report of the Postmaster-General, dated 30th April, 1863, signed by Lord Stanley, of Alderley, it is stated, "Postal communication between provincial towns has also, in many instances, been made more frequent. Between Manchester and Liverpool there are not fewer than *eight mails* in each direction daily." At page 11 of the Twelfth Report, dated "March, 1866," and signed also by Lord Stanley, of Alderley, the following words occur:—"The town districts of Liverpool have now *six deliveries* of letters from Manchester daily, as compared with only *three deliveries* of such letters in 1863. The improvement in the course of post between ordinary correspondents in Liverpool and ordinary correspondents in Manchester, is at present only partial and one-sided. A scheme is under consideration, however, for the extension of the deliveries and collections in Manchester, and when this plan shall have been carried out, a very marked improvement will be effected in the course of post between these great towns, and will, I doubt not, be followed by a rapid development of their already large correspondence." The italics in the foregoing extracts are ours. To solve the difficulty, if possible, we obtained

either six or seven collections a day for Manchester,* and a like, or very nearly a like number at Manchester for Liverpool and intermediate towns, so that, for postal purposes, Liverpool and Manchester are practically the same town.

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the October number of the "Local Postal Guide for Manchester, (published monthly) by command of the Postmaster-General," and it appears by it there are *ten* collections for Liverpool at the head office, and *three* at the receiving offices and pillar posts,—one of which only began on the 4th of October, 1867. There are eight arrivals from Liverpool, and six deliveries.

* The following admirable and eloquent description of MANCHESTER is, with one unimportant omission, taken from *Engineering*, of the 22nd of March, 1867:—

"To the mechanical engineer the name of Manchester has a significance similar in a certain sense, to that which the name of Mecca has for the people of Mahommet's creed. 'He is not a true follower of the Prophet who has not been to Mecca once in his life at least;' so is the saying in the Orient; and, in drawing the parallel, we are tempted to say—he is not a true mechanical engineer who has not visited Manchester once in his life, who has not seen the monuments raised to the memory of the prophets of modern generations, only recently dead, and more than that, who has not seen the faces of those great prophets still living and daily effecting marvels and revealing truth for the benefit of future generations. With the monuments raised to the dead we do not of course mean any special bronze memorial of James Watt, nor the unsightly monument of Crompton which ornaments the central part of Bolton, nor indeed, the memorial of Richard Roberts, which *ought* to stand somewhere in Manchester, but *does not* stand anywhere. But there are 150,000 boilers in operation in Manchester and the manufacturing district surrounding it—we state this figure as estimated by Mr. Longridge, the chief engineer of the Boiler Insurance and Steam Power Company—they represent, perhaps, one million of horses' power in steam engines daily at work, and these we call the memorial raised by the town of Manchester to the name of James Watt. As for the monuments of Crompton and Roberts, they form great groups like the pyramids in the graveyards of Egyptian rulers, only more numerous, more valuable, and more useful. Every cotton mill, every manufactory of textile machinery, is a memorial to Samuel Crompton and Richard Roberts. Take the largest of these groups—the Hartford Ironworks, Oldham – there are 8,000 men under the command of one leading mind, assisted by every aid that mechanical appliances can give, and indebted in almost every one of the details of their

And so it is with the great net-work of towns in the north of England, as well as with towns in every other part of the country, north, south, east, or west. We confess to the weakness that if we are in a country town or village, we cannot

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machinery to Richard Roberts again, employed in carrying out the ideas of this great inventor for the benefit of themselves, their families, and mankind at large. What a sight to compare with that of a solid chimney standing between four bronze lions! It is characteristic to the engineering profession that the works of our great men form monuments for their names which no national munificence can equal.

"To pass from the memory of those gone by to those who make Manchester what it is at present, viz., the centre and metropolis of mechanical engineering, we need scarcely make an interruption in our cursory reference to the history of mechanics. Mr. William Fairbairn, Mr. Whitworth, Mr. Nasmyth, are fellow travellers of Richard Roberts on the road of progress. They also are erecting monuments to their names; and the great engineering establishments which bear their names, form some of the most important items in the great total of Manchester manufactories, which great total may be considered at this moment to represent almost every one of the more important branches of mechanical engineering in the widest sense of that term. To commence with coal-mining, the Lancashire coal-bed is one of the richest and most important of this country; its different seams are applicable to all the varied branches of industry, commencing with the most valuable of all, the cannel coal, down to the cheapest coal slack, which is still capable of being converted into coke of good quality, and by the assistance of the washing machine can be made to yield the best coke required for the smelting of hematite iron of the highest marks. We have entered in detail into some interesting points connected with the coal-mining and iron manufacture of this district, in our recent account of the Wigan Coal and Iron Company. The iron manufacture in that locality is rapidly rising. It is based upon an exchange of coal and ore with the Ulverstone district, and may thank the introduction of the Bessemer process for its recent prosperity and its excellent prospects for future success. The Bessemer process itself (this important element in modern engineering), has found a centre in Manchester and its neighbourhood. The Bolton Steel Works, the Lancashire Steel Works, the Manchester Steel and Plant Company, the important steel works at Crewe, and the Mersey Ironworks in Liverpool, form an aggregate power of production fully as great as that which is centred in Sheffield, and of course much greater than in any other part of the

pass the post office without having a look at the notice in the window, telling for what places and at what hours mails are made up and despatched, and from what places and at what hours mails arrive for delivery: we are therefore in the

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world, that small district in Prussia, on the banks of the river Ruhr, excepted. The foundries of Manchester, although their production does not reach that of the largest establishments in Scotland with regard to quantity, are fully equal to them with regard to quality and size of individual castings which they are capable of producing. We have had occasion to mention the hydraulic ram of the hoist for charging the Woodward cupola at Messrs. Dobson & Barlow's works, which has been cast in one piece, 22 feet long, standing on its end, at the Union Foundry in Bolton, and we have been informed that this foundry is laid out for casting articles of the heaviest description, up to a depth of 30 feet. In the Bolton Steel Works, the anvil of the 25-ton hammer, which has been cast in its place, is said to be about 200 tons in weight. Machine-moulding, with all its delicacy and beauty of form, is more developed in the Manchester district than in any other locality. We have heard of wheels 3 feet in diameter, with teeth pitched one-eighth of an inch, *i. e.*, about 900 in number, being moulded by machinery at the Hartford Works, Oldham. The application of machine-moulding to railway axle-boxes we have noticed in our description of the Ashbury Works. For the construction of stationary engines of different sizes Manchester, we believe, admits of few rivals. We have noticed the large blowing-engines, with 100-inch cylinders, 12 feet stroke, made at the Bridgewater Foundry, Patricroft; the pumping-engines for the Abbey Mills Station, and the Liverpool Waterworks engines, now in progress at the Union Foundry, Bolton; the beautifully finished rolling-mill engines for the Barrow Hematite Steel Works, made by Messrs. Hick, Hargreaves & Co.; and Messrs. Musgrave & Sons' engines at the Lancashire Steel Company's Works and at Barrow-in-Furness. All these, and numbers of others, which may be counted by hundreds, form the vast group of engine constructions in Manchester. Engineers' tools have had their early development, and still have their principal seat of manufacture, in this important place. One by one they have come into existence at the Atlas Works in their first and original types, have obtained their graceful shapes, the hollow castings of their framework, the scraped surfaces of their slides, and the dead accuracy of their movements, at Mr. Whitworth's works, and have then become standard types of form more or less closely imitated by every tool-maker, not only in Manchester, but all over the world.

"Of specialities in tools, such as Messrs. Collier & Co.'s multiple drills,

position of being able to state that despatches and deliveries are innumerable in the vicinity of railways; away from them, the collections and deliveries are at most twice a day, frequently not more than once.

Messrs. Hetherington & Son's new drilling machines, and some new tools at work at Messrs. Parr, Curtis & Madeley's, we have had opportunities of taking notice some short time ago. They are only single items selected out of a great crowd of others, and that great crowd again forms only one small part of the entire mechanical business of Manchester. We pass to boiler construction, and we find it developed into a branch of engineering by itself. It stands upon a higher level in Manchester than elsewhere, and we need only refer to our recent description of Mr. Adamson's works, if we desire a proof for this assertion. The construction of locomotives—and we comprise Crewe, St. Helen's, &c., in the name of that manufacturing district generally understood under the designation of Manchester by mechanical engineers—shows the same predominance over that of any other town as the branches previously named. For railway plant we have now the newly established Bessemer Steel Works, making rails, axles, tires, and other articles; we have the Ashbury Works, with their large production of carriages and waggons; for iron bridges, the Fairbairn Engineering Company's Works. Of the machinery employed in the Bessemer process, the manufacture is exclusively in the hands of Messrs. W. & J. Galloway & Sons, and Messrs. Hick, Hargreaves & Co. The Nasmyth and the Condie hammer, and almost all the rolling mills for weldless tires, such as Messrs. Collier & Co.'s., Messrs. Galloway & Sons', and Mr. Jackson's mills, belong to the workshops of Manchester, and form elements of its trade. In wood-working machinery the production of Messrs. Thos. Robinson & Son, of Rochdale, is the largest of that class. For shipbuilding and marine engineering we need go no farther than the Mersey; but in this line, and in the branch of agricultural machinery, the great centres of manufacture lie elsewhere, and must remain so in the future from natural causes. With the consideration of these facts we think it sufficiently established that 'the city of the tall chimneys' is more than what it used to be half a century ago 'the cotton metropolis;' it is now the metropolis of mechanical engineering as well. There is another important institution which gives to Manchester the character of a metropolis for manufactures, and that is the Exchange. To attend at the Exchange forms part of the business of a commercial engineer in Manchester, and the Exchange has thereby become one of the most important institutions for one branch of the profession. The Manchester Exchange forms a general place of appointment for all parties interested in the manufactures of that

"Celerity of communication." If Mr. Hill will refer to page 58 of the Royal Commissioners' Report, he will see that the average speed of the quickest trains in England (those by which the great mails are conveyed) is 36½ miles an hour;

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district, where every manufacturer expects to find everyone engaged in trade at a certain hour once or twice in every week. To point out what saving of time, what enlargement of power for transacting business, this institution has given to the whole industrial population of Manchester, will hardly be necessary, but the extraordinary aspect which the Manchester Exchange presents to the eye of a stranger entering it any Tuesday between twelve and one o'clock is worthy of a brief remark. There is a dense crowd, numbering by thousands of heads, filling the entire area of the large hall, which is divided longitudinally in three parallel passages by two rows of columns or pillars supporting the roof. By universal admission, a kind of rule seems to have been established, perhaps without its having ever been expressed in words. This rule refers to the division of the total space in the hall between the different branches represented there. One of the outer passages belongs to engineers and machinists; the central part is devoted to the manufacturers of textile fabrics; and the part of the hall at the opposite side is occupied by the mercantile part of the assembly, the cotton brokers, exporters of goods, &c.

"A stranger entering the hall for the first time may recognise the side belonging to the engineers at a single glance. Their faces, their general appearance, and their whole bearing are characteristic, and not to be mistaken. There is, of course, no possibility of knowing one engineer from one merchant at first sight, but an assembly of, say, two hundred engineers looks as different from a congregation of two hundred merchants as two groups of men possibly can be. Those habits of thought and observation, that consciousness of—we may say—creative power, that determination to succeed in spite of difficulties, which are the attributes of the mind of an engineer, never fail to show themselves in the outward appearance of the man; they may be too faint for recognition in the single individual, but they are stamped upon an assembly of the members of our profession, where the marks common to the group come out more prominently by repetition. There are other things clearly visible in the appearance of the great crowd collected 'on Change' which are not perceptible by observation of single individuals, and that is the state of the trade and the nature of the transactions afloat. Looking at the crowd from above, and knowing the positions which the different branches habitually occupy in the building, the manner in which the groups cluster together, and the greater or

the average for similar trains in France is 31 miles, and in other states of Europe it varies from a minimum of 20 to a maximum of 30. The speed of our fastest trains is stated at page 109, *et seq.*

We must also request Mr. Hill to refer to the whole series of Postmaster-Generals' Reports. Every one of them contains paragraphs under the heading "Accelerations," but in the tenth, eleventh, and twelfth, there are no less than seven and a-half pages devoted exclusively to this one subject. In the Tenth Report (undated, but bearing internal evidence of its being intended for the year 1862), it is stated, "a statement of all the accelerations which have been effected within the last ten years, or even a list of all the places in the United Kingdom which have now an earlier arrival, or a later despatch of letters than were afforded to them in 1854, would show conclusively that the Post Office has, during that period, laboured strenuously and successfully to meet the demands of the public. But such statements would be confusing from the multiplicity of their details." The Postmaster-General therefore confines himself to alluding "to the acceleration of the Scotch mails, which took place in 1859; to that of the Irish mails, which took place in 1860; and to that of the

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less speed with which they change their positions, give remarkably clear indications to the practised eye. The Manchester Exchange is to be rebuilt and very considerably enlarged. At a public competition of plans for a new Exchange building, Messrs. Mills and Mergatroyd, architects of Manchester, have gained the two first prizes, and they are now entrusted with the construction of the new building. There are some other points, with regard to which the town of Manchester has just commenced to take up its proper position as the great centre of mechanical engineering. A college for engineering science is to be established in the cotton metropolis very shortly, and the funds for this purpose have been raised by subscriptions amongst the leading members of our profession, who have responded to the call with a princely munificence."

French mails which also took place in the year 1860." These accelerations are so great, and bear so importantly upon the correspondence of the whole kingdom, not only *inter se*, but with the whole continent of Europe, that each is very completely and elaborately described. In the report for 1864, the Postmaster-General, in addition to mentioning several important accelerations, refers, in a triumphant tone, to the advantages which have been gained to the public by the adoption of railways for conveyance of mails in various districts both of Scotland and Ireland; and in the report for 1865, equal satisfaction is expressed, because most important accelerations were made in the speed of all the main postal trains throughout Ireland. This part of the report concludes as follows. "Contracts for the general use of all ordinary trains were entered into with the Great Southern and Western, the Dublin and Drogheda, and the Dublin and Belfast Railway Companies; and the contract with the Ulster Railway Company was extended. It was chiefly by means of these contracts that the improvements effected in the mail service in Ireland during 1865, were greater than they had been in any previous year for a considerable time past."

The foregoing is the language used in the three latest annual reports of the department, the last of which was written about the time that Mr. Hill must have been submitting to the Royal Commissioners his reasons why the nation would benefit by the purchase of the railways. And here let us mention a belief which exists in the Office, that for several years previous to the present year, the Postmaster-General's Reports have been drafted by Mr. Hill. This belief, however, cannot be correct, as it is not to be supposed that Mr. Hill would blow hot and cold, and write white and black at one and the same time.

"Celerity of communication" (to again quote Mr. Hill's words), "can only take place by increased celerity of trains." We believe that in the present state of our knowledge we have acquired on railways in this country, the maximum that can be accomplished consistent with safety; and we say in all seriousness, that if Mr. Hill be not content with it, and that the Postal Department insist upon higher speed, he ought, in order to be consistent, also to insist upon being placed on the fore-buffer of the engine, and thus to substitute himself for the director, about whom the late Sydney Smith wrote so pleasantly some years ago. If a Postmaster-General were also required to travel in mail trains, Mr. Darby Griffiths would, we should suppose, no longer experience (at all events in the House of Lords) the fatal difficulties which led to the rejection some four years back, of his Bill to revive for Members of the House of Commons the right of holding the office of Postmaster-General. Nay, it is very probable that the most serious opposition would be found in the House, upon which, on the previous occasion, he was so anxious to confer the privilege.

Before quoting in full the recommendations of Sir Rowland Hill, as regards railways and the Post Office, it is desirable to draw attention to the fact, somewhat remarkable, that the only persons upon whom Sir Rowland Hill relies for proving his case as regards the Post Office, are his Brother, Mr. Edward J. Page, and our esteemed friend Mr. Charles Hutton Gregory, C.E., who is "the arbitrator (should not the word be 'referee'?) for the Post Office." It certainly appears strange, that official testimony of a somewhat more independent character should not have been produced. Assuming that the Duke of Montrose had not acquired sufficient knowledge of the working of the system, there is Lord Stanley of Alderley. His Lordship was Post-

master-General for six years, and only retired upon the present Government coming into office eighteen months ago. Mr. Tilley, the Chief Secretary, has been connected with the department for a great many years, so has Mr. Scudamore, admittedly the most distinguished man in the service. The evidence of several of the district surveyors would have been valuable; but not one of them was called to corroborate, or to add to the testimony of Messrs. Hill, Page, and Gregory, the spirit of which testimony is manifest, even in the Index of Evidence, as published in the Appendix.

Sir Rowland Hill proceeds thus:—

"On reference to the evidence of Mr. Frederic Hill, Assistant-Secretary to the Post Office, Mr. Edward Page, the Inspector-General of Mails, and Mr. Gregory, C.E., the Arbitrator for the Post Office, it will be seen that the laws regulating the relations between the railways and the Post Office are, at present in a state unsatisfactory to both parties; the dissonance necessarily producing inconvenience to the public, owing to the restrictions which it places on the use of trains for conveying mails, and the consequent impediments to the extension of postal facilities.

"I concur with Mr. Frederic Hill, in recommending that, as fast as lines become national property, clauses be inserted in the respective leases, entitling the Post Office to such use of the lines as may be necessary for its purposes, and that at specified rates of charge; such rates being so arranged as to remunerate the lessees and afford them a moderate profit—say 25 per cent. on the bare additional cost of the service.

"As regards lines remaining in the hands of the present companies, it appears advisable that whenever railway companies come before Parliament for fresh powers, advantage be taken of the opportunity thus offered, by requiring the companies to perform the postal service at specified rates regulated on fixed principles, and providing for all ordinary contingencies; any existing contracts which may have a fixed term to run being allowed to continue in force until they shall be terminated in the ordinary course, under the conditions for that purpose provided in each contract. The rates should be considerably higher than those recommended for insertion in the leases.

"As regards the use of such trains as may be run by the companies for their own purposes, I concur with Mr. Page and Mr. Gregory in opinion, that

the rate of charge to the Post Office should be based upon the rate of charge which the companies make to the public for similar services; due allowance being made to the Post Office for the extent and regularity of its custom, and for its performing the duties of collection and delivery.

"As regards trains specially ordered and controlled by the Post Office, I am of opinion, that excepting a few very peculiar cases, the payment for the service should also be according to a fixed scale; and this I think should be so regulated, as at once to cover the additional expense to which the company may be put by the Post Office requirement (after fair deductions for any use of the train made by the Company itself), and to yield on the sums thus ascertained the ordinary 100 per cent. required for interest of capital, &c., and profit.

"This, I propose, not as a perfect plan, but as more convenient, and even more equitable, than the plan now in use.

"The following tariff is based on the above principle, and is accordingly recommended for adoption, as regards railways *not* belonging to the State.

"Tariff of rates to be paid for the conveyance of mails by trains under fixed notice:

"First. Trains exclusively employed by the Post Office.

	On the Narrow Gauge. Per Mile.	On the Broad Gauge. Per Mile.
"For a train (consisting of an engine and the usual break van) and one separate carriage for the mails	2s. 4d. ..	2s. 6d.
"For every additional separate carriage (the number and distance to be run by each being varied from time to time according to the exigencies of the service), an additional rate of	0s. 3d. ..	0s. 4½d.

"In cases where the distance between the stations—between which the mail train is required by the Post Office to run—is less than fifty miles, the distance to be paid for shall be increased by one-fourth part of the difference between the actual distance and fifty miles.

"In all cases where a mail train is required to run in only one direction, the mileage to be paid for shall be assumed to be greater by 50 per cent. than the distance actually ordered to be run; and, again, where the distance so augmented shall still be less than fifty miles, the payment shall be further increased in accordance with the rule laid down in the preceding paragraph.

"When mail trains are run during the night (*i.e.*, between 10 p.m. and 6 a.m.), an addition shall be made to the mileage charge payable by the Post Office for the distance actually required to be run, such addition being

determined by dividing the sum of 6d. among all the trains run in the night, whether Post Office trains or not.

"Second. Trains not exclusively employed by the Post Office.

"From the rate which would be chargeable against the Post Office if the train consisted only of the carriage or carriages required by the Post Office as above, a deduction to be made for every carriage of whatever description ran in the train for other than Post Office purposes (the company having a right, as above, of varying the number of such carriages), at the rate of 4d. per mile on the narrow gauge, and 6d. per mile on the broad gauge; provided, however, that the rate remaining to be paid by the Post Office shall in no case be less than the rate which would be payable for the use of an ordinary train under the tariff hereinafter prescribed.

"That in the event of any company satisfying the Board of Trade, or other Government Board yet to be appointed (as suggested in this report), that owing to circumstances not herein provided for, it has a claim to additional payment, the same shall be made.

"Tariff of rates for the conveyance of mails by ordinary trains:

"First. Where the Post Office requires a prescribed amount of space, and employs its own guard to exchange bags, &c.

	On the Narrow Gauge. Per Mile.		On the Broad Gauge. Per Mile.
"For the exclusive use of one compartment of a carriage, second or any inferior class, at the option of the Post Office	2d.	..	2d.
"For ditto of two compartments	4d.	..	4d.
"For ditto of three compartments	6d.	..	6d.
"For ditto of four compartments	—	..	8d.
"For whole carriage	8d.	..	10d.

"And for any additional carriage or portion of a carriage, at the same rates.

"Second. When the Post Office does not require a prescribed amount of space and the mails are exchanged by the train guard.

"For every 112 lbs. ordinary maximum aggregate weight of mails ½d. per mile; any portion of 112 lbs. being considered as 112 lbs.

"In the event of the Post Office requiring a carriage or carriages exceeding the ordinary dimensions (by which term "ordinary dimensions" is meant carriages whose interior horizontal sectional area does not exceed, in the case of the narrow gauge, 150 square feet, and in the case of the broad gauge 225 square feet), the Company shall have a right to call upon the Board of Trade to increase the charge for such carriage or carriages by an addition to the tariff rates proportionate to the increased size of the carriage or carriages; and on the other hand, should the Company, for its own purpose, run one or more

carriages exceeding the ordinary dimensions, as above, in any mail train, not devoted exclusively to the Post Office, then the Post Office shall have a right to call upon the Board of Trade to determine in like manner the increased amount of deduction in respect to such larger carriages.

"The compensation for insufficient notice of the abandonment by the Post Office of a mail train under notice, shall be one-fourth part of the full payment for the difference between the actual notice and the required notice of six months.

"The other difficulties pointed out in Mr. E. J. Page's evidence, seem to indicate that the law with respect to the mail service on railways also requires alteration or extension in the following particulars, viz. :—

"First. The Post Office should have the power of *requiring* railway companies, *by legal notice*, when necessary, to run mails to be employed exclusively in the conveyance of mails and officers of the Post Office.

"Second. The right of a mail guard or other Post Office servant, when travelling and paying his fare as a passenger, to exchange bags at intermediate stations without additional charge, provided the aggregate weight of mail does not at any time exceed that allowed to a passenger of the same class, should be made clear.

"Third. The right of the Post Office to require for a mail guard or other Post Office servant, a monthly, quarterly, or annual or other periodical ticket, at the same charge as is made to the public for the same distance and for the same period, should be made clear.

"Fourth. The mode of calculating the rate of travelling of a mail train, making allowance for the difference between the stops of the company's fastest train, and those of the mail train required by the Post Office, should be clearly defined.

"Fifth. The right of the Post Office to insist upon the erection and use of the mail-bag exchanging apparatus at the cost of the department, should be made clear.

"In another portion of his evidence, Mr. Edward J. Page dwells on the practicability and importance of establishing a small parcel post at an uniform rate of charge: pointing out, at the same time, the peculiar facilities and advantages for this purpose, which are afforded by the organisation and machinery of the Post Office; so superior in their operation and extent to any possessed by railway companies.

"It appears highly desirable that, as fast as railways become national property, provision should be made in the leases for giving effect to these views; and in the meantime, fully believing that the plan would prove beneficial to railway interests as well as to the public, it is hoped that arrangements for the purpose may be made (as suggested by Mr. Edward Page), for attaining the same end, with the concurrence of existing companies."

The recommendations of Sir Rowland Hill, as regards the Post Office and the railways, although drawn up with such elaborate and dogmatic precision, have not the slightest chance of ever being adopted; but as it is so unceasingly asserted and repeated, on Post Office authority, that railways are more costly to the department than the old road conveyances, and that it is a great hardship on the Post Office that it cannot get mails conveyed by ordinary trains, except at unreasonable rates, it is desirable to make an addition to what has been said in previous pages, on both these questions.

We must ask permission to go as far back as the year 1838. In that year, as we learn by a return laid before the Committee of the House of Commons which sat on Postal Reform, and which was presided over by the late Mr. Robert Wallis, M.P. for Glasgow, that the daily mileage of mail coaches in 1838 was 24,613, and the payments for this mileage were £84,103, being an average of 2¼d. per single mile. And we learn also, by an article that appeared in *Fraser's Magazine* of September, 1862, written, as we understand, by Mr. M. D. Hill, Recorder of Birmingham, from information evidently supplied from official sources, that the weight of the letters carried throughout the kingdom in 1838, was 750 tons. We find likewise, by returns furnished to Mr. Wallis's Committee, that letters formed 7 per cent. of the total weight of mails, consequently the weight of mails for the whole year 1838, was 10,500 tons. The latest dated Postmaster-General's Report, which contains details of postal mileage is that of the 30th of April, 1863. It specifies that the mails travelled daily 49,782 miles by railway in 1862, at an average charge for the whole kingdom of 6¾d. per mile. In the same year "mails were conveyed by mail coaches, omnibuses, mail carts, &c., exclusive of conveyance of mail bags from one part of a town to another," 33,371 miles each day, at an average cost of 2½d. a mile.

In 1866, the railway postal mileage, according to the evidence and statements furnished to the Royal Commissioners on Railways, was 60,000 miles a day, or, with deductions for greatly diminished mileage on Sundays, Good Friday, and Christmas Day, about 18,780,000 miles per annum. The total amounts paid to railway companies by the Post Office was £570,502, or about 7½d. per single mile. The total weight of mails carried by railways is certainly not less than 110,000 tons, so that, whilst the payments to railway companies in 1866 were about seven times as much as they were to mail coaches in 1838, the weight of mails carried is nearly ten and a-half times as great. But the rate of speed has been *quadrupled* in the course of a few years. In the olden time, increase of speed of even *half a mile an hour*, always added considerably to mileage cost, but by railways, the old ten miles an hour are converted into forty, with much diminished cost,—weight for weight carried.

And, again, as regards the constantly reiterated Post Office grievance, that it is impossible to despatch mails by ordinary trains, except at a higher rate than is charged for the conveyance of ordinary parcels of similar weights, and that the department is in consequence deprived of the opportunity of sending mails as frequently as they otherwise would despatch them. This however, as has already been shown, is a grievance, almost imaginary, inasmuch as successive Postmaster-General's Reports show (see *ante* page 106) that contracts have been entered into with almost every railway company—beyond all doubt with all the leading companies—by which the right of sending mails by any train, whether passenger or goods, it may choose to select from, has been acquired by the Post Office. In fact, out of 12,000 miles of railway which the department sends mails over, it has, as we believe, this right or privilege over 11,000 of them. But

all doubt on the matter can be removed by a return on the subject being laid before either House during the next session of Parliament.

But even supposing the Post Office had not the power it in reality possesses, of sending mail bags by whatever trains it pleases, let us consider for a moment upon what ground either of right or of equity, the department can claim the privilege of sending its mail bags at the same rates as the general public pays for its parcels, for the same distances. This question must be dealt with in two portions: transmission of mail bags with a Post Office mail guard, and transmission in charge of the guard of the railway. As regards the first. Why, in the first place, is the Post Office to have the privilege of sending a passenger in the shako and red coat of a mail guard, at a second-class fare, who is to have, free, the usual amount of luggage (not personal luggage, be it remembered) allowed to a passenger? This luggage, let it also be remembered, the mail guard is to have the right of taking along with himself into the compartment in which he is to travel, instead of its being deposited in the luggage van. There would, probably, not be any objection offered to this arrangement if the guard were to remain quietly and peaceably in the compartment with his luggage beside him, until the end of his journey. But this is not what is required or expected. As the train stops at each station, the guard is to get out of his compartment and then to hand certain portions of his mail bags to another servant of the Post Office who is on the platform waiting the arrival of the train. This person is to receive the bags handed to him by the mail guard, and this latter is to receive fresh mail bags, and then to return to his compartment. The same process is to be repeated on the platform of every station at which the train may stop, and during

the running of the train between station and station, the mail bags are to be continuously sorted and arranged, so as to ensure correct delivery throughout the entire journey. It is not the space of one second class passenger, but that of eight or ten, that would be required. Yet it is persistently contended that the proper remuneration for this service, conveyance, business, or whatever may be its appropriate name, is to be the single fare of a second class passenger—and no doubt, if the mail guard could travel within the limits of a return ticket, his employers would consider that that is the amount he should pay for the double journey—not a farthing beyond it.

But if the services of the mail guard are to be dispensed with, and the duties just described are to be performed by a Company's guard, the Post Office considers that the ordinary parcels rate from end to end is what should be paid—nothing for intermediate changes and shiftings, for the coming in of new mail bags and the going out of old ones. Yet the Post Office itself considers that all these parcels are entitled to special attention and consideration, for before a railway servant is entrusted with the charge of them he takes an oath or makes a declaration—the same, we believe, as is taken by Post Office mail guards; and in order that they may be considered Post Office servants *pro hac vice*, they receive, if we recollect rightly, a gratuity of a few shillings per annum. If this be not so, it does not, in reality, affect the man's responsibility: it is the oath or declaration that binds, not the gratuity.

It is impossible for any reasonable, unbiassed, or practical man of business to assert that the railway companies would not be entitled to a somewhat higher rate of remuneration than second class fare, if bags are in charge of a mail guard, or that the rate for *one* from end-to-end parcel, is the proper

figure for mail bags placed in charge of a Company's servant, to be worked by him as if he were a mail guard.

One more point on the subject of postal conveyance by railway. It shall be the last.

The Post Office discharges three functions in connection with letters and other postal documents. They are, collection, transmission, and delivery. The first and last are performed by Post Office servants; transmission, except for certain portions of foot rural transport, is invariably by contract. It is transmission alone that makes a letter of value as a means of intercommunication between persons residing, or situated, more or less distantly from one another. If, as traders, we purchased a ton of letter paper, its price would probably be about £62, or say 7d. a pound; and supposing it came some 80 to 100 miles, its cost would be increased by another twenty shillings, a sixty-second of the first cost of the article. Convert this pound, or this ton of paper into a ton of written letters, and, if we take each chargeable letter at a third of an ounce (the Post Office considers each to weigh a little more than a quarter of an ounce, but for the purposes of this calculation they are taken at the higher figure), a pound of letters, with a postage* stamp on each

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* The earliest historical notice that exists respecting stamps freeing letters through the post, dates as far back at 1653. In that year M. de Velayer, *Maitre des Requêtes* in the French Court of Chancery, established an office close to the law courts, in pursuance of a Royal Decree of Louis XIV., authorising him to sell for two sous each, stamped slips of paper with the words printed on them, *Port payé——————le——————jour du mois——————de-l'an.* The date of the privilege ceasing is not known; it was at M. de Velayer's death. As regards modern postage stamps, Sir Rowland Hill, in 1838, gave the credit of them to Mr. Charles Knight; on the other hand, Dr. Gray, of the British Museum, claimed to have suggested them in 1834; and Mr. Charles Whiting, of Beauford House, Strand, in his evidence before the Postal Committee of 1838, stated that as early as 1830, he had proposed

letter, becomes worth four shillings to the Post Office, instead of sevenpence as a pound of paper; and, by the same process, a ton becomes changed from £63 to £448.

The total cost of the Post Office service for 1865 was

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them to the Government for franking printed matter, and he exhibited several specimens to the Committee. Mr. Lewins, in *Her Majesty's Mail*, does not take a correct view on this subject.

On the 23rd of August, 1839, the Lords of the Treasury offered to "all artists, men of science, and the public in general," a premium of £500 for the best design of an envelope that should fulfil the double purpose of illustrating the universality of the new postal system, and of acting as a frank of the value of one penny. The premium was awarded to the late Mr. Mulready, R.A., but the appearance of the envelopes caused such fun, banter, and amusement, that they were withdrawn as soon as possible, and they are now extremely scarce. We hope we shall not be accused of one of the highest of crimes, if we mention a belief very current in 1840, that it was not to Mr. Mulready, but to a very exalted personage, that the authorship of the design should really have been attributed.

At the first institution of postage stamps, there were only two forms, black (very shortly afterwards changed to red), one penny; blue, twopence. There are now ten forms, the value of each of which varies from one penny to five shillings.

In France, in Switzerland, and in Belgium, in consequence of the cost of transmission of newspapers and other printed matter in those several countries being so low, there are postage stamps of the value of one centime, two, four, five, ten, twenty, thirty, forty, and eighty, each. France has also postage stamps of the value of five francs (four shillings) each.

The number of stamps of different values circulating in the different countries of the civilised world that issue them (and there is hardly one such country that does not do so), is rather over 2,000. In case the reader should be travelling abroad, he may perhaps like to know what he must ask for, as the equivalent for the English compound word "Postage-Stamp." If in France, Switzerland, or Belgium, the word is "*Timbre-Poste;*" if in Prussia proper or Sweden, "*Freimarke;*" Hamburg or Lubeck, "*Postmarke;*" Austria, "*Post-Stempfel;*" the territory that was Hanover, "*Bestelgeld-frei;*" Holland, "*Post-zegel;*" Italy, "*Franco-bollo;*" Spain, "*Timbre* (with the final *e* pronounced) *de Posta.*"

Timbromaniacs (so collectors of postage stamps are called), give employ-

£2,941,086; the net revenue, £1,482,522, a little over 50 per cent.; consequently, a ton of letters, by no act of the Post Office, except by its monopoly, which recent criminal proceedings show that it is determined to interpret rigidly, is

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ment, as we learn from the editor of the *Every Boy's Annual*, for 1866, to a considerable number of persons who are especially engaged in the collection and sale of foreign stamps. These for the purposes of the trade are of two orders, the "maculate," or those which have gone through the post, and the "immaculate," or those which, if the owner were in the country to which they belong, would give free transmission to his letters, the adequate amount of stamps being fixed upon them. Some postage stamps have already become out of date, in consequence of the dominions in which they were issued having been absorbed in other kingdoms. Thus, in Italy, there are no longer the postage stamps issued in the former kingdom of Naples, or in the overthrown Grand Duchies of Tuscany, Parma, and Modena. (The last Stuart Queen of England, wife of James the Second, was the Princess Mary of Modena.) In 1866, Hanover, Frankfort, Nassau, and Electoral Hesse, having been seized by Prussia and absorbed into that kingdom, have ceased to issue postage stamps. The sovereign of the largest territorial possessions, since the time of Imperial Rome, Charles the V., of Spain, reigning also as Emperor over Germany, Austria, Bohemia, Hungary, and the Netherlands, gave authority in or about 1540, to the Prince of Thurn and Taxis, to establish a line of posts from Vienna to Brussels; and the family of this House has, ever since, held special rights and privileges in relation to the postal systems of Germany, their posts being distinct from those appertaining to the Crown, in the kingdoms through which their rights extended. But these privileges absolutely ceased in the countries absorbed by Prussia in 1866, and negotiations have since been completed for the transfer to Prussia of the remaining postal rights of the princely house of Thurn and Taxis. Their cessation, however, will have no consequence as regards postage stamps, those of the Governments of the countries through which their privileges extended, only having been issued in them.

Had France at the commencement of this year, been able to obtain possession of the Duchy of Luxemburg there would not have been an absorption of postage stamps, as those in use are Dutch.

But, apart from political considerations, France has had a very fortunate escape, in one respect, by not obtaining the desired annexation. In the canton of Diekerch there are three rather picturesque villages, the names of which are

worth £225 net to it. According to the ideas of Messrs. Hill (2), Page, and Gregory, the railway should carry the ton of paper, converted into letters, at a high rate of speed, and with numerous conditions of a penal character, at the same scale of payment, or, if possible, at a lower, than the price which was charged for the original ton of paper sent by ordinary goods train, at slow speed, and without any special conditions attached to its conveyance.

The railway companies are willing to carry letters and other postal matter at a rate not bearing any proportion or ratio whatever to the profit which the monopoly gets the benefit of by their conveyance, but at a fair and equitable scale of remuneration, which scale shall be decided, in case of difference, by two impartial men (Mr. Gregory, do you come *quite* within that definition?), and if they disagree, by an umpire who, at all events, is expected to be impartial.

But, before we conclude, we must again ask on what grounds, other than the hollow ones of pretence, can the Post Office claim special exemptions, as regards payments, as well as special rights and privileges, without adequate

respectively, Schindermanderscheid, Oberschindermanderscheid, and Neder-schindermanderscheid. What the French, with their dislike to consonants, would have converted those words into it is impossible to say. Even "Nantzig," when they got possession of Lorraine, was changed to "Nancy," and Metz, instead of retaining its original German pronunciation, is invariably spoken in France as if it were written "Messe." Although the *Annuaire des Postes* for 1867, gives the names of upwards of 19,000 foreign post offices in Europe and North America, it has not ventured to include in it the above named Luxembourg villages; yet, there are among them several Welsh, Polish, and Russian towns, with many names totally unpronounceable except by natives, and even they must, at times, experience difficulty; witness—Solnychewsku, Wysselok, Domojirowe, Oiaskoe Sermanske (Russian); Jjewsku, Zawod, Wjätka (Poland); Yaysymudw, Llanfairpwllgwyngyll, and Llanfairynghornwy (Wales).

remuneration for them? Neither the Post Office nor any other department of the State assisted railways during their inception, or during their construction; on the contrary, whenever they had the chance of raising their hands against or making exorbitant demands upon railways, they never failed to do so. Innumerable instances in proof could be cited, but one only must suffice "in this connection," as our American cousins would say. When, in 1855, the Bill for the improved "passenger and *postal* communication between London and Dublin," was in progress through the House of Commons, the late Mr. Wilson, then Secretary of the Treasury, gave notice of the introduction of clauses to exempt the Post Office from payment for this improved service. It was only on the strongly expressed determination of the promoters of the Bill, that if these clauses were persevered in, it would be withdrawn, that they were abandoned. Mr. Wilson excused himself—for he felt excuse was necessary—on the plea that he was forced to give notice of their proposed introduction, at the instance of the Post Office, and that he remonstrated, in vain, against them.

It is quite right, it is absolutely necessary in the interests of the community at large, that, inasmuch as railways are the public highways of the land, the right of postal transmission upon them shall be secured in the most complete, prompt, and absolute manner that law can enforce. There must be no doubt or hesitation upon this point; but that limit passed, the postal department is, notwithstanding that its officials are of "Her Majesty's service," nothing more than, as a whole, an extremely well-organised, efficient *trading* establishment, protected, as a monopoly, by many Acts of Parliament. The railways have never shown themselves otherwise than ready, it might rather be said anxious, to serve the Post Office; but in this land of trade and commerce, their

managers look for proper remuneration for services rendered. No more is asked, and no more is expected. The law and practice have very wisely instituted a distinction between the manner in which ocean and railway mail contracts shall be entered into. Because the ocean highway is open to all, tenders for conveyance upon it are invited from all; on the other hand, with railways it has been very properly decided that they shall convey the mails, whether they like to do so or not; but the same law that has enacted this compulsion, has also prescribed the manner by which a just and reasonable remuneration shall, in case of difference, be obtained. Others than the lawfully-constituted monopolists of St. Martin's-le-Grand would long since have been satisfied. Unhappily, however, Alecto, Tisiphone, and Megæra* have lashed them into *furor*. Cannot the *crême de la crême* of the gods, the uppermost crust of society in Cælestia, invent or discover a Townsend's Sarsaparilla to purify their bloods; a Soothing Syrup—a Dalby's Carminative—a Balm of Gilead that can assuage their anguish? Or, if the gods fail, might not a dose or two of Holloway's Ointment, taken internally, be tried? In former days, the Earl of Aldborough, then in the flesh, but now, alas, only of "glorious, pious," and pillular memory, was wont to testify of it, as a wonderful remedy in *the cure of ulcers.*

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* The Furies have the faces of women; their looks are full of terror, they hold lighted torches in their hands, snakes and serpents coil around their necks and shoulders. They are sometimes called in Latin *Furiæ*, because they make men mad by stings of conscience. They are the offspring of Nox and Acheron, and are esteemed virgins, because, since they are the avengers of all wickedness, nothing can corrupt or pervert them from inflicting the punishment that is due to offenders. There are only three Furies; some add a fourth, called Lisso, that is rage and madness, but she is easily reduced to the other three. The office of the Furies is to punish and torment the wicked by frightening and following them with burning torches.—*Tooke's Mythological Systems of the Greeks and Romans*, 36th edition, revised, corrected, and *improved*. London, 1831.

CHAPTER VI.

RAILWAY RECEIPTS, WORKING EXPENSES, AND PROFITS IN THE UNITED KINGDOM—DELAYS AND ACCIDENTS.

However vastly the United Kingdom has been benefited by railways, we shall show presently that it is far otherwise with those who have invested their money in their construction. Those first opened in England were, no doubt, profitable to their shareholders, because they were great arterial lines that connected the leading places of the Kingdom together. Along such lines there always had been large traffic, and it was no doubt greatly stimulated by the facilities which the new mode of locomotion afforded for its expansion. But as fresh railways were completed, and as the capital invested in them increased, the profits receded. Even at the present time, with larger receipts per mile than have ever been taken, the position of railway investment is almost from every point of view, unsatisfactory.

The tide of the early prosperity of railways began to turn in 1840.

Proceeding at once to the middle of 1843, we learn that at that date the amount of capital invested was £76,280,000, and the gross traffic receipts were only £4,535,189. If 45 per cent. be deducted for working expenses, the amount for division among investors was only £2,494,358. If one-third of the capital invested be considered debenture capital bearing an interest of not more than 4 per cent., it leaves only £1,391,360 for dividend upon £51,000,000, or a little more than 2½ per cent.

In 1848 the capital invested in British railways was

£152,640,000, the gross traffic receipts were £9,933,552. Deducting 45 per cent. for working expenses—amount £4,660,097,—a balance of £5,273,455 is available for division among investors. Taking one-third of the capital paid up as debenture capital, bearing interest at only 4 per cent., it leaves £3,021,455 for dividend upon £100,760,000 of share capital, or at the rate of less than 3 per cent.

At the end of 1853, the capital paid up was £273,324,514 and the traffic receipts had risen to £18,035,879. The working expenses, at 45 per cent. of the receipts, were £8,116,151, leaving £9,919,728 available for division, but between 1848 and 1853 the rate of interest upon debentures rose to fully 5 per cent. Taking, as before, one-third of the capital paid up, as debenture capital, it leaves £5,364,320 for dividend upon £182,216,343 of share capital, or at the rate of a little less than 3 per cent.

Five years later—at the end of 1858—the capital paid up was £325,375,507; the traffic receipts were £23,956,749; the working expenses, £11,668,225. Taking the debenture capital as one-third of the whole, it leaves £6,245,310 for dividend upon £216,917,205 share capital—or a very little less than 3 per cent. But as by 1858, fully 25 per cent. of the share capital was preferential, and bore a dividend on the average of 5 per cent., there remains, after payment of a dividend upon this capital of £2,711,450, only £3,533,860 for division upon the £162,687,905 "ordinary" or unguaranteed share capital, that was then invested in railways —not quite $2\frac{1}{4}$ per cent.

On the 31st December, 1863, the capital paid up was £404,215,802; the traffic receipts were £31,156,397; the working expenses, £15,027,234. The amount of debenture capital, taken as usual at a third of the total capital, was

£134,738,600, the interest upon it, at 5 per cent., £6,736,930. Deducted from £16,129,163, the amount of the total net receipts, £9,392,233 remains for dividend upon £269,477,202 share capital, or nearly 3½ per cent. This would be satisfactory, as compared with the amount divisible upon share capital in previous years; but, unfortunately, the amount of preferential, in proportion to total share capital, had not only increased considerably between 1853 and 1863, but the rate of dividend had also advanced. The London and North-Western issued some at 5, the Lancashire and Yorkshire at 6; so also the London, Brighton and South Coast, then one of the most highly thought of companies for investment; and the London and South-Western, a company established, apparently, upon a very solid basis, had to issue preference capital at as high as 7 per cent. Nevertheless, although for present calculation, and for that of 1865, next to follow, one-third of the share capital is considered as preference capital, the rate is taken as not raised higher than 5½ per cent. £4,940,414 must therefore be deducted as dividend on preference capital, leaving only £4,451,819 for division upon £179,651,468, or at the rate of just under 2½ per cent. But as several of the companies—many of them large ones—paid dividends of 4, 5, 5½, 6, 6½, and some few as high as 7 per cent., a considerable portion of ordinary share capital received at the rate of 1 and 1½ per cent., and an equally large portion did not receive, as is well known, any dividend at all.

We close our recapitulations with the year 1865, the latest to which the published returns of the Board of Trade extend. On the 31st of December of that year the total capital paid up was £455,478,143; the traffic receipts* were

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* The following is a statement of the traffic receipts and dividends on unguaranteed stock, for 1865, of the leading English railways. For their mile-

£35,890,113; the working expenses, £17,149,073; the amount of the debenture capital, taken, as before, at a third of the whole, was £151,826,044, the interest upon it, at five per cent. was £7,591,302. Deducted from £18,602,582 the amount of the total net receipts, £11,011,280 remains for dividend upon the total share capital, which amounted to £303,652,099, equal to £3. 13s. per hundred pounds.* But deducting £5,566,900, dividend upon £101,218,000 as preference share capital, 5½ per cent., there remain only £5,444,380 for dividend upon £192,434,000, or at the rate of £2. 16s. 10d. for each £100 invested. What was stated at the conclusion of the calculations of 1863 applies with at least equal force to 1865, very small dividends for a very considerable portion of railway share capital, and none at all for at least an equal amount.

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age see page 107. London and North-Western, receipts £6,312,056, dividend 6⅞ per cent.; Great Western, £3,585,614, 1 per cent.; North-Eastern, £3,529,288, 3 per cent.; Great Eastern, £1,690,269, no dividend; North British, £1,309,865, no dividend; Midland, £2,728,131, 5⅜ per cent.; London and South-Western, £1,477,843, 5 per cent.; Caledonian, £1,432,475, 5¼ per cent.; Lancashire and Yorkshire, £2,150,643, 5⅞ per cent.; Great Northern, £1,064,799, 7⅛ per cent.; London, Brighton and South Coast, £1,055,116, 5¾ per cent.; London, Chatham and Dover, £446,896, no dividend. It is a fact worthy of notice, that some of the smallest lines pay the largest dividends. Thus the Whitehaven, Cleator and Egremont (10 miles), paid 10 per cent.; the Whitehaven Junction (13 miles), 10 per cent.; the Furness (53 miles), 10 per cent.; Taff Vale (76 miles), 9½ per cent.; Blyth and Tyne (36 miles), 9¾ per cent. In Ireland, the Dublin and Kingston 7½ miles long, is guaranteed nearly 9 per cent. by the Dublin, Wicklow and Wexford Company. The reverse and black side of the picture is, that there were no less than ninety-one railways in England, twenty-eight in Ireland, and eleven in Scotland, which paid no dividend at all.

* Statements have recently appeared in the newspapers to the effect that the per centage available for division upon the *whole* capital invested in English railways is 4, in Scotch 4½, and in Irish 3½. This, no doubt, is correct, but the average is diffused over both debenture and share capitals.

On the 31st of March, 1866, the National Debt of the United Kingdom was composed as follows: funded, £773,313,219; the estimated capital of terminable annuities £23,351,043; unfunded, £7,956,800; total, £804,842,949,* or only £349,364,806 more than the total of railway investments at that period. The "interest and management" of the national debt in the year ending the 31st March, 1866, was £26,233,288; but as the Banks of England, of Ireland, and of Scotland, are the chief managers of the debt, in exchange for privileges accorded to them, the item for management cannot be great—not sufficient to reduce the average rate of interest below £3. 5s. per £100 invested. The case, therefore, stands thus, if viewed as between the creditors of the British nation and the investors (apart from debenture and preference shareholders) in the railway capital of the United Kingdom: the former receive interest guaranteed on the faith, credit, and honour of the most powerful nation—at all events commercially—in the world, eight shillings per cent. per annum more than those who have embarked their money in commercial enterprises that, in our opinion at all events, have been second only to Free Trade† in achieving the present commercial grandeur of England.

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* The National Debt was diminished £3,994,102 in the year ending the 31st March, 1867. Its amount then was £800,848,847, composed as follows:—£769,541,004 funded, £23,351,043 annuities capitalised, and £7,956,800 unfunded. The interest and management were £151,510 less than in the previous year.

† Our American cousins do not exactly agree with us in notions respecting Free Trade. A worthy writer in the *New York Times*, of September last, under the *nom de plume* of MONADNOCK, writes thus:—

"The correspondents of English papers give melancholy accounts of dull business in commerce and manufactures in America, but the remedy for this is so easy, as pointed out in a *Times*' leader, that it is only necessary to call an

There is not an article of commerce that the railway cannot move—does not move; there is not an article of commerce that the railway does not move at speed never less than eight and generally ten times as great as it was

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extra Session of Congress and adopt it. You have only to remove all restrictions upon Free Trade. Repeal all duties upon imports, and every shipyard would be alive with workers, every factory in full operation, and the whole country prosperous and happy. But the trouble is that nobody in America knows anything about political economy. Under the actual tariff it is said that American manufacturers are undersold by those of England and Germany, and Free Trade would bring all right again. It happens, however, that England, with Free Trade, is scarcely building any ships, and that she is in serious danger from Continental competition. How is this muddle to be disposed of? With Free Trade, half the labouring population in England lives upon wages just above the point of starvation, with no resource in sickness or old age but the workhouse, and Ireland is in a state of chronic poverty and discontent. With Free Trade there is a perpetual war between capital and labour, and the enormous burden of pauperism is increasing. Americans may be ignorant of political economy, but I cannot see that the English are overburdened with wisdom, or that the practical results of their system are of a very enticing character. The working men of England believe in Protection, and the English Colonies practise it to the great annoyance of the theorists at home.

"After all, Free Trade is a proved impossibility. Parliament is constantly interfering with what, according to our philosophers, should regulate itself. The Poor Law system is itself a Protective measure. So are all the laws limiting the hours and ages, and regulating the conditions of labour. There are Acts of Parliament forbidding the employment of women in coal-pits, where a few years ago they worked naked like brute beasts; Acts forbidding the employment in factories of children of twelve years; and during the last Session laws have been passed for the protection of children in the numerous trades and in the agricultural gangs which would disgrace Dahomey. There is need of abundance more of such interference. In the black country, north of Birmingham, there is a large population engaged in making nails by hard labour, especially horseshoe nails. On an average, three females are employed in this work to one male. I wonder if in all America there is one female blacksmith. Even the strongest-minded of the advocates of woman's rights have not claimed for women the trade of a blacksmith. But here little girls from seven to nine years old, are set to work and kept to work, as long as they can stand,

by canal, until competition stimulated the pace of the latter. To what extent? From the once normal rate of two to that of three miles an hour—no more. But now, the merchant of London, who a few years ago could not have

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hammering at the anvil, roasting by the forge, blacked with soot, never seeing schoolhouse or playground, but employed their whole lives making horseshoe nails for a bare subsistence. Absolute Free Trade sets women and children to work at forge and mine, and reduces wages to the lowest possible standard, and that is the system against which humanity protests, and with which Parliament, in spite of theories, finds it necessary to interfere. Free Trade, as ultimated in England, is the most debased ignorance, the most abhorrent cruelty, the most disgusting vice, and the most heartbreaking misery that can be seen in any country calling itself civilised and Christian. There is too much freedom of all kinds in England, and especially a great deal too much in Free Trade."

The *Times*, of the 5th of October last, replies at great length. Having fully explained the reasons why the United States adhere to Protection, the writer proceeds:—

"Free Trade in this country has been the labour of several generations of scientific and public-spirited men; it has been established on principles that have acquired the force of axioms, and is now proved and illustrated by splendid results. It may be said to have outlived prejudice, and to require no vindication. This, at least, is true as regards the educated classes, for it cannot be denied that lower down in the social scale Protection lingers still, in company with many other heresies, superstitions, and manifold forms of unreason. Free Trade requires a man to look beyond himself, beyond his own employment, beyond his own class, to the common right and weal, and this requires a certain amount of moral education. But it would be scarcely possible to detect in any respectable organ of opinion any trace of the old error, however ingeniously disguised.

"The *New York Times* abuses Free Trade, by charging upon it everything unhappy or disagreeable in the condition of this country, and by asserting that Free Trade cannot be carried out consistently, and is therefore a hollow hypocrisy. Our agricultural labourers work like slaves for a pittance, our women and children make horseshoe nails, or traverse the country in gangs such as would disgrace the kingdom of Dahomey. Our shipyards are idle, our workhouses full, and the most repulsive and incessant toil receives wages just above starvation point. The English labourer pines for Protection; the Irish

what he required from the manufacturing towns of the north in less than ten days, receives in the morning, goods that were in the warehouses of Manchester, Leeds, Sheffield, or any other of such-like towns in the north of England on

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peasant for any possible escape from the allegiance and laws that keep him poor and degraded. Meanwhile, when the pinch comes, we give up Free Trade. In the opinion of the *New York Times*, it is an abandonment of Free Trade to provide workhouses for destitution, sickness, and old age; to prohibit the employment of women and girls in coal-pits; to limit the hours of factory children and provide for their schooling; to interfere with any trade for sanitary ends; or to aid any man, woman, or child to be what they ought to be, to have what they ought to have, or to do what they ought to do. Free Trade, the writer says, has produced all this hideous mass of misery, and, having done it, recoils in horror from its own work, and hands the matter over to Protection in the shape of public charity and philanthropy.

"As the writer has taken his picture of England from the columns of its public press, and from its Parliamentary debates and returns, we should be the last to deny that there is in it a foundation of truth. But it is only as if an American were to fill his boxes with the very worst and filthiest rubbish he could pick up in this metropolis, and take it home as a fair average and faithful representation of the capital of the mother country. There is no falsehood so mischievous as truth partially and malignantly selected. As to Free Trade, the writer does not know what it is, and probably does not care to know. It is trade emancipated from all restrictions and burdens which are not in the interest of all the parties concerned; that is, which are for one person against another, one class against another, or one nation against another. As it is in the interest of common humanity—that is, of all the world—that the destitute, sick, and aged should not be left to perish; that children should not be worked above their strength, or left without education; that women and girls should not be made mere beasts of burden, or reduced to savagery, these are not questions of trade at all, free or not free. Little as "Monadnock" seems to be aware, he is himself interested in the maintenance of human nature at its highest possible elevation all over the world. At all events, he must allow Englishmen to indulge the sentiments of benevolence without having it imputed to them that they do it on protective—that is, selfish—principles, and, in so doing, are offending against the great doctrine of Free Trade. But is it Free Trade that has produced the scandals which Protection, this writer says, is invoked in vain to mitigate? They all existed,

the previous afternoon. The important consumers of timber, 150 to 180 miles from London attend sales there, in preference to places nearer home, and purchase largely, with such advantage that the difference of price pays the difference of railway carriage three and four times over. We once saw chests of tea, that on a fluctuation of markets to the extent of a halfpenny a pound, passed twice from Liver-

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far worse, in the days of Protection. They are the evils of a crowded country. The population of these isles has doubled since the beginning of the century, but it is impossible to rescue an acre from the surrounding seas except generally at an extravagant cost, or even to reclaim an acre without risk of loss. The land won't employ all, and the surplus must do what they can. America, on the contrary, has millions upon millions of the best land in the world to draw upon as fast as she wants them. She has all the charm of novelty, as well as its more solid advantages. Till her citizens fell out with one another in the mere excess of youthful energy, and the mere exuberance of wealth and power, they had no need of an army to call an army, or of a fleet to call a fleet. It is folly, if not mockery, to compare such a country with England, as if the circumstances were equal, and laws responsible for all the difference. A septuagenarian may be healthy and strong for his years; his activity of mind and body may speak well for the moderation of his diet, the regularity of his habits and the calmness of his temper. What would be thought of a young man of twenty, of remarkable strength and stature, who taunted the old gentleman with his inability to carry a sack of corn, to throw a cricket ball a hundred yards, to run a mile in five minutes, to leap over his own height, to walk twenty miles in a day, to eat a dish of raw fruit or a quart of oats without indigestion? Should the old gentleman even confess himself unequal to such feats, that would be no disparagement of the habits and plan of life which have made him what he is—healthy for his time of life, strong, with good heart, and with duly cultivated mental powers."

The following, from the *Scientific American* of August last, furnishes a present comment upon the value of "Protection" in the United States:—

"The mills are running at a loss in Lowell, Lawrence, and most of the other manufacturing towns of Massachusetts, and throughout New England. The Manchester mills and print works have goods on hand unsold of the value of $2,000,000 (£430,000). The same state of things exists with the Amoskeag Company."

pool to London and twice back again. They were enabled to be moved about in this way because collection, carriage and delivery cost £1. 10s. a ton, or at the rate of a fourth of a halfpenny a pound for 200 miles. Fish circulates through the small as well as the great arterial systems of the kingdom with the regularity and precision of the post, because it is unceasingly carried from the fishing ports inland by the fastest trains and by those that convey the mail bags. The Irish railways alone transported 1,092 tons of salmon last year—301 tons more than in 1865,—and now, with our protected fisheries, this amount will be rapidly added to. Ice, an article of modern commerce, is already beginning to find its way south by means of the railway, and there is not the slightest reason why elevated Northern Scotland should not *grow* the commodity, just as it has for many years been made to grow in Massachusetts, and more recently in Norway.* It is un-

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* Since 1865 there is a regularly organised service for the conveyance of ice from Martigny, Sion, and intermediate stations in the Canton du Valais, Switzerland, *viâ* Lausanne and Dijon, to Paris. As many as fifty tons a-day are during several months in the year, thus carried. As we write we have before us the traffic estimates of the proposed railway from Geneva to Chamounix, forty-four miles long, and one of the items of business expected is the conveyance of ice to Paris, Lyons, Avignon, and Marseilles, to be carried in the first instance on a tramway or siding not more than half-a-mile from one of the glaciers of Mont Blanc, and then to be hooked on to the railway.

Of the value of ice in actual railway transport, we have the testimony of recent American papers. The *New York Times* says,—"Large quantities of dead meat are brought to New York from distances of 800 to 1,200 miles, by railway. Ordinary covered goods waggons are employed, and the meat, in quarters, is laid upon the ice, the ice being laid directly upon the floors of the waggons. Ice is laid also upon the top, and additional quarters are laid upon this, with a final layer of ice over the whole. At one time a break of gauge existed, and the waggons had to be unloaded, and the meat repacked in ice. This expense and delay are now saved. This mode of carrying meat is found to be very cheap and satisfactory."

necessary to pursue this subject, for we each of us see, know, and feel that the railway is the great and grand distributor of whatever we require for our wants, and of all that energy and enterprise require for the development of national industry.

And, as regards personal locomotion, how grand and sublime are the powers of the railway. We leave Edinburgh to-night. We travel warmly in the cold season; luxuriously at all seasons, and with complete unconsciousness of the fact that as each hour passes, we are nearly forty miles farther from our starting point. The break at London in the morning gives us the margin necessary for ablution and refreshment; that evening we are in Paris, in ample time, and some to spare, for starting by any of the rapid trains that convey passengers and mails east, south, and west. If our destination be the Mediterranean, we are at Marseilles at noon the next day, exactly 41 hours from the time we had left Edinburgh; yet, Edinburgh, by railway, combined with a short sea passage, and Marseilles, are exactly 1,239 miles apart. Our pace, including breaks and stops, has been over thirty miles an hour, whilst getting over the whole distance; excluding the breaks and stops, five and thirty. We can commence the ascent of an Alpine pass, or one across the Pyrenees, precisely at the same time as we should reach the Mediterranean, had our destination been in that direction.

In 1834, when the late Duke of Wellington despatched Mr. Hudson, belonging to one of the Government offices, to Rome, to inform Sir Robert Peel that he had been called upon by King William IV. to form a Ministry on the compulsive retirement of Lord Melbourne and his colleagues,*

* On the death of the Earl of Spencer, father of the well-known Lord Althorp, in 1834, His Lordship succeeded to the Earldom. When Lord Mel-

it was thought a marvel that the messenger was able to complete his journey on the twelfth day from that on which he left London. Bound on an analagous mission, a Mr. Hudson of the present day, would be a sluggard indeed, if he occupied even a quarter of twelve days. Without the superscription, such as our ancestors (who could write) put on their letters, "Haste! post haste!"* one put quietly into a London post office "receptacle" on a Monday morning, would, as the clock of St. Peter's † was tolling 9·45 on Wednesday evening, be found within the precincts of the Eternal City. The distance? 1,355 miles.

But why need we multiply instances. Let us then pass to say a word or two about what railways have done for the humbler part of our population. Have they not attained facilities for their pursuits as well as for their enjoyments

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bourne went to Brighton to receive the king's commands as to the appointment of a new Chancellor of the Exchequer, His Majesty informed the Minister that, under the circumstances, he considered the administration at an end. This announcement created great surprise and excitement in the political circles and throughout the nation. The Duke of Wellington being sent for, His Grace advised the King to appoint Sir Robert Peel premier, and this was done accordingly.—*Haydn's Book of Dignitaries.* The Earl Spencer, whose death is above referred to, died on the 10th of November. The Duke of Wellington held several offices until the return of Sir Robert Peel to England, at the latter end of December. His ministry only lasted until the end of March, 1835.

* "Post," in the middle periods of our Anglo Saxon history, was the man who conveyed a letter. "Haste! post haste!" was intended as an instruction or request to the bearer of it to use despatch in its conveyance, just as in modern days we occasionally see on the envelope of letters, "Immediate," or on the letters of the humbler classes, "With Speed," "A Post," was a character often introduced in the masques and allegories of the middle ages, as well as in the pageants got up for the amusement of Majesty during royal "progresses."

† "*L'Hora di Roma* is now the time all over Italy. It is 36 minutes in advance of Paris, and 45 in advance of that of London."

that were not dreamt of thirty,—twenty years ago? How prosperous the working classes now are; their labour is at a premium, and in demand such as it has never before experienced. They have never been remunerated so handsomely, and they have earned their pay with shorter hours, better ventilation, better food and more of it, than they ever had before. Unions and combinations, however deplorable in their course of action, at all events, are signs and manifestations of power;* and, now-a-days, we find combinations and

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* "I know, gentlemen, that I have detained you at considerable length. There is, however, one most important subject upon which I must speak, and you must bear with me for a while. I claim that during the whole course of my political and private life I have been, and I will continue to be, the friend and well-wisher of the working classes; and I think I know those classes well enough, and more especially in this my own immediate neighbourhood, to know this, that there is nothing they wish for so much as plain speaking and plain dealing, and I venture in their presence, I hope of many of them—and I trust my words may reach many of those which are not present—I venture to warn them against one danger which I, in common with others, foresee as a possible consequence of the great measure which we have given. Apprehensions are entertained that the working men, not satisfied with overcoming that political influence to which they are entitled, will be disposed to lend themselves as dupes to designing persons, who may endeavour to cajole them, with the idea of returning representatives to Parliament, with loud professions of being the only friends of the working classes, and of being sent to Parliament especially to promote legislative measures intended to conduce to their welfare. Now, I believe that there never was a Parliament more disposed than the present to look to the interests of the working classes, and to consult for their benefit. I can only hope that the next Parliament may be equally desirous of effecting that object, and equally acquainted with the best modes of carrying it into effect. But I warn as a friend—as an earnest and sincere friend, and speaking from the deepest conviction—I warn the working classes not to be led away by the flattering delusion of men who will tell them that they can induce Parliament to pass a measure of exceptional legislation for their especial and immediate benefit. They cannot induce, I hope, any Parliament to pass any such measure; and if such a measure were to be passed, the workmen would find to their misfortune that it was the greatest injury that

strikes extended even to agricultural labourers. Why? Because they know—stupid, heavy, unintelligent, and unenlightened though they may be—that, thanks to the railway, they can get at least as good employment elsewhere as in

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could be done them—I mean a measure attempting to regulate the rate of wages. To interfere between labour and capital is beyond the legislation of any Parliament; and, indeed, it would be, in short, only to lead Parliament to adopt such a course of legislation as has been recommended in some of the bye-laws we have heard so much of lately in connection with the various Trades' Unions in the country. Do not let me be misunderstood. I am no adversary or opponent of Trades' Unions. I think that, confined to their legitimate object, they are useful and salutary instruments for maintaining the rights of the labouring classes; and forty-three years ago I was the member of the House of Commons who first recommended and succeeded in carrying the abolition of those laws which made it illegal for workmen to agree to combine together not to work under a certain amount of wages. I therefore hope that what I say may be understood as not proceeding from one who desires to oppress the working man. I say that even strikes, objectionable as they are in principle, and injurious as they are to the working classes, are not an illegitimate or an illegal mode of proceeding. I say that if capital and labour cannot agree together, the only mode of bringing them together is the absence of one or the other—the capital to employ the labour, or the labourer to give the capital. I go further, and I say that so long as Trades' Unions are charitable associations, and their contributions go to the relief of those who are thrown out of work by no fault of their own, they are unobjectionable and meritorious; but, from the disclosures we have recently heard, it appears they have gone far beyond those acts. I do not mean to refer to those gross acts of intimidation, picketing, rattening, and acts leading to murder. They are acts which no person will defend, and the members of Trades' Unions themselves shrink from acknowledging their participation in them; but I say that these associations go beyond their limits when they agree not only themselves not to work, but to prevent and intimidate other persons from working. For my own part, looking to the public and private interests of the members, I cannot for the life of me understand how English workmen, entitled to make the most of their own industry and science, can submit to the tyranny under which they are groaning. Gentlemen, the whole course of our legislation for the last, I won't say how many years, has been a protest against class legislation. It has been an argument in favour of the free admission of all foreign

their own villages and hamlets. The farmer knows—feels—and, farmer-like, grumbles at this, but he also knows, that, thanks to free trade, and thanks to cheap railway conveyance, he is enabled to obtain, in the first instance, the highest

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goods, an argument in favour of free-trade, an argument opposed to all class protection. What would you say if, in the city of Manchester, Government were to impose, as in Continental countries, an *octroi* duty on the importation of every article of agricultural produce? The whole city would be in an uproar; and yet you submit to the bye-laws of associations which say that not only shall a tax be paid, but that not a single brick shall be laid in Manchester that is imported from a foreign country, that is, from beyond a single district, even from beyond the breadth of a canal. We are speaking here in the Free-trade Hall. What do you say of bye-laws which say that not a stone shall be worked in a quarry, to save an enormous additional amount of labour in carting it to the place where it is to be deposited, but that it shall be brought in bulk and worked by the workmen; and if it should have been worked in the quarry, then the farce is to be gone through of working it again by workmen in Manchester? If this system is to prevail, what is to become of your threshing machines and your steam ploughs, your mowing and reaping machines? You would have to resort to your old flail and other obsolete implements, and in manufactures to old handloom weaving; you would have to do away with the power-loom and all those inventions of genius which, while they have multiplied, to an indefinite amount, the productive capital of the country, have at the same time multiplied to an extent almost equally indefinite the amount and number of persons employed. I say that the British workmen would do well seriously to consider these things. Let me add that I have now been for two and forty years a married man; and let me advise the workmen when they fall into any difficulty to consult their wives. If the workmen are the bread winners, their wives are the bread managers; and let them ask their wives and their children, if they cannot answer for themselves, what they think in the long run they have gained from those strikes which they have carried on with so much perseverance and so much loss, greatly to the advantage of those who apply the strings and manage the puppet."—*Speech of the Right Hon. the Earl of Derby at Manchester, 17th of October*, 1867.

The author avails himself of this opportunity to give his experience of a strike, which he went through as principal officer of the Eastern Counties Railway Company in 1849. In that year the locomotive superintendent had frequently to direct engine-drivers of passenger trains, not to leave their en-

possible fertilisation for his land, and, in the second, when his crops are gathered, that he can dispose of them, notwithstanding immense cereal and other eatable imports, in markets far distant, and at prices which not only leave him

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gines at stations, except to oil or look after them. The order not having been attended to by some of the men, the locomotive superintendent issued a notice to the effect that a shilling fine would be inflicted upon any driver who quitted his engine except for the purposes above stated. A man, notoriously not a first-class man, but with an abundance of that quality which is vulgarly, though effectively, expressed by the word "jaw," undertook, as was afterwards learned, to set the rule at defiance. Accordingly on the next day, he alighted from his engine at a first-class station, and ostentatiously walked up and down the platform with his hands in his trowser's pockets; he was, of course, fined. He declined to pay the shilling; and, owing to what is unfortunately usual in such cases, the influence of outsiders, men who had never done the honest day's work of an honest workman in their lives, the engine-drivers to a man, gave notice of their intention to leave the service in a week, unless the order were withdrawn. Had the demand been complied with, the discipline of the line was at an end. The Board, for it now became a Board question, therefore, after much serious and protracted deliberation, took this view. Orders were consequently given to the principal officers to lose not a moment, and to spare no expense in procuring engine-drivers elsewhere. This was no easy task to accomplish in so short a time as a week, but by arranging for the diminution of the number of trains, and through the sympathy of the public, which in the first instance had been altogether with the men, but was totally changed when the real facts became known, the service of the line was continued, and within nine days from that on which the old hands had given notice of retirement, almost all the usual trains were restored to the time table. The anxieties of a strike on a great leading railway are of a fearful character; those only who, like the author and his other brother officers, had to go through one, can attempt to describe them, and the very best description that could be written would fall far short of their reality.

But as regards the men; at first their leaders and the outsiders who were urging them to destruction, were very sanguine of success; in fact, at the meetings that were held three or four times a day (for there was a species of sittings *en permanence*) it was assured to them. But as days passed on and the order was not withdrawn, the passions of the leaders rose; not only were threats uttered, but notwithstanding apparently most careful watching on the

nothing to complain of, but much to be satisfied with. We no longer hear the old party cries, "Protection to native industry," and such like. The modern cultivator does not

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part of men whose trustworthiness there was no reason to doubt, some of the engines were tampered with, tow was introduced along the piston rods to prevent their acting; parts that should be oiled were not oiled, and some other things were done that at the time were described as "not intended to do serious damage, just to maim and lame the engines abit, not to destroy them."

But in this strike, that happened which has happened in every other strike, combination, or conspiracy of men of the humbler classes, since the days that strikes, combinations, or conspiracies first existed—that is, there was what is usually known as "a traitor in the camp," for the author knew, within less than an hour after each meeting broke up, all the material facts that had occurred at it. It is needless to say that the information given was of great value in check-mating the men, and leading to their eventual defeat.

So far as regards the strike during its progress, and until its death; and now for its consequences. The men were no sooner completely beaten than they were of course deserted by the leaders and the puppet-movers. The subscriptions that were promised by "the trades" during the strike were not forthcoming when the strike was over. The very word implies that the workers work not, but that, nevertheless, the employers require their service. But, unhappily for the men, this had ceased to be so on the railway.

The reverse of the picture was now seen by the men whom Lord Derby so happily describes as the "bread-winners," as well as by the wives, whom His Lordship, with equal aptitude, names the "bread-managers." The two pounds sterling a-week—or more—that the men were accustomed to receive each Saturday afternoon, were no longer ready at the pay-table; no, they did not even have the ten, fifteen, or twenty shillings a week, so vauntingly promised just a fortnight previously. "Strike-pay" was promised for six months certain, actual payment was for one week only.

Engine drivers, as a rule, are not more provident than the other sections of the working community of the railways; yet, some had saved a little money, with which they expected to hold out a few weeks, by which time they believed they would easily get into work again. But, in this respect, they were mistaken. There is a rule on railways that when an engine driver applies for a situation, the locomotive superintendent of the company at which employment is sought, writes for the man's character at his last place. This is obviously requisite, not only as an ordinary precaution, but as an act of necessity, in case a man should

require the protection which the old law gave him, He finds he can protect himself in a far better manner without it.

Material prosperity is spread broad-cast over the land. It is true we have recently had a financial crash, and a financial crisis; but we have had no crush, nor are we going to have one. It is also true that our exports for the first six months of this year are, as a consequence of somewhat diminished trade, less than they were in the corresponding period of 1866. But, how much are they less? Not 7 per cent. of their gross aggregate. They are, however, 3 per cent. better than they were for the like time one year previously; and, note also,

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have been dismissed in consequence of intoxication, or owing to having caused an accident. In the case of the Eastern Counties engine drivers, the locomotive superintendents of the already opened lines throughout the country refused to engage them for fully a year after the strike had ended.

The more necessitous of the men appealed to the author, and to his brother officers, to be reinstated. Many a man, hard working, honest, and worthy, accompanied his appeals by tears, caused by bitter sorrow and anguish at their positions; and, some of them, when reproached, that they, so esteemed and respected, as they knew they always had been, by their officers—yet had deserted—invariably replied, that they were told, in the plainest terms, that if they did not join the strike, they, their wives and children, should be made to suffer for it in their persons. No doubt they then knew, what the world at large has only recently known, that such threats were meant, not as threats, but as realities. It was felt, however, that it would be unjust towards the new men if the old were re-admitted, at all events at first; but, by degrees, as vacancies occurred, some of those who had not emigrated, or who had not been taken on lines which just then were opened in various parts of the kingdom, came back into the service. But they came back at the bottom of the list of drivers, with six shillings a-day, as goods engine drivers, instead of seven shillings and sixpence a-day as passenger drivers of the first class, and it took some of them two years after re-admission, before they regained their former first-class pay. Of the distress in many forms which the strike caused to men who had no alternative but to join in it, innumerable instances could be cited, and the author was able to confirm by personal experience what he had always believed to be the case, that in strikes, workmen are usually beaten, and that, if even apparently successful, they are, they must be, losers.

that they are in those six months, £2,000,000 more than they were in the whole *twelve* months of fifteen years ago.

The twin sisters of progress in our day, are free trade and the railway. Both are universal as regards application; both are expansive and ever expanding. They always advance, they never recede. Free Trade, however, is, so to speak, national, or of the nation as an abstract. It requires for its world-spread development no more than that trade shall avail itself of the advantages which unfettered intercourse between nations imparts. The railway is the commercial reality of everyday life. Its existence cannot be started without aggregated capital. It then becomes the earnest, visible, and ever-working bee in the hive, and by the means which it places at the disposal of all, not only are intercourse and interchange facilitated between nations, but among ourselves movement is giant-like and unceasing, not only for ourselves actually, but for everything that pertains to us in our wants and necessities, no matter under what classification they may be placed. A grand prosperity has been achieved for the nation, but the gold to which much of its accomplishment is due has proved unfruitful. The fact, undoubted, need only thus be recorded. Others can say of it what they please as a grievance.

It may be said, and no doubt it is said, that want of success in railway investments has arisen from extravagance and mismanagement. Undoubtedly the assertion is in part correct as regards both the origination and the construction of most of our railways, but the incompetence of Parliament, its unfitness as a tribunal (notably so in the case of Lord Libeller), and the false system it has fostered, have contributed a much larger share than the other two elements to the present ill-favoured and unsatisfactory position of railways.

"Ah! but the working of railways! There, at all events, we have you." "See how defective it is. See the innumerable complaints constantly appearing in the papers about want of punctuality. See the frightful accidents that are occurring." "Yes; it is quite true that delays occur to trains. Nay, more, let it be granted that they are frequent—but frequent in proportion to what?—to the number of trains that are running night and day throughout every part of the kingdom?" "Yes." But the answer to that is—in 1865 3,448,509 passenger trains ran in the United Kingdom, which is at the rate of 10,387 trains each week day, and half that number is assumed as the number on Sundays, and on Christmas Day and Good Friday. Fewer long trains travel on Sundays than on week days, but on short urban and suburban railways the trains are, except during the hours of divine service, as numerous as on week days. Besides the passenger trains there were, in 1865, 2,108,198 goods trains, heavily laden with merchandise and minerals, or at the rate of 6,060 trains on each week day, and half that number on Sundays, Christmas Day and Good Friday, making a total each day of 16,447. At the end of 1865 there were, as has been frequently stated in these pages, 13,289 miles of railway open for traffic; at present (October, 1867) the number of miles is fully 14,300, and there cannot be less than 13,000 passenger trains a day. The proportion of trains arriving late to trains arriving to time is not three per cent. throughout the whole kingdom, and of those, nine-tenths are not more than fifteen minutes behind time. The average number of persons travelling each week day throughout the year is nearly 800,000; of these the very utmost that are detained beyond fifteen minutes is 3,000; so that for every 300 persons who travel per diem one must expect, on the doctrine of averages, to be

over fifteen minutes late, and one out of every thirty-four passengers may be a few minutes over time. Judging by the tone and the language of many of the letters of complaint which appear in newspapers, if we could suppose such a person as one utterly ignorant of everything relating to railways, he would believe that the officials experience a special pleasure and enjoyment when trains are irregular. Let us, in reply, assure that excellent and ignorant person that there is nothing more abhorrent (with only one exception, to which we shall refer immediately) to railway nature than want of regularity and precision. They are to him precisely as the *vacuum abhorendum* of Nature, Pan-Anglican and Pan-Mundal.* In everyday life, if things go punctually and pre-

* We would not dare to invent a word of bi-lingual derivatives if we had not the authority of all the bishops for so doing, and to this we may add that the member of the Episcopal Bench, who is a distinguished philologist, especially sanctions word-coining. Dr. Chenevix Trench, Archbishop of Dublin, says (page 151 *et seq.* of his "*Study of Words,*") that poets may at all times coin them, and prose (not prosy) writers occasionally, and His Grace refers, in proof, to Cicero and St. Augustine. "Pan," is of the old Greek, but "Anglican," as well as "Anglia," are Latin words, that were coined two or three centuries after Latin was living and every-day-spoken. "Anglia" is in reality derived from the Angles, an ancient German nation, an off-shoot of the Suevi, who migrated to the parts of Denmark, now known as Schleswig and Holstein. In process of time they came over to this country in greater numbers than the inhabitants of the other nations that dwelt along the East Coast of Northern Europe. Tracing the derivation of "Angli," we fear that the name comes from nothing more dignified than the Saxon word angel or engel, which signified a fish-hook. Being the most daring of all the pirates that infested the Northern Seas, they were specially distinguished as such among other nations, who said of the Angli, that they were like hooks, they caught all that was in the sea and made prey of it. Such were our ancestors of 2,000 years ago and upwards. (Has the vulgar saying of "with a hook," any connection with our origin as an Anglo-Saxon nation?) But hear what Professor Henry Morley says of Englishmen, through Saxon and English Literature, for more than thirteen centuries. "Our writers before Chaucer, were men speaking the mind of our country during the period of the formation of the language,

cisely with us, the whole of our machinery, both corporeal and physical, works pleasantly, without trouble and without difficulty. And so it is on the railways—as long as there are punctuality and regularity all goes right. It is, therefore, the fact that the unceasing efforts of the staff of every railway company in the kingdom are unremittingly directed to ensuring punctuality to trains, as far as human nature can ensure it. It is the interest of the officials of every grade to have everything on the line working with the precision and fidelity of clock-work. The slightest irregularity at any part of a line at once brings an accession of labour and of responsibility upon the shoulders of every official, be he high or low, connected with it. But happily Englishmen, among whom, of course, we include Scotchmen and Irishmen, placed in

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either in Latin, the common tongue of the learned, or in Anglo-Saxon, or in Anglo-Norman, or in English, of which the original elements were so variously proportioned and so incompletely blended, that it differs much from English of to-day. But with occasional impediment of a word that has passed out of use, the language of Chaucer, and those of his contemporaries who did not, like the author of "Piers Plowman," write in the less developed English of a rural district, speaks to us all yet with a living warmth. With Gower and Chaucer, therefore, begins the literature of formed English; and as the best fruit of John Gower's genius is contained, not in his English, but in his Latin poetry, it is by common consent to Geoffery Chaucer that we now look back as to the very spring and well of English undefiled.

"But our Chaucer was only a middle link in a long chain. Before his birth, the literature of this country had maintained, for a longer time than has passed since his birth, a foremost place in the intellectual history of Europe. To say nothing of the yet earlier Beowulf, English Cædmon poured the soul of a Christian poet into noble song 650 years before Chaucer was born. Six centuries before Chaucer, Bede, foremost of Christian scholars, was the historian of England, and Chaucer wrote his "Canterbury Tales," not quite five centuries ago. It is only because we have done so much during these five centuries, and every stroke of the work has told upon our present, that we are content to look on Wycliff, Chaucer, Gower, and the author of "Piers Plowman," as men of a remote time who lived in the dim caves about the bubbling

positions of trust and responsibility have always acted, and always will act, as Englishmen ought to act—from a consideration that influences them above all other considerations, a sense of duty. Hence no effort that railway officials can make is wanting when irregularities occur. But human means and human appliances break down at the moment least expected; no ingenuity, no foresight can prevent them. The weather, a slight shower of rain, which renders rails slippery at starting; a heated axle, caused by a few particles of grit getting into an axle box, notwithstanding the minute precautions taken to prevent such an incident; the delays, confusion, and blunders of passengers themselves,—an old lady insisting vehemently that she gave her little box with "my best bonnet in it," to the guard, whilst she had taken

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source of our literature. They did not live at the source of our literature, and they are not remote. Their aspirations were ours, their ways of thinking ours, their battle ours, except that we have the advantage of a few points gained.

"With Chaucer our own day begins, but he is not the day-spring of our literature. In prose and verse for century after century before the time of Chaucer, there was a literature here of home-speaking earnestness, practical wit and humour, that attacked substantial ills of life; sturdy resistance against tyrannies in Church and State; and as the root of all its strength, a faithful reverence for God. With all this, Chaucer was in harmony; and so too, as we shall find, have been our best writers of every succeeding generation. For in our literature, which is but our voice as a people, the mind speaks, that has so laboured as to win for England, almost alone among the nations, the inheritance of an inalienable freedom."—*English Writers from Chaucer to Dunbar.*

The most distinguished among our classical scholars, the Rev. T. E. Yonge, says, in his recent edition of the complete works of Horace, that, partly in consequence of some resemblance in our present national character to that of the Romans in their cultivated age, our literature bears many traces of Horace. His sentiments, if not indicative of deep thought, are so instinct with the practical common sense on which we pride ourselves, so genial, and, above all, so charmingly expressed, that they are continually recurring to the recollection of every educated mind, and re-appearing in our best authors. The *Pall Mall Gazette* hasn't a good word for Mr. Yonge, nohow.

it into the compartment, and in her flurry, agitation, or absence of mind* at the prospect of her coming to her station,

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* The most remarkable instances of absence of mind that we can remember reading are the two following:—

A writer in the eighty-seventh volume of the *Quarterly Review*, in the course of a very pleasant article upon the mechanism of the Post Office as it was in 1850, says: "Of dead letters, a considerable number containing property valued in two consecutive years at upwards of £10,000, have actually been posted without any addresses at all! Indeed many years ago, a blank undirected letter, on being opened at the Dead Letter Office in London, was found to contain in notes no less than £1,500. The only way," proceeds the writer, "in which this extraordinary, and at first sight almost incomprehensible, fact can be accounted for is, that the attention of the good lady or good gentleman who had folded and sealed such a valuable money letter had been so hysterically exhausted by the desire to do both with extreme caution, that, under a moral syncope, there had not remained between the crown of the head and the soles of the feet strength of mind enough to enable her or him to finish the operation. In short, the neglect had proceeded from what is properly enough called 'absence of mind,' which, in a description for which we humbly beg pardon, we will endeavour to exemplify by the following anecdote:—An over-tired Yankee, travelling in Kentucky, called at a log-hut for refreshment. The young woman of the hovel, that she might quickly spread the table, gave him her infant to hold, and in a few minutes laying before him a homely meal, she then modestly returned to her work. The long-backed man, naturally enough, was enraptured at the sight of the repast, and overwhelmed by conflicting feelings of gratitude to the young woman, of admiration of the lovely infant that sat smiling on his knee, and of extreme hunger, in a fit of absence of mind exactly such as caused the person in England to post a letter containing £1,500 without any address, he, to the horror of the hostess, all of a sudden, with great energy . . . . . kissed the loaf, buttered the child's face, and cut its head off—at least so runs the story in Kentucky."

Our second case of remarkable absence of mind is also American, and it has in one respect the advantage over the foregoing, it occurred at the beginning of this year. A judge "out West," presiding at a trial, so completely lost his presence of mind by the presence of a beautiful young English lady about to be examined as a witness, that when she had repeated the words of the oath, previous to her examination in the case, he placed his face for her to kiss instead of the book. The young English lady, not being acquainted with American jurisprudence, but having a great respect for the law, did as she was

had forgotten that she had at starting placed it on the seat beside her; at ticket collecting and ticket examining platform—for, alas! the prevalence of fraud and dishonesty among—we regret to say, and the remark only applies to a very few as compared with the general mass of travellers—all classes of ticket holders—renders occasional examination of them necessary ;* but, of course, the most frequent cause of

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ordered to do by the judge. His absence of mind was so great, that when the witness had completed her evidence he swore her again, this time, however, varying the form of the oath slightly; "The evidence you have given is the truth, the whole truth," &c. The kiss was in the act of being repeated, and there is no knowing how long the Judge's absence of mind might have continued, had not his wife very fortunately come on to the bench in the very nick of time to administer to him a sharp blow on one ear, which, for fear of ear-jealousy, was passed on to the other with almost electric rapidity. The spectators in court, as well as the counsel, attorneys, jury, and officers, were unanimously of opinion that the remedy was equally effective as it was rapid and pungent. As regards the beautiful English lady, the only inconvenience she experienced was that she had to be sworn all over again and to be examined all over again. Both the direct and cross-examining counsel were bachelors. "The next news that is expected to be heard of one of them," says the editor of the American newspaper from which the foregoing is extracted and its truth guaranteed, "and of the beautiful English lady, is in the portion of our advertisements that we call 'Our Ladies' Column'; and as regards the other counsel, we have already set up in type the following headings of a sensational article we intend to write: 'Appalling suicide of a very distinguished and remarkable Member of the Bar.—Disappointed love.—A beautiful young English lady.'"

* The class of all others that sails closest to the wind on railways is the class of "Bagmen." Ladies' dogs occasionally lead them to do a little bit of cheating. Innumerable pleasant stories could be told in connection with this subject. "Sweet little pets!" hidden under shawls and in hand-baskets are the most common modes of concealment, but others more erudite are occasionally practised. For instance, shortly after telegraphs were laid alongside of railways, a principal officer of a Railway Company got into a compartment of a stopping train, at an intermediate station. The train had hardly left, when an elderly gentleman, in terms of endearment, invited what turned out to be a little Skye terrier to come out of its concealment under the seat. The dog came out,

delay on railways proceeds from—without which the railway would be nothing at all—the engines. As is well known, all engines are made of the best materials of every description; but it is not so generally known that—according to the testimony of Sir Francis Head in 1849, and of the late Mr. Robert Stephenson, M.P., in 1866—a locomotive consists of

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jumped up, and appeared to enjoy his journey, until the speed of the train slackened previous to stopping at a station; the dog then instinctively retreated to its hiding place, and came out again in due course after the train had started. The officer of the Company left the train a station or two afterwards. On its arrival at the London ticket platform, the gentleman delivered up the tickets for his party. "Dog ticket, Sir, please." "Dog ticket! what dog ticket?" "Ticket, Sir, for skye terrier, black and tan, with his ears nearly over his eyes; travelling for comfort sake under the seat opposite to you, Sir, in a large carpet-bag, red ground with yellow cross-bars." The gentleman found resistance useless; he paid the fare demanded, when the ticket collector, who throughout the scene had never changed a muscle, handed him a ticket that he had prepared beforehand. "Dog ticket, Sir; gentlemen not allowed to travel with a dog without a dog ticket; you will have to give it up in London." "Yes; but how did you know I had a dog?—that's what puzzles me?" "Ah, Sir," said the ticket collector, relaxing a little, but with an air of satisfaction; "the telegraph is laid on our railway. Them's the wires you see on the outside; we find them very useful in our business, Sir. Thank you, Sir, good morning." It is needless to tell what part the principal officer of the Company played in this pleasant little drama. On arrival in London the dog ticket was duly claimed, a little word to that effect having been sent up by a previous train to be sure to have it demanded, although, as a usual practice, dog tickets are collected at the same time as those for passengers.

Sometimes scenes that ought to be very heart-rending and touching occur when a dog for which the fare has been regularly paid is separated from its owner, but as a rule, objection is not made to a dog travelling with passengers if they have no objection, and the dog be only a small one. We have more than once had conversations with ladies on "the great dog question," and some of them say truly that, as there is no charge on railways for "nasty cats and parrots, and other birds," or "for babies under three years of age," why should they be made to pay for what does not give a twentieth part of the trouble that only one baby causes. But after all, the number of dogs that are paid for, as compared with "free" dogs, is very small indeed.

5,416 pieces, all of which, although indebted to machinery for a large portion of the work of their construction, have, nevertheless, each and every one of them, to pass through human hands, and they have to be fitted and put together as carefully as the machinery of a first-class watch. From the moment that a locomotive commences duty she is examined daily by competent and skilled men, whose object is to detect, not only the slightest flaw, but the slightest indication that may lead to one; and if either be detected, to substitute another locomotive which has successfully gone through the ordeal of rigid examination. The engine-driver and firemen are also on the alert, for they know what the consequences may be to them if a break down or accident take place. Yet, in spite of unceasing watchfulness, portions of the machinery of an engine will give way, at places, too, never expected. An engine may apparently be doing her duty admirably, when all of a sudden a tube—a great artery of her internal organisation—bursts. With us weak mortals an internal artery bursting lays us low for ever; and, although so dire a fate does not attend the engine, she is, for all the purposes that she was engaged upon at the moment of her disaster, as practically dead as if she had never been gifted with motive power. No human foresight can prevent these and similar, although minor, accidents to engines, no more than we can tell whether the apparently healthy and vigorous man of the morning may not be the cold and lifeless corpse of the afternoon.

Yes, as long as we are human, and must depend upon human means (no matter how apparently complete and perfect they may be) for the fulfilment of our purposes, unrehearsed and unexpected incidents, leading to disappointment, annoyance, and vexation, are alike inevitable and unceasing. And so it is we have not, and never can have, Perfection

on railways; but we have the nearest possible approach to it in all that relates to their working. This is a sentence that may possibly—nay, more probably will—excite the terrible susceptibility of the *genus* which, without being "of the poets," is, nevertheless, vastly irritable—the great and magnificent British public. Why, the very losses of temper we display whilst we exact perfection in others, is proof that we are a long way from possessing it ourselves. Should we not remember one of the earliest lessons taught us by our Saviour, from whom nothing but goodness and wisdom could ever flow?—"He that is without sin among you let him first cast a stone." Cast the stone when you yourselves are perfect; without sin of thought or sin of action. But do we not witness daily, hourly, at each instant, that perfection does not belong to any of us? But let all men be assured of this—not on the testimony of quacks and nostrum-mongers, but on the undoubted evidence of fact—fact which is truth, pure, consistent, and unadulterated—that there does not exist in any one of the innumerable organisations, ramifications, aggregations, or embodiments throughout the empire a class of men that is more earnestly devoted to produce that near approach to perfection just referred to than among the well, yet often unjustly, abused humble servants of the railway community; for it is upon these men, in its last resource, that the public must depend for everything. At the stations of large towns and cities their individuality is naturally not so much noticed—or it might perhaps be more correctly stated, not so much known—as at smaller stations, being more completely mixed up in the immense human leaven of great populations. Still those of the public who frequent large stations know some of the men—inspectors, guards, and porters. They respect them; and if inquiry be made of the minister of the faith to which each

man belongs, he will be able to assert of more than nine-tenths of them, that each carries the moral discipline which he has learned on the railway into the transactions of his inner life. Besides attending at his place of worship, his little home is clean and respectable; his children are brought up—as they should be brought up—with respect for religion, with steady attendance at the school; and when the hours of play come round they are not the less ready, on occasion, to give or to receive the pummelling which every real English boy is ready to give or to receive, and is all the better therefor into the bargain.

Go to country stations; but before going there let one fact be stated, that the process of "winnowing" on railways, or separating the grist of the staff from the chaff, is always going on; that is, the men who do not come up to the standard—not of height, for on many railways this qualification is not regarded—but of moral and physical quality, are unceasingly being got rid of, or leaving the railway by discharging themselves.

At the country station is there a man of the district, of his sphere of life, that is more respected, or that enlists a larger amount of sympathy among all classes, than the station master? Cordial good feeling and considerate kindness are extended to every one of the persons that are subordinate to him. Why? There is not a man or woman of the land, high or low, rich or poor, "gentle or simple," who has either visited or who resides adjacent to a country station, that cannot answer the question, in language of the heart, much warmer than any that it would be right for us to make use of.

But accidents? Yes, and let it here be stated broadly that when they do occur, they are, of course, harrowing to the minds of the public, but, it must be added, they are

infinitely more so to railway officials. They are of a fearful character when they do happen, but, happily, they are not very frequent.

We proceed to give an account of them for the years from 1861 to 1865, both inclusive.

In the first-named year there were (including the estimation of 100 journeys as taken by each periodical ticket-holder, and they are included in this proportion in the calculation for the subsequent years) 178,929,039* passengers, of whom 46, or one in every three and three-quarter millions carried, were killed, and 781, or one in every quarter of a million, were injured from causes beyond their own control; 33, or one for every five millions and a half carried, were killed from their own misconduct or want of caution.

In 1862, 186,094,671 passengers were carried, of whom 26, or one in every seven millions carried, were killed, and 536, or one in every 333,000 persons carried, were injured from causes beyond their own control; and 9, or one in every twenty millions and a quarter carried, from their own misconduct or want of caution.

In 1863, 211,074,175 passengers were carried, of whom 14, or one for every fifteen millions carried, were killed, and 400, or one for every 550,000 carried, were injured, from causes beyond their own control; and 21, or nearly one for every ten millions carried, from their own misconduct or want of caution.

In 1864, 236,922,065 passengers were carried, of whom 15, or one for every fifteen and three-quarter millions carried, were killed, and 698, or one for every 350,000 carried, were

* It is to be understood that, although the numbers of passengers carried, as stated above, do not correspond with the numbers given at page 40 *et seq.*, there is in reality no difference, as in the previous pages the journeys of the ticket-holders are not included, but in this page they are.

injured from causes beyond their own control; and 21, or one for a little more than every eleven millions carried, from their own misconduct or want of caution.

In 1865, 261,577,415 passengers were carried, of whom 23, or 1 in every eleven and a half millions carried, were killed, and 698, or 1 in every 380,000 carried, were injured from causes beyond their own control; and 13, or 1 in every twenty millions carried, from misconduct, or want of caution.

If the several figures above stated be added together, it will be seen, that whilst 1,094,597,385 passengers were carried on English railways in five years, the number of persons killed from causes beyond their own control, that is, through some accident, neglect, omission, or commission on the part of the railway companies, was 124; and the number injured, in consequence of one of the foregoing reasons, was 3,449. Of these persons, although many were serious sufferers, the great bulk received injuries from the effects of which they were cured in a few weeks,—several in a few days. In the same five years, 97 passengers were killed from misconduct or imprudence.

In addition to the numbers enumerated in the foregoing statement, a great many persons, not passengers, are killed, either by trespassing on the railway, walking on it at forbidden places, or *by suicide*. In 1865, their numbers were—killed, 76; injured, 351. Many railway servants are killed or injured each year, mainly, we regret to say, through their own imprudence. In 1865, 122 were killed, and 83 injured.

The above catalogue is, undoubtedly, a melancholy one; one that it would, of course, have been all the better if it could have been avoided. But this, we say with deep sorrow and regret, is impossible. In the first place, as long as the working details of railways depend upon human hands and human heads, we shall have accidents. Some of the worst

accidents that have taken place on railways have been caused by the sudden failure, not of presence of mind, for there was no circumstance of a peculiar nature to require it, but by an utter failure, a total absence, as it were, of mind, just at the very moment that, by no means a great, but still some, mental exertion or exercise of mind was requisite. Signalmen, perhaps the most careful and cautious persons in railway service—men selected for the position, after much previous drill, in consequence of superior steadiness, sobriety, and good conduct—find, too late, from some cause utterly unexplainable, that the lever of "points," or of a signal has been turned to the left when it should have been turned to the right, or *vice versâ*. Fearful accidents occur from the machinery of the engine suddenly giving way, in consequence of which it leaves the rails, and the carriages behind it follow, and pile themselves one above another in a manner that is incredible to those who have not seen them. Other accidents arise from a sudden failure of portions of the permanent way; yet, possibly, the same permanent way has been carefully looked at by completely competent men only half-an-hour previous to the accident; for it may be mentioned, that there is no part of a railway road-bed that is not thoroughly examined every morning. In a line that is well signalled—and it may be taken for fact that there is no railway in the kingdom upon which there are not at present efficient signals—accidents are not the result of delays, although there is a very general belief in the minds of the public that it is otherwise. In two recent instances, accidents of a calamitous nature have been the result of a rail being taken up and not replaced before a train has come upon the spot; this description of accident having been chiefly caused by permanent-way signal-men not going sufficiently far back with the flag danger-signal to enable a train to be

brought to a stand-still before arriving at the spot where the line is interrupted, other precautions have been added, which now render an accident from this cause nearly impossible. But many of the fearful collisions, the terrible accounts of which shock the public mind from time to time, are caused by combinations of circumstances and incidents so extraordinary and unusual, that it is hard to conceive, on the doctrine of combinations, how they could occur. They do occur, nevertheless; and all that can be said with respect of them is, that the circumstances of every railway accident are carefully read and studied by every traffic manager, and most station masters, in order that a lesson or a caution may be obtained for future guidance. But these accidents will continue to occur—there are, we fear, no real means yet discovered to prevent them—and all that can be hoped for as regards the future is, that as experience of what are in short almost impossible circumstances is accumulating, we may perhaps arrive at an epoch where no further incidents of this character can be combined together for human destruction on railways.

What has been already said with reference to the earnestness of railway officials to prevent delays, applies with tenfold additional force to their never-ceasing anxiety to avoid accidents. There is no possible precaution that can be taken, which is not taken to endeavour to prevent them. In every way they are disastrous; they not only create intense personal suffering and misery, they are not only a risk to employés, because at any moment, from an act of imprudence or forgetfulness, employés may be the cause of them, and thereby render themselves liable to punishments that extend even to penal servitude; but even *after* their occurrence they become to them a source of immediate and immense responsibility. The line must at once, quick almost

as the flash of lightning, be protected against trains coming in either direction; the killed and wounded must be removed, and those to whom life still belongs must be attended to with the most earnest solicitude; arrangements must be made, and carried into execution without a moment's delay, so as to render the line fit for traffic again in the shortest period that human hands, aided with hearty good-will, can accomplish; all these duties must, nevertheless, be executed in the midst of scenes of havoc and misery that are enough to unnerve and prostrate most men, with as much coolness and *sang froid* as if the man's services at the moment were not more important than attaching an additional carriage to a train, in consequence of an unusual accession of traffic at a station, or the performance of some other such like formal piece of every-day duty.

But beyond all these considerations, there is one that cannot, when referring to the subject of railway accidents, be overlooked, or passed by without comment—their cost. In 1865, no less than £333,533 were paid in compensation by railway companies, in consequence of railway accidents. If to this amount be added £200,000, for destruction of rolling stock and road, the heavy expense involved in their re-establishment or replacement, the enormous law costs to which the companies are subjected in settling claims or in defending actions, mounts up the total amount of actual expenditure, owing to these fearful occurrences, to upwards of half-a-million sterling, or nearly $1\frac{1}{4}$ per cent. on the total capital expended on railways. To this amount might also be added loss of receipts which always occur to a railway immediately after the occurrence of a serious accident. From the one cause of cost, without seeking to find any other reasons, railway companies have good reasons to dread railway accidents.

Yet considering the immense amount of persons carried, the numbers killed or wounded is small as compared with the numbers of those who are sufferers from accidents to which we are all liable all over the kingdom. Taking the metropolis only, there were 375 persons killed in the year 1862, of whom 171 came to sudden death within city limits, the remainder being the casualties of this description for all the other parts of London.* If we refer to the Wreck

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* As these sheets are going through the press, we find circulating through the newspapers the following account of *carriage accidents only* in the streets of London for 1866 and the first nine months of the present year:—"Of the persons who frequented the streets of London last year, 205 were killed by horses and carriages of various kinds, or, on an average, four persons met with a violent death by this class of accidents every week. In 1865 the number was still greater, 232 persons being killed by street vehicles. These numbers, however, only represent the cases which terminated fatally; of those persons who were seriously, but not fatally, injured, there is no record. Of the 205 deaths in 1866, 36, or 17·4 per cent., were the result of falls from vehicles, and 17, or 8·4 per cent., occurred by collisions, &c., death resulting through being knocked down by or thrown out of vehicles. Of the number of persons who were run over, 14, or 6·6 per cent., were killed by omnibuses; 7, or 3·6 per cent., by carriages; 25, or 12·0 per cent., by cabs; 105, or 51 per cent. by heavy vehicles, such as carts, vans, drays, and waggons. In glancing at these results, it is worthy of notice that the greater portion of the fatal carriage accidents in the streets of London were not caused by cabs or omnibuses, the deaths by these vehicles amounting only to 29 per cent. of the total number. One-half of the accidents were caused by the heavy vehicles, and about 20 per cent. of the total deaths occurred among carters and carmen. Of persons run over, about 77 per cent. were males and 23 per cent. were females. Among males 26 per cent. of the deaths were those of children under ten years of age; among females about 60 per cent. of the deaths were those of children under ten years of age. The number of carriage accidents in the streets of London which terminated fatally in the first nine months of 1867 was 129."

Dr. Ogden Fletcher, the Medical Officer of the Manchester, Sheffield and Lincolnshire Railway, in his recent interesting work, *Railways in their Medical Aspects*, to which, as well as to the subject upon which it treats, we hope to

Register of the Board of Trade, for 1866, we will see that, whilst the number of wrecks and casualties to ships* from all causes, on or near the coasts of the United Kingdom was 1,860 (just 251 more than the average of shipwrecks for the

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refer hereafter, says that there are five times more people killed by carriages in the streets of London every year, than were killed on all the railways in Great Britain during any of the last seven or eight years.

* The aggregate number of vessels entering and clearing outwards from all the ports of the United Kingdom in 1866 was 403,598, being 5,657 less than in 1865. The total tonnage of these vessels in 1866 was 31,262,450, of which 21,255,726 was British, and 10,006,724 was foreign. Of this total tonnage about a third, or 10,761,413 was tonnage of steam vessels, of which 9,484,594 was British, and 1,276,819 was foreign. Thus, whilst the steam tonnage of Great Britain was not far from being one-half of its total tonnage, the tonnage of foreign steam vessels frequenting the ports of the United Kingdom was only a little more than an eighth of its total tonnage. The tonnage of the ships lost or damaged on or near the British coasts in 1866 was 428,000. The *Times*, in the course of a most interesting and lengthened summary of ocean and coast disasters for 1866, speaks in terms of just indignation of the unseaworthy state that colliers and other coasting vessels, but especially colliers, are permitted to go to sea, and concludes by stating that, "The aggregate loss of life is enormous, and so is the aggregate destruction of property. The former is a species of woe inflicted on humanity; the latter is practically a tax upon commerce. While the art of saving life on the coast is understood, thanks to the progress of science and to the stout hearts of our coast population, the art of preserving property is as yet but imperfectly known among us, and still more imperfectly practised.

"On reviewing the dismal record, we are bound to take courage from the many gratifying facts it reveals in regard to saving of life, which, after all, is our principal object in commenting on this doleful *Register*. Noble work has been done, and is doing, in that way, which has not only elicited the admiration of the British public, but also that of many foreign nations; and this was strikingly illustrated last July by the International Jury of the Paris Universal Exhibition awarding to the National Lifeboat Institution one out of their nineteen great gold medals, in acknowledgment of the important services it had rendered to shipwrecked sailors of all nations, hundreds of whom, and thousands of our own hardy sailors, it had rescued from a premature grave, and many homes from the desolation of widowhood and orphanage."

last five years, and 322 more than the average for ten years), the number of the lives lost was 896.* It is estimated that 500,000 persons navigate the ships both foreign going and coasting, in which these lives were lost. Their number would have, beyond all doubt, been greatly added to, but for noble efforts that have been established, as well as increased within very recent years, for saving life from shipwreck. During the last year and the first-half of 1867, no less than 1,600 lives have been saved by means of the 153 boats of the National Life Boat Association. A large number of lives has also been saved by the rocket apparatus which is furnished to the Coast Guard by the Board of Trade, out of the Mercantile Marine Fund.

In 1864 there was one life lost for every 109,715 tons of coal raised in British collieries. In that proportion there would have been 903 persons killed in collieries in 1866.

Accidents by fire are awfully numerous, and no class or rank of life is exempt from them, but they are naturally more numerous among the children of the humbler classes than in the superior stations of life. From the nature of

* The return issued by the Statistical Committee of Lloyd's, October, 1867, shows that the number of lives lost by casualties to ships for the half-year ending the 30th of June last was 687, being only 209 less than during the whole of 1866. 503 crews of sailing ships were saved and 17 crews of steamers. The number of crews drowned was 29. The return goes on to state that the total number of casualties to sailing ships in the half-year was 5,525, to steamers 500. The number of ships missing was 64, of steamers 7. Total number of ships abandoned 228, steamers 5. Of these 190 were totally lost. The number of collisions to ships is 808, to steamers 147; total, 955. Of these 85 were sunk. The number of vessels sinking from causes other than collision was 281. The number of ships stranded was 1,483, of steamers 126. There were three cases of piracy. The number of vessels burnt or on fire was 65 ships and 5 steamers. The number of cases of mutiny, sickness, casualties to crew, and refusing to do duty was 201. There were 11 ships waterlogged. Totally lost, 1,072 ships and 37 steamers.

female dress, the sex is not only more exposed to these accidents than men are, and the consequences are less fatal to males than they are to females. Fire-escapes have been a means, under Divine Providence, of saving many lives from destruction in houses on fire.*

Distressing and harassing as railway and other accidents are in this country, their number and frequency in the United States are utterly appalling. Of accidents to American railway trains in 1866, there were 82, by which 115 persons were killed and 607 were wounded. "This," says the writer from whom the foregoing information is derived, "is an improvement over 1865, when there were 183 railroad accidents, killing 335 persons outright, and wounding 1,427 others." It appears also that 1866 exhibits a better report in this respect than any year since 1861, but it must not be forgotten that in American accidents

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* Captain Shaw, the Superintendent of the London Fire Brigade, stated in his evidence before a Committee of the House of Commons that sat in 1867, on protection of life and property from fire, that there were 681 fires in London in 1840, one to every 2,800 inhabitants, and one to every 379 houses. In 1850 the number of fires was 868, or one to every 2,673 inhabitants, one to every 347 houses. In 1860 the fires were 1,056, one to every 2,613 inhabitants, one to every 335 houses. The fires in 1865 were unexceptionally high—1,502, or one to every 1,900 inhabitants, one to every 250 houses. In 1866 the number of fires was 1,338. The "heavy fires" are now about 25 per cent. of the whole number, but in 1860 they were above 40 per cent. The average sum spent upon a fire in London for many years has been £18. But fires are much more expensive in America: Brooklin (opposite New York), costs £35 each fire; Baltimore, £90; Boston, £157; New Orleans, £172. Of 29,069 fires which have occurred in the last 33 years in London, candles caused 11 per cent. of them; curtains nearly 10; gas nearly 8; flues nearly 8; sparks from pipes, 4½; lucifer matches, children playing, smoking tobacco, and stoves, each, 1½ per cent. The Fire Insurance Companies and the Fire Brigade consider one-third of the London fires as involved in suspicion; but Sir Thomas Henry, the Chief Magistrate of Bow Street, does not concur in this opinion.

"persons wounded" means only those who were not "killed outright" at the time of an accident. The great bulk of the wounded die subsequently, and should in reality be included among the killed. Persons who only suffer from minor wounds and injuries are not reported. It is only in England that the slightest injuries are reported and are included in the general account of persons injured. There were 23 steam-boat disasters on the various rivers and inland waters of the United States during 1866, by which 633 persons were killed and 156 wounded. In 1865, by 32 such accidents, 1,788 persons were killed and 265 were injured; but in 1865 a larger number of persons were killed in this way than in any previous year since 1854. What the numbers were in 1854 the writer who imparts the foregoing information does not mention; but he adds:— "These figures do not include any loss of life by disasters on the ocean." As, until the outbreak of the war of 1862, the mercantile marine of the United States was equal to that of the United Kingdom, we may conclude, even making allowance for its recent diminution, that there must have been more lives lost on the sea than on the lakes, because American-built ships have always been notoriously less solidly built than British, and because the United States does not possess life-boats and other means of saving life such as we happily have in such abundance in this country.

We conclude this chapter by repeating the painful admission that railway accidents are inevitable. It must, however, be added, as an act of justice to railway officials, that their efforts are never-ceasing to prevent them. But, after all, how feeble and powerless is poor humanity!

CHAPTER VII.

HORSES AND ENGINES—CREWE.

The locomotive is like the horse. The latter, with long thin legs and slight frame—at least made so by training—is the race horse. His pace for a length of not more than a mile and a half is at the rate of 25 to 31 miles an hour. The Derby race of 1867 was run by Hermit, the winner, at the rate of 31·4 miles an hour. It was won in three seconds less time, or at the rate of nearly thirty-two miles an hour, in 1866. Since the Derby, Hermit has been "nowhere" in all his races. A first-class hunter will go cross country occasionally at the rate of about twenty miles an hour. A first-class "roadster," with a weight suitable for his strength, will do fifteen miles, and maintain the pace for an hour. In the latter days of the old mail coach, the four horses *galloped* nearly the whole of seven miles in about thirty-two minutes, but, as contractors used to say, "the pace was killing." On one occasion there was a race between two coaches from Maidstone to London; the distance—from Maidstone to the Bricklayers' Arms, Dover Road, thirty-six miles—was accomplished by the winner in two hours and three-quarters. Perhaps there is no better road in all England to run a *coach* race upon—it is undulating slightly all the way; whereas a completely level road is fatiguing to horses. A fast gig-horse, with light weight behind him, will go twelve miles in an hour, and can maintain that pace for at least an hour; but there are many horses in England that, having only to draw "a sulky"—that is, a vehicle for but one person—would easily accomplish four-

teen and a half miles in an hour, and some are able to go fifteen. The old posters of former days could go eleven miles at the ordinary scale of pay for the post-boy. Properly "tipped," he would get over the ground at the rate of twelve, or even thirteen, miles an hour. The Gretna Green pace was fifteen, and sometimes, for the last mile or two, nearly twenty; the object being to distance an enraged father, and to get within the toll-bar, closed against the pursuer at the instant the pursued had passed it. But at this pace there was ever a risk of converting a marriage-feast into what Mr. *Punch* tells us all Scotchmen, with eye to main chance, prefer to all other meals—"a gude, mautter-of-fact funeral brickfeast, wie plenty of the whisky aut it."

An ordinary gig horse will go at the rate of ten miles an hour, and maintain the speed for an hour and a half. Butcher-boys' horses are wonderful at a spurt; but they could not maintain the pace for any distance. The stately carriage-horses—too highly fed, dressed, and cared for, to go at very high speed—can get over the ground at the rate of ten miles an hour; but they could not continue for any time at that speed. The ordinary carriage-horse, of less breed and mettle, will draw a heavier load, and can get over his nine miles an hour without distress. The large horses in the "unicorns"—the vans of Pickford's and the other great establishments of the same character—being a cross between the cart and the carriage horse, can draw a less load than a cart horse, but at a speed that averages fully five miles an hour; whereas the cart horse, whilst easily drawing a load of upwards of a ton in weight, could not go any distance, without breaking down, at a higher rate than from three and a half to four miles an hour.

From the foregoing, it will be seen that there is a difference between the ordinary pace of the cart horse and

the pace that the race horse can go for a short distance, of twenty-seven miles an hour—that is, the latter can go nearly eight times as fast as the former; but the difference of weight is more striking. A completely exact comparison is not possible, because in one case it is weight carried, in the other weight drawn—say eight stone against one ton and a quarter; one to twenty-five. We believe that the highest speed at which an English horse can draw a vehicle—but then it must be feather-weight and very high wheels—is at the rate of about seventeen miles an hour. The late Mr. Osbaldiston, of sporting memory, had a horse that slightly exceeded it. The American trotting horses of greatest celebrity trot nearly eighteen miles in an hour, and they never break into a gallop. "They are," said a sporting friend of ours, "taught only to trot; they don't know how to gallop."

The difference between the extremes of engines in different classes is not so great as it is with horses; it is, nevertheless, considerable. The express engine, with its driving-wheel of diameter varying from six feet and a half to eight feet, can carry a *light load* of seventy to ninety tons on a good—that is, a comparatively level—road-way, at the rate of fully fifty miles an hour, and can maintain this pace with perfect safety for a length of 90 to 100 miles, provided she can be supplied with water, as can now be done by means of the trough. Were she with a load behind her, not exceeding three or four carriages, she could, as a matter of performance, and without reference to the question of safety, maintain, without difficulty, a rate of sixty miles an hour. A four-wheeled coupled engine, each of the four wheels being of six feet diameter, and with appropriate dimensions of heating-surface, draws easily 120 to 150 tons, at a running speed of forty miles an hour. An engine, similar in other respects, but with wheels of five and a half

feet diameter, could run thirty-five miles an hour with an increase of load of from thirty to fifty tons. "Goods engines" of the most powerful class—that is, six wheels coupled—diameter of wheel four feet, can draw from 300 to 350 tons. This is also the diameter—in some instances it is even smaller—for the heavy engines used to ascend severe gradients.

In England we have no heavier goods engines on the narrow gauge than six-wheeled coupled. Their weight is about thirty-five tons. On the London and North-Western they are only thirty-one tons. Abroad, however, there are some few engines of much greater power. Thus, on the Orleans Railway, there is a ten-wheeled coupled tank locomotive with 19¾-inch cylinders, and 24 inches stroke. It is used principally to overcome a long and heavy gradient near Auvergne. The diameter of its wheels is three feet six inches. The "Steyerdorf," an Austrian tank engine, which has run about 20,000 miles in the last four years, has ten wheels, six of which are coupled in one coupling, four others, being "bogie" wheels, are coupled together separately. There is also an extremely ingenious intermediate shaft by which the two separate couplings are connected together. All the wheels are of the same diameter—3 feet 3½ inches. The other principal dimensions are, cylinder 18¼ inches, length of stroke 25 inches. This locomotive is principally employed upon a line with very stiff gradients and sharp curves. Its maximum running speed does not exceed thirteen miles an hour.

The Northern of France Company has a few engines of immense power. Passengers between Calais and Paris may have observed them occasionally at stations. Their funnels lay horizontally on the upper surface of the boilers until near their extremities, when they bend upwards; their

mouths are thus perpendicular, like the funnels of ordinary engines. The weight of each of these locomotives is nearly forty-five tons, and it is said that they can easily draw loads of 600 tons; but their adoption is not likely to be general. They must be very injurious to the road and very destructive of couplings, &c.

Not content with this weight, the Northern of France Company exhibited in the Paris Exhibition a four-cylinder twelve-wheel tank engine, made by Messrs. Gouin & Co., the weight of which, fully loaded with fuel and water, is 58½ tons. It has 1,920 feet of heating surface.

In 1863, M. Thouvenot, a French engineer, proposed, in a pamphlet published at Lausanne, the construction of a colossal locomotive, the weight of which was to be 82 tons, horse power 582, heating surface 5,512 square feet, estimated consumption of fuel 250 lbs. per mile. This engine was proposed principally with the view to the ascent of mountains by railway; yet the weight of the train was to be less than the weight of the engine—only seventy-four tons. The speed estimated was twelve miles an hour. No such engine has as yet been, or is ever likely to be, constructed.

The earliest passenger locomotive engines were all made with "inside cylinders," that is engines, the cylinders of which were within the framework. The late Mr. Joseph Locke we believe first introduced "outside" cylinder engines, that is, cylinders outside the framework, and at once visible to the eye. The "Crampton" engines—a great favourite in various parts of the continent, especially on the Northern of France Railway, but never in England—all have outside cylinders. The outside cylinder engine was very popular some twenty years ago, but the tendency of engineers, especially since the introduction of steel-cranks, is to revert to inside cylinders. Even at the Crewe manufacturing shops, where

formerly none but outside cylinder engines were built, engines with inside cylinders are now constructed. The same on the Great Eastern, and one or two other lines where outside cylinders were at one time exclusively adopted.

As regards locomotive makers—thirty-six years ago the trade did not exist in Great Britain. The following list comprises the names of about thirty firms and establishments, all actively engaged in the production of railway engines. Some can construct as many as 110 a year (Messrs. Sharp, Brothers, and Messrs. R. Stephenson & Co.), and there is none that cannot produce from twenty-five to thirty; their total capacity is about 1,500 engines per annum. Messrs. Sharp, Stewart & Co., and Beyer, Peacock & Co., of Manchester; Messrs. Robert Stephenson & Co., and R. & W. Hawthorn, at Newcastle; Messrs. Kitson & Co., Manning, Wardle & Co., Hudswell & Clarke, and the Hunslet Engine Company, Leeds; the Avonside Engine Company, at Bristol; Messrs. Hopkins, Gilkes & Co., Middlesboro'; the Canada Works, Birkenhead, now the property of Mr. Thomas Brassey; the Vulcan Foundry, Warrington; Messrs. George England & Co., New Cross, London; Messrs. James Cross & Co., St. Helen's; Mr. R. Brotherhood, Chippenham; Messrs. Fletcher, Jennings & Co., Whitehaven; Messrs. Hughes & Co., Loughborough; the Yorkshire Engine Company, near Sheffield; the Worcester Engine Company, Worcester. The Steam-Plough Works at Leeds have recently commenced locomotive building, and have already despatched engines for Mexico. The Bridgewater Foundry, near Manchester, has resumed this class of work, and is now making engines for the Brighton Railway. Messrs. Ruston, Proctor & Co., of Lincoln, are now locomotive builders; also the Lilleshall Company. Besides these makers, the railway companies are themselves large constructors of loco-

motives. The Crewe Works turns out 120 new engines yearly. The Great Western Company make large numbers of engines, both at Swindon and at Wolverhampton; the Midland Company produce many engines at Derby; the Brighton Company make locomotives at Brighton, as do also the South-Eastern at Ashford, the South-Western at Nine Elms, London, and the London, Chatham, and Dover at the Longhedge Works, Battersea. So also do the Caledonian Company at Glasgow, the North-London at Bow, and the Great Southern and Western Company at Inchicore, near Dublin.

The largest locomotive works in Scotland are those of Messrs. Neilson & Co., of Glasgow, and we know, from personal knowledge and experience, that they produce excellent work. The Glasgow Locomotive Works, Glasgow, is also a large establishment, with capacity for very extensive business.

There are no locomotive building firms in Ireland.

The money value of the new locomotives only, turned out each year by these establishments is close upon £4,000,000 sterling. Nearly a third of the locomotives built are sent abroad.

In 1864, the number of locomotives on the German railways was 4,768, 574 of which were manufactured abroad; Germany now not only builds her own locomotives, but she sent 1,000 last year to other countries, such as Switzerland, Italy, France, and Russia. The number of engines now used on the railways of Germany is 5,250, of which 340 have to be replaced every year, it being calculated that a locomotive seldom lasts longer than fifteen or sixteen years. The largest of the German factories is that of Borsig, of Berlin, which has built more than 2,000 engines since it was first established in 1841; the two-thousandth engine being the

one that was sent to the Paris Exhibition of 1867. As the one-thousandth locomotive of this establishment was completed in 1859, it follows that its producing capacity is about 125 engines a year. Of the others, the principal are that of Maffei, in Bavaria; that of the Austrian railway companies at Vienna; Egerstorff's, at Hanover; Henschl's, at Cassel; and the Carlsruhe Factory, which sent its four hundred and fifty-ninth locomotive to the Paris Exhibition.

The great locomotive establishments of France are not more than six in number; those of Messrs. Schneider & Co., at the Creusot Iron Works, of Messrs. Cail & Co., Messrs. Gouin & Co., Messrs. Kœchlin & Co., of Mulhouse, the establishments at Five-Lilles, Graffenstadt, and Commentry. Each of the great French railway companies make locomotives. The capacity of construction of all the establishments in France does not exceed 450 engines per annum. Although France is very proud of having exported a dozen engines to England, she is herself a large importer of them, principally from Belgium; and she requires an expansion of at least 50 per cent. of her present locomotive production before she can be independent, for them, of other nations.

The largest locomotive constructing and engineering factory in Belgium is that of the "Societé, John Cockerill," at Seraing, established in 1834, by our countryman of that name. Mr. Cockerill did not live to see the complete success of the establishment. The other leading locomotive constructing firms in Belgium are those of Messrs. Nicaise & Deleuwe, of Louvière; G. Raghens & Sons, of Malines; Messrs. Charles L. Cavels, of Ghent; "Compagnie Belge du Materiel des Chemins de Fer," at Molenbeek Saint Jean; Thivenet, of Marchienne; Haurez & Co., of Monceau-upon-Sambre; and A. Detombay & Co., of Marcinelle. The loco-

motive producing capacity of Belgium is about 600 engines per annum, and it can be easily extended.

Switzerland has one locomotive building factory, which was recently opened at Zurich. Italy, Spain, Russia, and Holland are not locomotive producing countries. About 4,500 engines per annum are now constructed in Europe, but in case of demand at least 2,000 a year more could be produced. Canada and Australia are the only British colonies in which they are made; in the former their first manufacture dates back about twelve years, but it is only in the present year that a commencement has been made of building them in Australia. The first Australian engine was made at Sydney, and others are now in process of construction there.

There are, according to the last Post Office returns, 814 head postal towns in Great Britain, besides at least 4,000 sub-postal towns, boroughs, and villages, scattered all over the kingdom. There are in France no less than 4,361 "Bureaux de Poste et de Distribution," both major and minor, and, as we have already said at page 144, Monsieur Vandal, in his *Annuaire des Postes* for 1866, enumerates about 19,000 postal towns in Europe and North America, exclusive of Schindermanderscheid, Oberschindermanderscheid, and Nederschindermanderscheid, which he has omitted to mention. With all these the French Post Office has correspondence more or less direct; so also has that of England. What the number of cities, towns, and villages, may be in the other parts of the world it is impossible to say; but this, at all events, is certain, that there is only one town, one great town, that has been conceived for the locomotive, born for the locomotive, wet-nursed for the locomotive, weaned for the locomotive, breeched for the locomotive, birched for the locomotive, apprenticed for the locomotive;

its *prima lanugo* was for the locomotive; and, finally, *prima lanugo* has since grown to manhood, and, by the usual metamorphosis, has been converted into bristles, through the locomotive.

Just thirty-three years ago, at the original planning of the Grand Junction Railway, Crewe, which otherwise might have never been more than a road-side station, was fixed upon as the site for the company's locomotive and carriage establishments. Its locality was convenient, being 42½ miles from Liverpool, and 54½ from Birmingham. Besides, it was at a comparatively poor and unfrequented part of the railway, where land could be—and actually, in the first purchases, was—obtained cheaply. Well, the line was built, the station was opened, and the repairing shops were erected. They were (in the plural number) "*parva metu primo*," for it was always the late Mr. Joseph Locke's habit to build with as much cheapness and economy as were consistent with efficiency and good working. The locomotive and carriage requirements for 97½ miles of railway, with six trains a day in each direction on week days and four on Sundays, added to which were a couple or three goods trains each way on week days, were not great. Therefore, the first erections at Crewe were modest and unpretending.

In process of time Crewe grew, for not only was the Grand Junction married with the London and Birmingham, neither bride nor bridegroom, however, retaining its former name, but each becoming "London and North-Western." A year or so after celebration of the marriage, Crewe became the junction point of the railway to Manchester; thence afterwards extended in a mystifying net-work of lines over all the manufacturing towns of Cheshire, Lancashire, and Yorkshire. On the left there was the line to Chester, one of the railways constructed by George Stephenson, which, in

1849, was extended, by his son Robert, to Holyhead. The main arterial railway did not, in the first instance, extend farther north from London, than the point where the Liverpool and Manchester Railway bisected it at Newton Junction; but, by degrees, it stretched out to Preston, then to Lancaster, then to Carlisle, and therefrom all over western Scotland. So that the insignificant, almost unknown, Crewe of 1837 had not only become, in 1849, a great centre of traffic of every description, but it was also the workshop, the family residence, when in health, of upwards of 220 engines and tenders, as well as the hospital and place of receptacle for such of them as became sick, halt, or maimed, while working the traffic of what became, at the time of the amalgamation, the northern division of the London and North-Western Railway. The extreme southern point of this division was, and we believe still is, Stafford; at the commencement of the railway—very much like Crewe—an insignificant and unimportant road-side station. In the north, Crewe engines worked as far as Carlisle, westward to Holyhead, and eastward along the mystifying net-work of lines which fertilise Cheshire and its two adjacent manufacturing counties. Upwards of one hundred engines were at work every day; and besides keeping them all in perfect order, the establishment turned out a new engine and tender every Monday morning, commencing on the 1st of January, 1848.

In 1849 the number of men and boys employed in all the shops devoted to engines was 1,600; the weekly wages of each averaged just a pound a week—£1,600. "Close to the entrance of the locomotive department," says Sir Francis Head, in his "Stokers and Pokers," "stands, as its *primum mobile*, the tall chimney of a steam-pump, which, besides supplying the engine that propels the machinery of the

workshops, gives an abundance of water to the locomotives, and also to the new railway town of Crewe, containing at present about 8,000 inhabitants. This pump raises about eighty or ninety thousand gallons of water per day from a brook below into filtering-beds, whence it is again raised about forty feet into a large cistern, where it is a second time filtered through charcoal for the supply of the town."

"After passing through a workshop," continues Sir Francis, "containing thirty-four planing and slotting machines, in busy but almost silent operation, we entered a smiths' shop, 260 feet long, containing forty forges all at work. At several of the anvils there were three, and sometimes four strikers, and the quantity of sparks that more or less were exploding from each, the number of sledge-hammers revolving in the air, with the sinewy frames, bare throats and arms of the fine hale men who wielded them, formed altogether a scene well worthy of a few moments' contemplation. As the heavy work of the department is principally executed in this shop, in which iron is first enlisted and then rather roughly drilled into the service of the company, it might be conceived that the music of the forty anvils at work would altogether be rather noisy in concert. The grave itself, however, could scarcely be more silent than this workshop, in comparison with the one that adjoins it, in which the boilers of the locomotives are constructed. As for asking questions of, or receiving explanations from, the guide who, with motionless lips, conducts the stranger through this chamber, such an effort would be utterly hopeless; for the deafening noise proceeding from the riveting of the bolts and plates of so many boilers is distracting beyond description. We almost fancied that the workmen must be aware of this effect upon a stranger, and that on seeing us enter they welcomed our visit by a special

charivari sufficient to awaken the dead. As we hurried through the din, we could not, however, help pausing for a moment before a boiler of copper inside and iron outside, within which there sat crouched up, like a negro between the decks of a slave-ship, an intelligent-looking workman, holding with both hands a hammer against a bolt, on the upper end of which, within a few inches of his ears, two lusty comrades on the outside were hammering with surprising strength and quickness. The noise which reverberated within this boiler, in addition to that which was resounding without, formed altogether a dose which it is astonishing the tympanum of the human ear can receive uninjured; at all events we could not help thinking that if there should happen to exist on earth any man ungallant enough to complain of the occasional admonition of a female tongue, if he will only go by rail to Crewe, and sit in that boiler for half-an-hour, he will most surely never again complain of the chirping of that 'cricket on his hearth,' the whispering curtain lectures of his *dulce domum*."

It is impossible to follow and narrate, in a work of this description, all the details of manufacture by which the rough masses of iron, steel, copper, and brass become converted into the perfect locomotive. We therefore close these extracts from Sir Francis' pleasant book, by what he says of the erecting-shop at Crewe, it being remembered that production being now more than double what it was in 1849, the delivery of an engine every three days is its usual amount, and sixteen or eighteen times a-year there is an interval of only two working days between the births of two engines :—

"At the farther end of the line of rails close to the north wall, there appeared a long, low, tortuous mass of black ironwork, without superstructure or wheels, in which the form of an engine-bed in embryo could but very faintly be traced.

A little nearer was a similar mass, in which the outline appeared, from some cause or other, to be more distinctly marked; nearer still, the same outline appeared upon wheels. To the next there had been added a boiler and a fire-box, without dome, steam escape, or funnel-pipe. Nearer still, the locomotive engine, in its naked state, appeared in point of form complete, and workmen were here busily engaged in covering the boiler with a garment about half an-inch thick of hair-felt, upon which others were affixing a covering of inch deep plank, over which was to be tightly bound a tarpaulin, the whole to be secured by iron hoops. In the next case the dome of the engine was undergoing a similar toilette, excepting that, instead of a wooden upper garment, it was receiving one of copper. Lastly (it was on a Saturday that we chanced to visit the establishment), there stood, at the head of this list of recruits, a splendid bran-new locomotive engine, completely finished, painted bright green (the varnish was scarcely dry), and in every respect perfectly ready to be delivered over on Monday morning to run its gigantic course. On other rails within the building were tenders in similar states of progress; and, as the eye rapidly glanced down these iron rails, the finished engine and tender immediately before it seemed gradually and almost imperceptibly to dissolve in proportion to its distance, until nothing was left of each but an indistinct and almost unintelligible dreamy vision of black iron-work."

In 1849 the coach repairing business of the northern division of the company, as well as the locomotive establishments, were at Crewe, but by a recent arrangement all the locomotive staff and material which existed at Wolverton (for it was, until the transfer, both the engine and the carriage repairing establishment of the southern division of the London and North-Western Company) have been removed

to Crewe. Wolverton has received the carriage repairing establishment of Crewe, and henceforward its duties will be limited to this service. As regards waggons and all the rolling stock relating to the goods department, a separate establishment has been formed at Earlestown, near the junction station of that name, 187 miles from London. By this arrangement Crewe will shortly be able to turn out some thirty or forty more engines a year, bringing the regular number of engines manufactured up to three a week,—of the money value of fully £7,000.

Let us now give some details of the growth of Crewe in the last nineteen years. In 1849, as has just been stated, 1,600 men and boys were employed there, averaging £1 a week each in wages. At present the number of workmen of all kinds employed, including the locomotive works, the steel works (of which anon), rail making, and "the steam shed," is about 4,350. It is never at present under 4,300. The wages due to "the hands" each week is £5,050, so that the average per person employed has increased from £1 a week in 1849, to £1. 3s. 3d. at present. In 1849 there were 360 miles "worked" by Crewe. Now the number is 1,328. In 1849 there were about 100 "Crewe engines" in steam daily; now there are from 800 to 850, varying according to the amount of work that has to be gone through.

Among the additional buildings which have very recently been erected is a new repairing shop, capable of accommodating thirty-two engines. It is fitted up with travelling cranes, worked by cord, on the principle invented and employed by Mr. Ramsbottom. Full and interesting particulars of this, and the other machinery now adopted at Crewe, will be found in the *Engineer* newspaper of February 9th and 16th, 1866, and in *Engineering* of the 25th of October, 1867.

In addition to the cranes just referred to, one has recently been supplied to the new iron foundry, in which are placed two very large cupolas required for the heaviest castings. This crane is capable of sustaining a weight of thirty tons; a smaller one lifts ten tons. There are also two hydraulic cranes, similar to those invented by Bessemer, for hoisting ingots out of the converting pit at the steel works; also a hoist worked by hydraulic machinery for lifting metal, coke, &c., from the ground floor to the firing stage of the cupolas. In the same range are a brass foundry, millwrights' shop, carpenters' shop and saw-mill, the whole covering an area of about 112,000 superficial feet.

Before quitting the subject of locomotive repairs, it must be stated that there are—what on other railways would be called large shops—minor establishments at Carlisle, at Camden, at Edge Hill, near Liverpool, at Longsight, near Manchester, and at Preston. The very heavy repairs, however, which all engines require from time to time are done exclusively at Crewe.

But, besides locomotive work at Crewe on the foregoing gigantic scale, and in all its infinities, the London and North-Western Company decided in 1863 to commence the manufacture not only of rails on the ordinary system, but also upon the new and marvellous process known as the "Bessemer Process," so called after the name of the distinguished gentleman who is its inventor. Thanks to this process, of which, owing to the scope and character of our work, we can only say a few words, a most important saving in the items of maintenance and renewals, is about to be effected on railways. The Bessemer works at Crewe were opened in September, 1864. The number of men exclusively employed at them is 378, and their wages are £444 a week. In the article of steel rails alone, the works turn out at the rate of

6,000 tons a year, and this is exclusive of the number of steel tires, axles, &c., also manufactured there. This number is increasing daily, owing to the increased economy effected by their introduction.* The amount of iron rails also

* A proof of the value and economy of steel rails is afforded by what has occurred at Chalk Farm station. At this part of the London and North-Western Railway the traffic is literally unceasing. On one line, for a short length, are ordinary rails, and Bessemer rails on the other. The latter have already outlived twenty-five sets of iron rails, and appear very nearly as fresh as when first laid down. Very nearly the same result has been obtained at the locomotive shops of the London, Chatham and Dover Company.

"Steel-laid Railways.—A line of railway laid in steel is now well known to be superior, in respect of economy of working, to one laid in iron. It requires less labour in keeping up, and, all other things being equal, it can be maintained in a better running condition than an iron way. The reasons of its superiority are apparent enough. A yielding roadway is a bad roadway for traction; and while bad at all speeds, it is especially bad at high speeds. Whatever may be the explanation, the following are well-established facts:—The axle friction of carriages, and the mere resistance to rolling along a smooth rail, are constant at all speeds. The actual resistances to the motion of trains upon our best railways are, however, considerably greater at high than at low speeds, and the excess is very much beyond that known to be due merely to the atmosphere. Besides the latter resistance, there is a considerable resistance known to increase in the ratio of the square of the speed, and it is, we believe, the universal custom of the profession to speak of this as the resistance due to "concussions;" and what but an irregular, uneven, or yielding line can cause concussions? These increased resistances apply to lines in good and even first-rate condition, and are much greater on lines not well kept up. The constant resistances are but from 8 lb. to 10 lb. per ton for the engine, tender, and train, so that the resistances due to "concussions" are about equal to the constant resistances at 40 miles an hour, and twice as great at 60 miles an hour. At the high and increasing speed at which railways are now worked, these "concussions," due to the irregularities of our lines, thus absorb the principal portion of our locomotive power, and entail a heavy charge in the shape of working expenses. But for these "concussions" our lines might be worked, probably, at 35 per cent. instead of 50 per cent. of their present gross receipts, there being always a considerable proportion of the working charges which, like management, station attendance, &c., are independent of the condition of the

manufactured is about 14,000 tons a year. As renewals of rails are required on those parts of the system where the traffic is heavy and the trains are frequent, iron will be superseded by steel rails. It is probable that, eventually, the latter only will be found on the London and North-Western system. This, however, is not likely to be the case for some years to come. In the meantime, the iron rails constructed at Crewe, being so much superior in quality to those manufactured by the iron masters, will

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line. Although we have no precise data to show the superior working condition of a steel-laid, as compared with an iron-laid line, it is notorious and beyond dispute that the steel lines are worked at less expense, not only so far as renewals of rails are concerned, but in respect also of maintenance of way, locomotive power, and wear and tear of carriage and waggon stock. Steel rails, by their superior hardness, strength, and stiffness, approach much nearer than iron to the mathematical planes to which all rails should conform, in order to diminish the resistance to traction to a *minimum*. Taking the working expenses of railways at their present average rate, it would be a low estimate indeed to say that, even apart from all consideration of the *renewals* of rails, the superiority of steel over iron rails does not amount to at least 2d. per train mile, taking into account the saving of locomotive power, wear of carriage and waggon stock, maintenance of way, &c. At this rate a line, having fifty trains each way daily, and having 240 tons of steel per mile of double line, would save, yearly, £304 per mile of way, equal to more than 25s. per ton of the steel in the line. One great objection heretofore made to the introduction of steel has been the extent to which the compound interest upon its increased cost would mount up in a series of years; but even if the saving in working expenses were but half that estimated above, it would fully pay for the *whole* interest of steel, at £12. 10s. per ton, at which rate steel rails are now often sold. Under the hardest wear, steel rails have outworn twenty-five times their weight of iron, and no estimate now made of their service is ever less than that of a threefold durability over iron; but if their durability was only as much greater than that of iron as their cost is greater, or even if it were absolutely no greater, it is virtually certain that they would prove cheaper in use than iron, because of the superiority of working condition of a steel-laid as compared with an iron-laid line, and the consequent very considerable saving in working expenses." Abridged from *Engineering*, October 11, 1867.

carry the traffic on the less frequented portions of the line, and will cost less for maintenance and renewal than steel rails at their present prices. The cost of their production will, however, no doubt, be greatly diminished in the course of the next three or four years. Mr. Bessemer's royalties, unless he obtain renewal of his patents, will cease about that period.

But how are the 14,000 men, women, and children, who now constitute the population of modern Crewe, lodged and otherwise provided for? When, in 1849, they numbered 8,000 they were lodged in 514 houses, a number which we expect the Registrar-General would have put his finger upon and objected to—nearly 16 persons in each small habitation. Now, the number of houses is about 2,000, of which 720 belong to the company. They are built along commodious and pleasant streets; well lighted with gas; well Macadamised or paved. As signs of civilisation, there are gay and lively shops, brightly lighted up on winter evenings, replete with modern fashions for the ladies, and, for the rougher sex, there is everything at hand for every-day work, and for Sundays. All the usual signs of civilisation prevail within town boundaries. There are dancing masters and dancing mistresses, music masters, and music teachers of the gentler sex, barrel organs and German bands, occasional theatrical performances by the *artistes* of the "circuit," balls, dances, flirtations, marriages and their usual consequences, and, to wind up, there are four lawyers, seven policemen, a weekly newspaper called the *Crewe and Nantwich Guardian*, and two undertakers! The gentleman who has so kindly furnished us with most of the information herein given respecting modern Crewe, wishes it specially to be noted, that "the undertakers do not make this their sole business, but are also drapers," a request that we have great pleasure in complying

with, adding thereto a hope on our own parts, that the worthy drapers may long find it more profitable to wait upon Crewe living, than to follow it, when dead, to its last resting-place.

In a work published at the commencement of this year by Messrs. Tinsley Brothers, entitled "Some Habits and Customs of the Working Classes, written by a Journeyman Engineer," the writer alleges that working men cannot write letters for the reason that "they were very good scholars once, only they have forgotten all their education,"—hence it is, continues the author, "they usually regard letter writing as a soul-depressing business fit only for the gloom and involuntary confinement of a wet Sunday." But this is not the case at Crewe, for we find, by a postal return presented to Parliament in August last, that the Post Office distributes 6,350 letters every week. Of course this number is exclusive of the legion beyond number that the locomotive department receives and sends out "on company's service." The service correspondence of the traffic and of the stores departments must also be very considerable. All these letters are conveyed solely by the company's trains.

Crewe is now even better off, as regards its water supply, than it was in 1849. The whole of it comes, at present, from Whitmore, close by the station of that name, eleven miles from Crewe, where it is pumped out of the red sand-stone into a reservoir. Now, it happens, fortunately, that Whitmore is 580 feet higher than Crewe, so that the water gravitates in pipes laid along the railway, and it is so pure at its journey's end that it requires no filtering whatever. The consequence is, that not only is there an abundant supply for Crewe Works, but every house in the town is also well furnished. Recently, considerable additional demand has been made on the water supply of the town, owing to the opening of some large and convenient modern baths. These

consist of a capacious swimming bath, the cost for which is 2d. each bather. A first-class warm bath at these baths costs sixpence, a second fourpence; but at the baths inferior in point of style and elegance, the price is only 1½d.

Formerly a medical man was appointed to attend the workmen and their families in sickness, or when accidents occurred. Of late years the doctor is no longer provided by the company, as far as sickness is concerned, as the system was found to cause much dissatisfaction, many of the workmen being connected with societies which provided special medical attendance for the members. For accidents, however, an hospital has been erected, the expenses of which are partly defrayed by the railway company, and the medical man appointed by the company still attends to the surgical cases of the men themselves, for which each man pays one half-penny a-week.

The town was governed in 1849 by a council of fifteen members, two-thirds of whom were nominated by the workmen, and one-third by the directors. Now the government is vested in a Local Board of Health consisting, as in the previous arrangement, of fifteen members, who are elected altogether by the ratepayers. The time has not yet arrived, in the opinion of the leading persons in the town, for applying for a Charter of Incorporation; at all events, nothing is thought about it at present.

We have left to the last a brief description of the arrangements which have been made for Divine service, religious instruction, and for moral cultivation and improvement. In 1849 there was only one church at Crewe. It was capable of accommodating about 800 persons. In 1867 the original church had been enlarged, and had become capable of receiving 1,200. In 1865 Mr. George Duncombe, of London, presented an iron church for the use of the inhabitants—a

noble act, for which God will for ever bless him and his. But the Parish Church and the iron church having proved inadequate for the number of members of the Established Church who present themselves to hear God's word, the site for the construction of another church has been secured, and the work will be commenced before the close of the present year.

Besides the Episcopalian churches, there are fourteen places of worship for other denominations—equal to the accommodation of over 4,000 persons. The Town Hall and Mechanics' Institution is supported by about 400 members. It contains a large reading room, a gymnasium, and a library, which now numbers upwards of 3,000 volumes. In addition, there are several commodious and well lighted class-rooms in which evening classes are held for the higher education of those pupils who are unable to attend the ordinary schools in the day time. The number of such pupils exceeds 150. The drawing class is a branch of the Chester School of Art. The pupils are examined annually by the Government Examiners. There is also a science and art class, a tributary of the South Kensington system.

The Mechanics' Institution receives a free grant of patent specifications from Government. These are greatly esteemed by the pupils, who have made much use of them during the last few years.

The ordinary schools established by the company, and attached to the Episcopalian Church, have recently been enlarged. The daily attendance of children at them is about 700. The schools belonging to the other denominations of worship are attended daily by over a thousand children.

Crewe boasts of a handsome and substantial market hall, which covers an area of 14,000 superficial feet. Saturday is market day. There was no private manufactory of any description in the town until 1865, when Mr. Compton, of London, established a factory for making up the clothing

worn by the company's servants. Upwards of 250 persons are now employed in it.

At the head of the mighty establishments at Crewe—establishments in which, including men and materials, there is a weekly expenditure of about £20,000—over a million a year—is one man who, if he had been in Egypt, with works not a quarter the size and not half so ably carried out, would have been at least a Bey, more probably a Pacha, in Austria a Count of the Holy Empire; in any other country in the world, except England, with crosses and decorations, the ribbons of which would easily make a charming bonnet of existing dimensions. But in England the earnest, persevering, never-tiring John Ramsbottom is John Ramsbottom—no more. It is true that he has European and Transatlantic reputation, and that he is Fellow and Honorary Fellow of innumerable societies, thus abnegating in his person the latter half of the aphorism that says :—

"Worth makes the man, the want of it the fellow."

For without the worth he never would have been the fellow. Probably had Mr. Ramsbottom been a Member of Parliament, he might have hereditary honours by this time. But ere long there will be fresh agitation for distribution of seats, notwithstanding the anger of the *Quarterly Review* of October, 1867, at the "Conservative Surrender." Then will be the time for Crewe to put forward its claims to have its bone, its sinew, its muscle, its manly vigour, and Titanic power represented. Who more worthy to represent it than the present semi-sovereign prince who sways, with nearly omnipotent power, 157½ miles from the supreme and sovereign authority at Euston? Add Barrow-in-Furness, and then "King Iron" would make his thunder heard in St. Stephens!

Crewe, although pre-eminently the great locomotive city of the empire, is far from being the only one. Next in importance

to it is Swindon, at which are located all the great engineering works of the Great Western Company; it is seventy-eight miles from London, on the main line, which leads on the left to Bristol, Exeter, Plymouth, and the whole extreme South-Western parts of England; on the right to Gloucester, and thence to South Wales. The Great Eastern locomotive works are at Stratford, four miles from London; those of the Great Northern at Doncaster, 157 miles. The Midland, the latest addition to the number of railways having their termini in London, have their shops at Derby, 120 miles from London. Crossing the Thames, we find the South-Western locomotive shops at Nine Elms, within half-a-mile of those of the London, Chatham and Dover, at Long Hedge, Battersea. The London, Brighton and South Coast works are at Brighton, fifty-two miles from London. Finally, those of the South-Eastern are at Ashford, the junction point whence, besides the main line to Folkstone and Dover, one branch runs to the left to accommodate Canterbury, Deal, Margate, and Ramsgate, another to the right extends to St. Leonards and Hastings; Ashford is sixty-seven miles from London. The largest railway company in England, the terminus of which is not in London, is the North-Eastern; in mileage it ranks third, being only exceeded by the London and North-Western and the Great Western. Its locomotive shops are at York; those of the Caledonian Company are near Glasgow. The two railway companies of longest dimensions in Ireland, the Great Southern and Western and the Midland Great Western, have their work-shops respectively at Inchicore and at Broadstone; both these places are suburbs of Dublin. There are more than 20,000 skilled workmen and their apprentices employed in the engine repairing and constructing factories belonging to the railway companies of the United Kingdom.

CHAPTER VIII.

A JOURNEY ON THE LOCOMOTIVE.

Reader! have you ever travelled on a locomotive? We believe not; at least there have been very few of you of the male sex, none of you of the gentler—for there is a law on railways like that of masonry, railway engines are "tiled" against crinoline.* If one of you should, peradventure, ever succeed in bounding the barrier, you will, like Miss Aldworth†

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* The first admission of crinoline into England is thus described by Miss Agnes Strickland in Vol. 3 of her "*Lives of the Queens of England*":—"On the day of St. Erkenwald, the 14th of November, 1501, writes the herald to whom we are indebted for the particulars of the marriage of Prince Arthur with Princess Catherine of Arragon, the Duke of York led the infanta from the Bishop's Palace to St. Paul's. Strange diversity of apparel of the country of Hispania is to be '*deseriven*,' for the bride wore, at the time of her marriage, upon her head a coif of white silk with a scarf bordered with gold and pearl and precious stones, five inches and a half broad, which veiled great part of her visage and of her person; this was the celebrated Spanish mantilla. Her gown was very large, the body with many plaits, and beneath the waist certain round hoops bearing out their gowns (those of the princess and of the four Spanish maids of honour who attended her) from their bodies, after their country manner. Such was the first arrival of the famous farthingale in England." Ladies, a friend of ours recently asked us, "What is the length of a crinoline"? Having of course "given it up," he informed us that it is usually *over two feet!*

† Miss Aldworth of Newmarket House, County of Limerick, concealed herself in the case of a clock in the room of a house at which a masonic lodge was held. Before the completion of the day's proceedings her hiding place was discovered. She was immediately brought forth and on the spot she was made a mason. She took the oaths, and like a good member of the craft as she was, never divulged the secret to the day of her death. Even now (1867) her insignia as a masoness are preserved with religious care at Newmarket House, and the chair in which she used to sit when at her lodge is in the dining room; above the chair is her portrait.

a hundred years ago, be sworn to keep the secret for life,—and we are sure you will keep it.

We, however, have been permitted to travel on the engine from London to Stafford and back again, and not having been sworn to secrecy, we venture to give a brief account of the journey.

It is not to be supposed that going through the air at the rate of between forty and fifty miles an hour is disagreeable. It is not so, unless the weather be severe and trying; but in fine, and especially warm weather, the rapid movement creates a feeling of much pleasure and enjoyment. It is only when amateurs do not travel on railway engines that the real hardships of locomotive driving can be appreciated; of late years, however, the little wooden fencing, with oval glass window on each side, the whole technically called a "cab," gives an amount of protection which materially lessens hardship in inclement weather.

It may be considered, as a general rule, that there are on an average, twelve men employed on each mile of railway in the United Kingdom. Taking the present length of railways as 14,300 miles,* this would make the number about 172,000. Of course on many of the railways, especially on those opened in recent years, which are single lines, and run through districts where the population is sparse and the trains infrequent, there is nothing like that average number employed. But, on the other hand, the unceasing increase

* The latest statistics show that there are 50,117 miles of railway in Europe; North and South America, 40,866; Africa, about 300; India, 4,070; Australia, 480. Of the North and South American railways, 33,896, belong to the United States, and there are about 16,000 miles constructing. Almost all American railways are very inferior in point of construction to European railways, and they are nearly all single lines. They have, however, been of inestimable value in developing the material resources of the country.

of business, especially in goods and mineral traffic, on all the leading railways that connect important places together, necessitates continued increase of staff; hence it is that the number of men directly employed is very nearly the same per mile as it was seven or eight-and-twenty years ago.

The engine drivers and firemen constitute about a twelfth of the total staff of railway companies.

One of the oldest railways guide books published, gives exact directions how to arrive at Euston Station from other parts of the town, and we are told to take special notice of the "Grand Facade at Euston Grove." The centre of it is the Doric portico built by Hardwich, used by nobody, which, however, cost shareholders no less than £40,000. No wonder, seeing that it contains not less than 75,000 cubic feet of Yorkshire freestone, several of the blocks of which, weighed upwards of thirteen tons each.

Passing *by*, but not through this massive portal, we arrive at the actual station, and thence at the platform, whence, in the magnificent language of penny-a-lining,* we are so shortly to be "hurled along through the atmosphere at singularly rapid—it might almost be said marvellously terrific speed of forty-five miles an hour." Not being historiographers for Mr. Frith, R.A., we do not intend to give any account of the persons whom he truly, but not with such intense artistic effect as in the "Derby Day," depicts, as those who fill a railway platform just before a train is starting. We must therefore not say anything of the unconscious or indifferent old gentleman, who so placidly reads his newspaper, within six inches of the two broad-brimmed detectives, one of whom dangles the "bracelets"

* Penny-a-lining, so called, because it is paid for by the newspapers at the rate of three-half-pence a line!

into the view of the foiled and agonised culprit, compelled to convert an intended migration into forced residence in Newgate. We must also leave unrecorded about heaving porters, rushing guards, precipitous newsboys, friends parting—some with lurking tears, some with tears more open—some with scarce suppressed pleasure and fervent hope, as they affectionately squeeze each other's hands, that they may never meet again, at all events on this side of Jordan; all these must we pass by, that we may show to the engine driver and his "mate" the order, which gives us the privilege of placing ourselves, with them, on the foot-plate of the engine.

There she is—manacled with harness that Vulcan presided at the forging of—smoke-vomiting, steam-emitting, snorting, bubbling inside, grunting, growling—hissing too, with an intensity equal to the combined and concentrated hissing of ten thousand offended and irritated cats, additioned with the hissing of at least the like number of angry birds, the hissing of one of which was enough to save from capture Roman Capitol, ancient Rome's strongest fortress, 365 years after Roman City had been created.

Every passenger is seated, the door of every carriage has received its last bang* at closing, even the inevitable last man

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* There is only one part or portion of railway practice which, with all our railway experience, we are unable to account for. Yet the practice is universal. We (always in the singular number, we are plural, editorially, only) have travelled in a great many parts of the world, but wherever we have gone we have never found but one undeviating and unalterable rule among the door-opening and the door-closing portion of the railway community. Is it an instinct or an abstract idea with them that the door of a compartment cannot be closed unless the closing be accompanied with a loud and violent bang, which pleases nobody and sets nervous persons into a state of glowing trepidation? Or is there a masonry among the officials of this grade, from participation in which the higher classed portion of the railway fraternity is excluded, the secret of the craft being

has rushed in, panting and breathless, and has been shoved with main force, by at least a dozen sturdy porters, into a compartment. This last man is as inevitable as the dog at Epsom Races on the Derby Day, or any other incident of life, the absence of which is so impossible, that life could not go on without it. There always is—there always *must* be—a last man; inexorable fate has so decided. Then it is that the gentleman in the braided green coat, with—as a further mark of distinction from other officials—a hat on, gracefully and graciously, with becoming dignity, yet withal not pompously, in short, exactly as befits a railway official of authority, weight, and consequence, waves a white flag which he has just received from an official of humbler grade standing beside him, once up, once down, and once more up again. He waves no more; the before-mentioned humbler official receiving the flag staff from his dignified chief, carefully folds it up, that it may be in readiness for precisely the same ceremony at the departure of each subsequent train; the chief (still dignified) gives a *vade-valeque* motion of his right hand, the guard sounds his whistle, and all the bustle, life, excitement, and animation of ten minutes by-gone have as completely vanished, as if they had never existed.

The engine has no sooner, by the slight movement of the

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hat all railway carriage doors must be banged as they close them? Dear colleagues of the class of carriage door shutters, country station masters, inspectors, ticket collectors, guards of the first class, guards of the second, and temporary guards, foremen porters, ordinary porters and good-looking porters, porters of the strong back, and porters of brachial muscle much developed, let us entreat and implore you to retire from the brotherhood and learn to close carriage doors gently, quietly, and as becomes your gentle natures. There is a Latin proverb which means do your work vigorously, but be gentle in the mode of doing it,—*suaviter in modo, fortiter in re.* One word from a cordial friend to a wise man, suffices.

"regulator" which the driver gently handles, received a first injection of steam into her cylinders than she starts into motion as a thing of life, with a weight behind her of not less than from 100 to 150 tons. The slow pace at starting is gradually increased, but she has scarcely passed the limit of the station when she is taught the lesson of life, which even the most favoured learn—that it is with her as with man, it is uphill work, at all events in its early stages, for in the first mile and a quarter she has to ascend the stiffest hill in her whole journey, "1 in 80," Camden being just a hundred feet higher than Euston. Bury's "four-wheelers," the *dii maximi* of railway engine power in 1840, were so weak that they could not bring a train, the weight of which was not a quarter of one of a modern date, up the "Euston incline" without the friendly aid of ropes worked by two fixed engines of high power, and two very high chimneys, at Camden. But the chimneys have long since disappeared, and the engines are doing good service in some other place belonging to the Company's gigantic establishments. The engine and train emerge from the Primrose tunnel to hide themselves in a minute or two afterwards in that of Kilburn, and as they pass the station of that name, the reader may be reminded it was there that Dick Turpin began his ride to York, on Black Bess, 130 years ago*. Had it been mail

* Turpin's ride to York turns out, notwithstanding the bright and vivid description of it by Mr. Harrison Ainsworth, to have no real existence as regards his hero. Nevertheless, Mr. Ainsworth had fact for the foundation of his story, a noted burglar of the latter end of the 17th century having actually ridden, after the commission of a great and daring robbery, from, if we recollect rightly, Stamford or some place to the south of it, and on his trial (for he was subsequently indicted) he was able to produce persons who had seen him in York early the following morning. The evidence, however, against him on other points was clear and decisive, and he paid the penalty for his crime, in the manner usual in those days; they hanged him.

horses of the olden time their run to Wimbledon (seven miles from Euston) would have completed their present journey, and they would have rested until they were harnessed to the "up mail," and having brought it to London, their work of twenty-four hours would have been completed. But at seven miles from its starting point the iron horse would not have been more than four or five minutes at full running pace; three minutes in time and two miles in distance bring time-honoured Harrow in sight, "on the hill," for its church is noticable from every point of the compass, and it was of it that Charles II. said, during a theological discussion in his presence, "the true visible church, as it could be seen everywhere." Of its school,*

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* The oldest of the great public schools, or "grammar" schools, of England is Winchester, founded in 1381 by William of Wykeham, a Bishop of Winchester, the year after he had founded "New College," Oxford. There is no doubt, however, that Winchester school, in its original shape, is of much greater antiquity than the time of William of Wykeham, some authorities tracing its existence to the introduction of Christianity into Britain. It has the only English motto of all our great public schools, "Manners makyth man." Royalty frequently visited the school for the first two hundred years after Wykeham's endowment. In 1570, Queen Elizabeth pleasantly asked one of the scholars whether he had ever endured the famous Winton birching. He happily replied from the "Æneid,"

"Infandum, Regina, jubes renovare dolorem,"

which produced a most gracious smile from Her Majesty.

Eton College was founded by Henry VI. The Procuratory is dated the 12th September, 1441; but the Charter is dated twenty-nine days later—on the 11th October; and the royal endowment was not completed until 1443. The most pious, but most unfortunate, of English sovereigns took the warmest interest in the success of the school, and whenever he heard of any of the boys visiting his officers and attendants at Windsor Castle, he would send for them, and admonish them to follow the paths of virtue; besides his words, he would give them money to win over their good will, saying to them "*Sitis boni pueri; mites et docibiles, et servi Domini.*" "Be good boys, be

founded in 1571 by John of Lyon, but one momentary view is obtained, and that is only as a day train darts along the

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gentle and docile, and servants of the Lord." The motto of Eton is, "*Floreat Etona.*"

John Colet, Dean of St. Paul's, founded St. Paul's School in 1509. The motto is "*Doce, Disce, et Discede.*"

Westminster School (the motto of which is "*In patriam populum que*") was established in its present shape by Henry VIII.; but it existed as a school even in the time of Edward the Confessor. The Letters Patent of Queen Elizabeth, who took an interest in the school from the patronage bestowed upon it by her father, are the oldest extant about it. They bear date the 11th of June, 1560.

Rugby School, founded by Laurence Sheriff, grocer and citizen of London, celebrated the tricentenary of its existence on the 26th of June, 1867, with Dean Stanley, of Westminster, as President. Rugby's motto is, "*Nihil sine Laborando.*"

The Royal Grammar School of Shrewsbury was founded by the Corporation of the town in 1549; and in two years afterwards obtained from Edward VI. for its endowment, a portion of the estates of the dissolved collegiate churches. Its motto is "*Intus si reete, ne labora.*"

Edward VI. founded several grammar schools, the first of which was that of Norwich, but his name is more intimately associated with that of Christ's Hospital, London (popularly known as the Blue Coat School), than with any other. He died on the 6th July, 1553, having just one month previously signed its charter of incorporation. Christ's Hospital is without a motto.

The foundation of the Merchant Tailors' School is due to the wisdom and munificence of the ancient "Company of the Marchaunt Tailors," which, according to Stow, has been a guild or fraternity from time immemorial. The statutes of the School, which has for a motto "*Homo plantat, homo irrigat, sed Deus dat incrementum,*" were authorised and sanctioned on the 24th September, 1561.

The motto of Harrow is "*Stet fortuna domus.*"

The site upon which Charterhouse School stands was purchased by Thomas Sutton in 1611 from Thomas Earl of Suffolk, fourth son of the fourth Duke of Norfolk (beheaded in Queen Elizabeth's reign), for the establishment of a hospital for the support of poor and aged people, and a free school for the maintenance and education of poor children. Letters patent to carry out both these objects were immediately granted by James I.; the motto is "*Floreat Æternum Carthusiana Domus.*" For full particulars of these schools see "The Great Schools of England," by Howard Staunton; and for details concerning the early history of Eton College, and of all authors who have written respecting it previous to 1858, Vols. 1 and 2 of the "*Annals of Windsor,*" by Messrs. R. R. Tighe and J. E. Davis, should be consulted.

valley that leads to Watford. The three most distinguished men of modern times who have received their education there have been Peel, Palmerston, and Byron.*

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* Byron has left us the following recollection of his Harrow School-boy days:—

Ye scenes of my childhood, whose loved recollections
Embitter the present, compared with the past;
Whence science first dawned on the powers of reflection,
And friendships were formed too romantic to last;

Where fancy yet joys to retrace the resemblance
Of comrades in friendship and mischief allied;
How welcome to me your ne'er-fading remembrance,
Which rests in the bosom, though hope is denied!

Again I revisit the hills where we sported,
The streams where we swam, and the fields where we fought;
The school where, loud warned by the bell, we resorted,
To pore o'er the precepts by pedagogues taught.

Again I behold where for hours I have ponder'd,
As, reclining at eve, on yon tombstone I lay;
Or round the steep brow of the churchyard I wander'd,
To catch the last gleam of the sun's setting ray.

I once more view the room, with spectators surrounded,
Where, as Zanga, I trod on Alonzo overthrown;
While to swell my young pride, such applauses resounded,
I fancied that Mossop himself was outshone;

Or, as Lear, I poured forth the deep imprecation,
By my daughters of kingdoms and reason deprived;
Till, fired by loud plaudits and self-adulation,
I regarded myself as Garrick revived.

Ye dreams of my boyhood, how much I regret you!
Unfaded your memory dwells in my breast;
Though sad and deserted, I ne'er can forget you,
Your pleasures may still be in fancy possest.

To Ida full oft may remembrance restore me,
While fate shall the shades of the future unroll!
Since darkness o'ershadows the prospect before me,
More dear is the beam of the past to my soul.

The northern extremity of the long Watford tunnel, twenty miles from London, is reached just thirty-three minutes from the time of starting; yet it has been climbing work all the while, and the climbing work continues still farther to Tring, eleven miles more distant from London; but the hill is not so steep as it was at starting. Long it is; but Tring is, nevertheless, only some 750 feet higher than Euston, and some 350 feet higher than the top of the cross of the noblest Protestant Church in the world—St. Paul's. Has the engine felt it? Not she. She has only shown that she knows the difference between a gradient of 1 in 80 and 1 in 300, by the bound she made into higher speed, as, escaping from the stiffer incline, she dashed on to more level ground through the Points of Camden.

In the by-gone days of the early railway, the engine that could gain the heights of Tring without baiting on the way was a wonder. In 1844, when experiments were made preparatory to running express trains between London and Birmingham in three hours, the exultation was great when it was found that a tender could be constructed to hold water enough to convey a light train as far as Wolverton without stopping.

Finality is an unknown element on the railway: Progress is its only pass-word. The tender was no sooner found capable of carrying water to Wolverton, than it was determined to extend the distance to Blisworth. Not very long

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But if through the course of the years which await me,
Some new scene of pleasure should open to view,
I will say, while with rapture the thought shall elate me,
"Oh, such were the days which my infancy knew."

Byron used to lay on the tombstone above referred to for hours, when labouring, even as a boy, under those morbid excitements that embittered his comparatively short life. It is still called "Byron's Tombstone."

afterwards the run was increased to Rugby, twenty miles farther. Engines and trains have for some years run these eighty-two miles without stoppage; but of late the water-crane has been supplemented by the water-trough, of which we shall take occasion to speak presently.

From Tring to Leighton the ground is gone over in nearly as few minutes as there are miles—one only conspicuous object being visible in the intervening distance—the noble house built, not ten years ago, for the great Rothschild, by the still greater Paxton.

As the train flies through Leighton Station, the engine-man's watch tells that he has completed his forty miles in his appointed time, fifty-six minutes from that at which he left London. Well that he is quick of glance, for before the watch is replaced in its pocket, the engine and train enter in the Linsdale Tunnel. It is the worst on the line, for though short—only 284 yards in length—you are halfway through it before the first gleam of daylight is caught streaming in at its opposite entrance. "I have got the distant signal all right, Jack, put some coal on"—says the engineman to his fireman, and the furnace door has scarcely been opened for three shovels full, before the iron-clad is dashing through Bletchley Station—46½ miles from London, —twenty years ago, a small road-side station; now, a first-class and intricate junction, whence a branch juts off to the right to Bedford, and thence to Cambridge; another on the left to Oxford. It is thus that the two Universities are brought into railway connection, and the rival seats of learning and of boat racing are only three-and-a-half hours apart from each other. Might not Cam do well by an occasional training visit to the banks and stream of Isis?

Bletchley is also intricate, because it is here that the third line of railway, ordered by the London and North-

Western Company in 1858, commences, and is continued except through the Watford Tunnel (at either end of which it is very ingeniously connected with the original up-line of railway) on to Camden Station. This third line is solely for up goods, cattle, and mineral traffic, and the relative speed of such trains and those for passengers can be seen and appreciated, as the latter pass alongside the former for a minute or two, and then leave them behind at the rate of twenty-five miles an hour—twenty *versus* forty-five.

Time was when Wolverton was looked upon as the most dangerous part of the whole line between London and Liverpool. It was, therefore, a halting place not only for all passenger trains, but goods trains came to a stand there also. At Wolverton likewise were the main locomotive repairing shops of the original London and Birmingham Company; and when the company was amalgamated with the Grand Junction and other companies, the locomotive establishment became that for the southern division of the London and North-Western Company, the two northern points of which are, Birmingham, looking westward, and Stafford, looking slightly to the eastward. In process of time the repairing shops have been doubled, trebled, nearly quadrupled. In 1840 Wolverton had a population of 2,000, all of whom were company's servants or their families. In 1849 it was double that number, and now, in 1867, it is 6,000. But of this number about 1,700 are on the wing with their families. These are the men who have hitherto been employed in the locomotive works, which (as stated at page 199) have just been transferred to Crewe. These men and their families, however, will not leave a void in the population, as their places will be supplied from the carriage portion of the Crewe establishment, and from the carriage works of the company, until now located at Saltley, near Birmingham.

The chief owners of land at Wolverton are the trustees of the Radcliffe Library Estate at Oxford; and, although they have erected upon the property a church, to which is attached a churchyard (already beginning to show a great many mounds), they have always been unwilling to dispose of land for building purposes to the extent required by the company. The consequence has been that part of the town or village of Wolverton has had to be built nearly a mile away from it!—at a place called Stantonbury, to the great inconvenience and discomfort of all the men who have to take up their quarters in that locality.

Besides the Radcliffe Episcopalian Church, there is one built mainly by subscriptions from the shareholders of the company. Conjointly they are capable of seating about a thousand people, and the schools connected with them have nearly 600 children in daily attendance. Besides these two churches, there are other places of worship, equal to the accommodation of about 1,100 people.

Of the Infant School Sir Francis Head gives a description, which is as accurate for now as it was for eighteen years ago:—"At the western extremity of the building, on entering the infant-school, which is under the superintendence of an intelligent-looking young person of about nineteen years of age, we were struck by the regular segments in which the little creatures were standing in groups around a tiny monitor occupying the centre of each chord. We soon, however, detected that this regularity of their attitudes was caused by the insertion in the floor of various chords of hoop iron, the outer rims of which they all touched with their toes. A finer set of children we have seldom beheld; but what particularly attracted our attention was three rows of beautiful babies, sitting as solemn as judges on three steps one above another, the lowest being a step higher than the

floor of the room. They were learning the first hard lesson of this world—namely, to sit still; and certainly the occupation seemed to be particularly well adapted to their outlines; indeed, their pinafores were so round, and their cheeks so red, that altogether they resembled three rows of white dumplings, with a rosy-faced apple on each. The picture was most interesting; and we studied their cheerful features until we almost fancied that we could analyse and distinguish which were little fire-flies, which small stokers, which tiny pokers, infant artificers, &c."

In the early days of Wolverton, a reading-room, and a library, containing some 700 volumes, supplied the mental occupation and recreation then afforded to its residents. Now there is a Science and Art Institute, an off-shoot from South Kensington, which contributed £500 towards the erection of the building. Its library possesses nearly 3,000 volumes, almost all of which are contributions. The chief person in this work of kindness and goodness is Miss Burdett Coutts, that pre-eminently good lady whose name has but to be mentioned to ensure for it universal respect and admiration.

The institute has an enrolment of 350 members, a large number of whom attend the evening class, and it is a pleasurable fact to state that the pupils have been successful, more than on the average, in the science examinations which are annually held there. As at Crewe, the Government makes it free grants of patent specifications; many of these are closely studied, and all are highly appreciated by the students.

The directors and principal officers of the company, always mindful of the best interests of its staff, and ever keeping a paternal, but not obtrusive eye upon it, have recently erected a model lodging-house, solely for the convenience of single young men. Fifty of them are now accommodated in it;

each has a separate bed-room, and the whole establishment is superintended by a very carefully selected manager, who is responsible, not only for the good conduct of the lodgers whilst under its roof, but also for their comfort. The system works well, and it will be extended.

In 1840, and for some few years afterwards, passengers ran a risk at Wolverton to which, happily, or, as we venture to think, very unhappily, they are no longer exposed—that is passengers who travelled chiefly in first-class carriages, and in the express trains of that period were accustomed to alight for ten railway minutes (*anglice* five) at the celebrated refreshment rooms, the fame of which was world-wide. It was not only that the soup was hot, and the coffee "superheated," but it was admitted by those who, by the process of blowing the former, and pouring the latter into saucers, were able to get a mouthful or two, it was admitted we say, that each of these beverages was excellent. But there was an attraction at these refreshment rooms that rose superior to all the hot soup, the hot coffee, the hot tea, the buns, the Banbury cakes, the pork pies, the brandy, whiskey, gin, and "rich compounds," the ample statistics of which will be found in our foot-note.* Need we say that we refer to the

* Subjoined is Sir Francis Head's description of the Wolverton Refreshment Rooms as they were in their palmy days :—

"In dealing with the British Nation, it is an axiom among those who have most deeply studied our noble character, that to keep John Bull in beaming good humour it is absolutely necessary to keep him always *quite full* The operation is very delicately called 'refreshing him;' and the London and North-Western Railway Company having, as in duty bound, made due arrangements for affording him, once in about every two hours, this support, their arrangements not only constitute a curious feature in the history of railway management, but the *dramatis personæ* we are about to introduce, form, we think, rather a strange contrast to the bare arms, muscular frames, heated brows, and begrimed faces of the sturdy workmen of railways.

"The Refreshment Establishment at Wolverton is composed of—1. A

charming young ladies, in whom were concentrated all the beauty and grace that should be corporated in modern Hebes. Our excellent friends, Messrs. Spiers & Pond, of well-earned and well-deserved "Buffet" celebrity, have

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matron or generalissima. 2. Seven very young ladies to wait upon the passengers. 3. Four men and three boys, ditto ditto. 4. One man-cook, his kitchen-maid, and his two scullery-maids. 5. Two housemaids. 6. One still-room maid, employed solely in the liquid duty of making tea and coffee. 7. Two laundry-maids. 8. One baker, and one baker's boy. 9. One garden-boy; and lastly, what is most significantly described in the books of the establishment—10. 'An odd-man.'

"'*Homo sum, humani nihil à me aliemun puto.*'

"There are also eighty-five pigs and piglings, of whom hereafter.

"The manner in which the above list of persons, in the routine of their duty, diurnally revolve in the 'scrap drum' of their worthy matron, is as follows:—very early in the morning—in cold winter long before sunrise—'the odd-man' wakens the two housemaids, to one of whom is intrusted the confidential duty of awakening the seven young ladies exactly at seven o'clock, in order that their 'première toilette' may be concluded in time for them to receive the passengers of the first train, which reaches Wolverton at 7·30 a.m. From that time until the departure of the passengers by the York mail train, which arrives opposite the refreshment room at about eleven o'clock at night, these young persons remain on duty, continually vibrating, at the ringing of a bell, across the rails (they have a covered passage high above them, but they never use it), from the north refreshment room for down passengers to the south refreshment room, constructed for hungry up-ones. By about midnight, after having philosophically divested themselves of the various little bustles of the day, they all are enabled once again to lay their heads on their pillows, with the exception of one, who in her turn, assisted by one man and one boy of the establishment, remains on duty receiving the money, &c., till four in the morning for the up mail. The young person, however, who in her weekly turn performs this extra task, instead of rising with the others at seven, is allowed to sleep on till noon, when she is expected to take her place behind the long table with the rest.

"The scene in the refreshment room at Wolverton, on the arrival of every train, has so often been witnessed by our readers, that it need hardly be described. As these youthful handmaidens stand in a row behind bright silver urns, silver coffee pots, silver tea pots, cups, saucers, cakes, sugar, milk, with

worthily followed in the footsteps of the great inventress of the railway refreshment room, as it should be; and happy we are to record the fact, that go where we may, we are sure to see, under the magic words announcing that they are the

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other delicacies over which they preside, the confused crowd of passengers simultaneously liberated from the train, hurry towards them with a velocity exactly proportionate to their appetites. The hungriest face first enters the door, 'magnâ comitante catervâ,' followed by a crowd very much resembling in eagerness and joyous independence the rush at the prorogation of Parliament of a certain body following their leader from one house to the bar of what they mysteriously call 'another place.' Considering that the row of young persons have among them all only seven right hands, with but very little fingers at the end of each, it is really astonishing how, with such slender assistance, they can in the short space of a few minutes manage to extend and to withdraw them so often; sometimes to give a cup of tea, sometimes to receive half-a-crown, of which they have to return two shillings, then to give an old gentleman a plate of warm soup, then to drop another lump of sugar into his nephew's coffee cup, then to receive a penny for a bun, and then again threepence for four 'lady's fingers.' It is their rule, as well as their desire, never, if they can possibly prevent it, to speak to anyone; and although sometimes, when thunder has turned the milk, or the kitchen-maid over-peppered the soup, it may occasionally be necessary to soothe the fastidious complaints of some beardless ensign by an infinitesimal appeal to the generous feelings of his nature, we mean, by the hundred-thousandth part of a smile, yet they endeavour on no account ever to exceed that harmless dose. But while they are thus occupied at the centre of the refreshment table, at its two ends, each close to a warm stove, a very plain matter-of-fact business is going on, which consists of the rapid uncorking of, and the emptying into large tumblers, innumerable black bottles of what is not inappropriately called 'stout,' inasmuch as all the persons who are drinking the dark foaming mixture, wear heavy great-coats, with large wrappers round their necks, in fact are *very* stout. We regret to have to add, that among these thirsty customers are to be seen, quite in the corner, several silently tossing off glasses of brandy, rum, and gin.

"But the bell is violently calling the passengers to 'Come! come away!' and as they have all paid their fares, and as the engine is loudly hissing—attracted by their pockets as well as by their engagements, they soon, like the swallows of the summer, congregate together, and then fly away.

"It appears from the books that the annual consumption at the refreshment

caterers, sweet faces, worthy types of English beauty, all the more worthy because with them is combined the modest demeanour, emblem of purity, without which all is absent that adorns woman and renders her enchanting. Messrs.

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room averages 182,500 Banbury cakes; 56,940 Queen's cakes; 29,200 pâtés; 36,500 lbs. flour; 13,140 lbs. butter; 2,920 lbs. coffee; 43,800 lbs. meat; 5,110 lbs. currants; 1,277 lbs. tea; 5,840 lbs. loaf sugar; 5,110 lbs. moist sugar; 16,425 quarts of milk; 1,095 quarts of cream; 8,088 bottles of lemonade; 10,416 soda water; 45,012 stout; 25,692 ale; 5,208 ginger beer; 547 port; 2,095 sherry; 666 gin; 464 rum; 2,392 brandy. To the eatables are to be added or driven, the eighty-five pigs, who after having been from their birth most kindly treated and most luxuriously fed, are impartially promoted, by seniority, one after another, into an infinite number of pork pies.

"Having, in the refreshment sketch which we have just concluded, partially detailed at some length, the duties of the seven young persons at Wolverton, we feel it due to them, as well as to those of our readers who, we perceive, have not yet quite finished their tea, by a very few words to complete their history. It is never considered quite fair to pry into the private conduct of any one who performs his duty to the public with zeal and assiduity. The warrior and the statesman are not always immaculate; and although at the opera ladies certainly sing very high, and in the ballet kick very high, it is possible that their voices and feet may reach rather higher than their characters. Considering, then, the difficult duties which our seven young attendants have to perform—considering the temptations to which they are constantly exposed, in offering to the public attentions which are ever to simmer and yet never to boil; it might be expected that our inquiries should considerately go no further than the arrival at 11 p.m. of the 'up York mail.' The excellent matron, however, who has charge of these young people—who always dine and live at her table—with honest pride declares, that the breath of slander has never ventured to sully the reputation of any of those who have been committed to her charge; and as this testimony is corroborated by persons residing in the neighbourhood and very capable of observation, we cannot take leave of the establishment without expressing our approbation of the good sense and attention with which it is conducted; and while we give credit to the young ladies for the character they have maintained, we hope they will be gratefully sensible of the protection they have received." *Stokers and Pokers*, by the author of "Bubbles from the Brunnen of Nassau." London: John Murray, Albermarle Street, 1849.

Spiers & Pond have—as the late Mrs. Hibbert had—but one rule for "tainted angels"—their expulsion.

At moments, however—they were only moments—female grace was at fault at the Wolverton refreshment rooms. The late Douglas Jerrold (father of one of the workman's most real and truest friends—Blanchard by Christian name) had in his play of the "*Housekeeper*" one of the characters, a drunken wine-porter, who appears on the scene for only a few minutes, and all the language he gives utterance to is advice to his daughter and her companion, never to go anywhere without a cork-screw. No doubt this is good paternal advice, such as any good father of a family might give, but it is the use only of the instrument with which we are concerned. Wolverton had many stringent rules, and one of them was that "draught bitter" should not be "drunk on the premises"; pale ale, therefore, could only be furnished by means of the cork-screw. Now, we appeal to any father, husband, brother, cousin, or lover (the two latter often synonymous,—see all the dictionaries, classical and vulgate); Did you ever see a young lady draw, with grace, a cork out of a bottle in the old-fashioned way, that is, by placing it within the ample folds of her dress (all the more ample if crinoline were concealed behind it), and then tugging until the cork is extracted; if the cork be an easy, obedient, willing cork, the operation is not difficult, and woman's want of grace is but for the moment, but it became momentous, to say nothing of bursting of tapes and wrenching of hooks and eyes, red face and perhaps disappointment, if main force must be resorted to. At all events, the late Mrs. Hibbert (known at Wolverton and elsewhere as Generalissima) appreciated the difficulty, and with woman's tact transferred, by a wave of her sovereign sceptre, the beer bottle drawing department of the establish-

ment to the hands of the young gentlemen with all the buttons, and thus released the young ladies from the duty. She never, however, could, to the day of her death, make up her mind that the young ladies ought to be relieved from ginger beer and soda water.

But before we quit for ever (scriptorially) the subject of bitter beer—of Bass, Ind, and Allsopp; of immortal Burton, that squeezes quart bottles into pints, pints into thimblefuls, of which three-fourths are froth; and of tap-tub measurement that, by a talisman, converts an imperial pint of the amber fluid into four half-pint *glasses*, let us ask permission to philosophise for a moment—for a moment only. Woman! You are never more charming, more feminine, more enchanting than when you are domestic. A magic circle of fascination then surrounds you. You are in your real mission, and being real, you are angelic. But, woman, be true to yourself; be domestic to the fullest extent that brightest imagination can picture or truth realise. But, sex most dear, most loveable of all things human that can be loved, hear the advice of one who believes you were sent on earth for the holy purpose of refining man, and of purifying him—never, oh, never be seen using a cork-screw!

Sir Francis Head, in a passage which we purposely omit because we want to have our own say, in our own way, on the subject, informs us that by 1849 four of the young ladies had managed to make excellent marriages. Sir Francis has greatly understated the number. It is quite true that the daily occupations of the young ladies, even without drawing the corks of beer bottles, were arduous and unceasing. Nevertheless, as with all busily occupied people, a time can be found for everything. Not four, but four times four of them found sixteen eligible husbands, and at the present time we know two of them, one not fat, but "fair and forty," the

other with slight disadvantage in point of age—forty-four (she confesses to forty*)—but in every other respect at least as eligible, who have had each to exhibit the sable signs of sorrow, void, and bereavement, within the last eighteen months. Let us just pause for a moment, to shed a "pensive tear" to the memory of the two dear departed, just as in the days of our boyhood our sympathies were requested in memory of the celebrated bonnie lassie of "Kelvin Grove," by the father of a lady of present times, who is worshipped by millions, and has been possessed of only by four. (May he of the strong shield endure for ever!) Our tear is shed; and now, like the military bands that accompany the remains of a departed comrade to the grave with the *Dead March in Saul*, and return to barracks with joyous and festive music, do we proclaim, by sound of wedding trumpet and cornet-à-piston, the probability that, ere long, each of the charming widows will make a second matrimonial venture. We can, in fact, go one step farther. One of the ladies has already purchased the grey silk dress, absolutely necessary on such occasion; the second has not gone so far as actual

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* Ladies, it is sometimes dangerous to conceal your exact ages. We will give you a case in point, that only occurred in the summer of the present year. A lady, as far back as 1825, insured her life for the benefit of her relatives. She only died a few months ago; but on coming to compare her age, as given by herself at the time of effecting the insurance, with that on the certificate of births required by the office, to be obtained, after death, from the parish register, it was found that although the lady was in reality 42 years, in 1825, she only owned to 35, and paid premiums on that scale for 42 years. The office, had it been so disposed, might have declared the policy absolutely forfeited. It took a more generous course; the policy was admitted, as a claim, but from the amount that would have come to the legatees, if all had been in order, the difference of premium between 35 and 42, for 42 years, with interest and compound interest thereon, from the period that each premium became due, was deducted. The legatees thus received not more than half the nominal amount stated on the policy.

purchase, but she knows where to put her hand upon one at a moment's notice. The dress-maker has already been consulted about the trimmings.*

It may probably be observed by any person who has been so venturous as to read the first hundred or so of our pages, that we are given to statistics. This is so, and it has also been alleged of us that we readily detect errors in them when prepared by others. Without taking to ourselves more than a decorous quantity of flattering unction, we believe we shall be able to show, in a work preparing for early publication, that, as regards Post Office statistics, at all events, none have been issued by the department for the last fifteen years that are not abounding in most egregious blunders, and that the logical dogmas of "contrariety, sub-contrariety, and contradiction" were never carried to greater extent than in these documents. Our statistics and contradictions are, at the present moment, however, of a different character. They refer to what, in the palmy days of Wolverton as a seat of learning and refreshment, formed an important part of the population of the colony; at least they are described as so being, both in an article of the *Quarterly Review* upon the London and North-Western Railway of 1849, and in Sir Francis Head's "Stokers and Pokers," published in the identical same year, and almost in the identical same month. Nevertheless the former names seventy-five pigs and piglings as members of the refreshment establishment; but Sir Francis disputes the figures, raises it ten higher, and not only insists that they were eighty-five in number, but that each was converted, in his or her turn every year, into pork pies and sausage roly-polies. But whichever amount be the

* Both ladies have since been married. "No cards." Were we a newspaper proprietor, we should charge two and sixpence additional for the two last words of this announcement.

correct one, let the pork pies and sausage roly-polies rest in peace. The indigestions of which they were, in their day, the *teterimæ causæ*, have long since passed away. Let no rude attempt be made to re-produce them.

Thanks to increased lines of railway at Wolverton, both "main" and "siding," thanks also to signalling so improved in principle, and so minute in action—signalling which embraces the visible "arm" by day, the visible tri-coloured lamp at night, the audible "fog," and never-failing, ever truthful Electricity—express and other trains can, and do dart past the fifty-two mile post placed at the eastern extremity of the station with celerity and certainty, the same as at any other part of the system.

Still the engines speeds onwards, untired, at undiminished pace. She and her train are near to Blisworth, 62½ miles from London, and it is four miles south of this station that she is allowed her first draught of water. Of solid food she has still enough, for of the four to five tons of coal with which she started on her journey, she has not consumed more than a ton and a-half. Not far from Roade Station, on each side of the railway, is a reservoir of pure water, and at this part of the line the gradient is as nearly as possible level. Within the rails, both "down" and "up" sides, are placed two narrow troughs, each about a quarter of a mile long. By means of syphons the water is conveyed from the reservoirs to the troughs, and just as the engine approaches, a small inclined plane with wooden sides, such as the inclines by which luggage is dashed from packet-piers to steamers, is lowered from the front of the engine. The inclined plane brought in contact with the water compels it, contrary to all hydraulic principles, to ascend along it, until the water is deposited in the tank of the tender. As the engine approaches the end of the trough, the inclined plane

is, by the simplest possible means, drawn up, and the engine has a fresh supply of water that would enable her to go fully as long again as the distance she has already completed.

These reservoirs are now found so useful that there is a pair of them on the London side of Watford, another between Warrington and Newton Junction, and a third on the London side of Conway, as near as can be half-way between Holyhead and Chester.

Four miles from Blisworth, on the right, stands Northampton, famed for its production of shoes, unequalled, as regards numbers, in any other part of the kingdom, and for its obstinate persistence (in the blind and unenlightened period of railway history) in refusing to allow the London and Birmingham Line to come within a less distance than 25,000 yards between it and its shoddy-shoebility. Independently of the injury which this obstinacy has ever since inflicted upon the town, it cost the railway company a loss in money of more than a million sterling, a lengthened and inferior section of railway, a tunnel 2,423 yards long (only 217 less than a mile and a-half), which, during its construction, ruined four contractors and caused the deaths of upwards of a hundred working men. Finally, the obstinacy of Northampton delayed the opening through of the railway from London to Birmingham for fully two years. No wonder, then, that its present generation of men is ashamed of the deed. Some go so far as to deny it altogether; others are more scrupulous, and only palliate it with excuses of which quibbling and petty ingenuity are the joint parents. "There is nothing like leather;" the only question is—its application.

In the centre of circulate movement there is one mathematical point which, although not absolutely still, approaches a state more akin to quiescence than to motion. Such is

Weedon, not absolutely dead, but next door to it—"deadly lively"—sixty-nine miles from London. It is considered the centre spot of England, and it was, apparently for this reason, seriously suggested in the time of the great war, "when George III. was king," that His Majesty should take up his residence at this tranquil spot, to be out of harm's way, in case of invasion. The intention, however, was not carried out, and Weedon has ever since been lost to a fame and importance which even the passage of the London and North-Western line has failed to give it. It is almost the only town in the civilised world which the presence of the railway has failed to render even lively. No need then, for our engine and train to stop there, so they proceed on with undiminished speed through the rich pastures and glowing corn-fields of Northamptonshire and Warwickshire.

Arrived at Crick, seventy-five miles from London, they are within a mile of the great Kilsby Tunnel just referred to; and its northern extremity has not been left behind more than a mile and a-half, when the elaborate system of signals necessary for the protection of the next station comes in sight. The first of them is passed at speed; but gradually, as the engine and train approach the second, the driver slightly lowers his regulator, and the guards, both at the fore and hinder parts of the train, take their breaks in hand; so does the fireman, at his powerful break on the engine. The second signal is passed; white takes the place of green at the third, if all be right; but if not, and there be any sudden obstruction at or near the station, vivid red lamps by night, bright red arms by day, appear from half a dozen places almost with the electric flash and speed of lightning. Two sharp, shrill, and sudden whistles from the engine tell the guards that danger is ahead—that is, should they not themselves have seen it; an unlikely circumstance,

for they are as keenly alert in their break-vans as driver and fireman are on their engine. In a moment three powerful men are applying, with utmost energy, the immense break-power at their command—so powerful that the passengers often feel a concussion that awakes the dormant, and almost hurls them against their opposite neighbours, and the train is pulled up within a space varying from 200 to 400 yards.

But if "red upon green" be not the order, steam is gradually shut off before the third signal is passed, the breaks are applied gradually and steadily, the train comes to walking pace, and, as the engine glides into the station, the driver looks at his watch, and sees by it that it is exactly two hours, less one minute, since he quitted London. He is correct to time to the moment; but if he were not so, he would, even if he were blameless, hear of it from two sources certainly—his own foreman and the railway guard; and if it were a postal train, through the inspector of that department. To the first-named official, at all events, he would have to give ample explanations.

At Rugby, driver and fireman are allowed four minutes to "water the engine," which means, giving her a fresh supply of that most precious aliment, going carefully round and *under* her to see and to feel that no part is unusually heated, and to supply with oil, from cans with the stork-like necks we see in the hands of all drivers and firemen, those parts of the engine and machinery which cannot be supplied during transit. In the course of these four minutes, if the train carry the mails, a postal operation is manifested which suddenly converts the platform, previously comparatively tranquil, into a scene of intense animation. Piles of mail-bags are hurled out from the vans and travelling post offices with indescribable celerity. The guards and porters

of the department perform this part of the business, but from the moment the bags are on the platform post office drudgery in respect of them ceases, and it then becomes the duty of the railway porters to attend to their further manipulation. This duty, however, is deferred until the bags awaiting on the platform the arrival of the train are lodged, by post office mandate, in van or sorting office; a sharp "All right" is heard to issue from the inside of the latter, the railway passengers who have left their carriages have returned to them, the porters have ceased crying, "Take your seats for north," and have replaced it by, "Any more passengers for the Scotch express?" all doors are closed—banged,—"Are you all right behind?" The wave of a white flag by day, a white lamp by night, is railway language for "Yes,"—a sharp decisive whistle from the foremost guard,—whether the sound be heard above the hissing of the escaping steam or the motion only be perceived it matters not, the engine driver understands it,—up goes his regulator, on goes his steam, the fireman (who has freed his break as soon as the engine is ready for starting) looks to the rear of the train as it begins to move from the station. If the engine don't "slip," the regulator, further raised, admits more steam to the cylinder; should it slip, steam is altogether shut off for a moment, and then let on again. The engine has got over the slippery point on the rails,—slippery either from the ordinary foulness of the atmosphere, or more probably, from some of the oil which has fallen from the engine to the rails. She is now getting to her speed; the guards, who have not jumped from the platform until after the train is in motion, shut themselves within their vans, they see that their breaks are all right and begin arranging their parcels; the *sisyphi* of the sorting post fall to again at their always-beginning and never-ending labours; such passengers as can sleep, sleep, such as can't

don't. And so the engine and her train, leaving the railway to Coventry, Birmingham, and the "Black Country" to the left, and that to Leicester, Nottingham, Derby, and all the east coast cities of northern England, to the right, pass onwards towards and through Nuneaton, a junction station which sends a branch to the left towards Coventry, and thence to Leamington, and one to the right to Leicester, where it connects with the system of the Midland Railway Company; a halt at Tamworth (necessary because it is a great postal centre, although of comparative insignificance as regards the railway) takes place thirty-three minutes after departure from Rugby, the intervening distance being twenty-four miles,—thence to Stafford, 133½ miles from London, accomplished in three hours fifteen minutes, entitles not only the engine, but those who are placed to control her, to rest and repose for a certain period.

A sister engine, which has been all ready-coaled and watered fully half an hour before the time appointed for the train's arrival, is attached thereto, and she proceeds onwards, reaching (if it be the Limited Mail) Crewe, 25 miles distant, in 30 minutes; Carlisle, 299 miles from London, in 9 hours; Edinburgh, 401 miles, in 10½ hours; Perth, 449 miles, in 12 hours 20 minutes. Here begins the beautiful and picturesque Highland railway*, the most northern of all our railways at

* *Engineering*, of September the 27th, and October the 4th, 1867, contains several extremely well executed views of some of the bridges and viaducts of the Highland Railway. "They are engraved," says the Editor, "not because of any special peculiarities of their mechanical structure, but mainly on account of the fine character of the abutments and approaches; in short, the artistic qualities of their general design. For variety and originality, for pleasing outline and detail, and for their dignity and their harmony with the associations of the district traversed by the line, these bridges are admirable works in every respect. They have an artistic as distinguished from their

the present time. Of it a few words. Its main line, extending from Perth through Inverness to Bonar Bridge, is of the total length of 204 miles. Thus London and the northern extremity of the Highland Railway are 653 miles apart, and the whole distance is accomplished by the Limited Mail in 22 hours and 20 minutes. Including branches, the Highland Railway is 250 miles in extent. Between Inverness and Perth it passes over several summits of considerable height, the highest, 1,500 feet above the level of the sea, being on the borders of Inverness and Perthshire. The next highest is at Dana, where the level is 1,000 above that of the sea, and about 40 miles to the south of this, and again at Dunkeld, the elevations are 400 feet each. The summits are gained by the line winding in and out amongst the hills, and by gradients of 1 in 70 (75 feet to the mile) and 1 in 80 (66 feet in the mile). At Speyside, near Keith, there is a rise for three miles of 1 in 60 (88 feet in the mile). The cuttings and embankments are, of course, on a large scale, and owing to the great elevation and exposed position of the line, the strong winds in the winter time sweep the snow from the hills and deposit it in the cuttings, thus making very heavy drifts. The snow ploughs invented by Mr. William Strandley, the Locomotive Superintendent of the company, are said to be very successful in removing these drifts from off the railway.

But, although the Highland Railway is now the most

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merely material character, and they are, notwithstanding, economical structures."

Mr. Joseph Mitchell, the engineer, by whom the line was constructed, read a paper descriptive of it at the Meeting of the British Association at Dundee in August last. This paper is given in full in *Engineering* of September the 13th.

northern* in the United Kingdom, it will probably cease to be entitled to be so called before the end of the present year, for it is expected that by that time the "Sutherland Railway" will be opened for traffic. This line is to extend from Bonar Bridge to Golspie, a distance of twenty-seven miles; not all northwards, for, for the first three miles, it goes westward, and enters the county of Sutherland by crossing the river Oykel, which is spanned by an elegant iron-girder viaduct. It then turns northward to Lairg, where it inclines to the east, and continues in that direction until it reaches Golspie. The whole of the land occupied by the line from the river Oykel to Golspie is owned by His

* Great, and it is hoped successful, efforts are now making to connect the North-East and the North-West of Scotland by a line to be made from Dingwall, eighteen miles beyond Inverness and the most western station of the Highland Railway, through Strathpeffer to Loch Carron, a distance of fifty miles, whence there will be steam communication with the Isle of Skye. The Dingwall and Skye Railway Company has been formed some time, but now, in consequence of the amount of capital subscribed, and the liberality of the landowners, application is to be made for an Act of Parliament to authorise the construction of the line; Mr. Matheson, M.P., is the Chairman of the Company. At the conclusion of its half-yearly meeting, held on the 30th October last, Mr. Kenneth Murray proposed a vote of thanks to the Chairman, Mr. Matheson, M.P., and in doing so, expressed his most cordial good wishes for the prosperity of the Skye Line. "Every thing," said Mr. Murray, "that lays in my power to promote it as a shareholder and otherwise, I feel it my duty as a Ross-shire man to do, and every one who has the interests of the North of Scotland, and of the people at heart, must sympathise with the efforts made to open up the distant West country. To Mr. Matheson, almost solely, the very high merit of having pushed forward the scheme is due, and I think he has very strong claim on every gentleman, whether proprietor, farmer, or minister even, that they should come forward and assist him in an object so very dear to him, as no line projected for a long time had such a claim on public sympathy and on the purse of the public." Mr. Matheson, in returning thanks, expressed the hope that by 1870 passengers from Edinburgh and Glasgow might reach Postree, the capital of Skye, in about thirteen hours, and passengers from Inverness in about six hours.

Grace the Duke of Sutherland, whose magnificent Highland residence, Dunrobin Castle, stands on the sea-shore, within a short distance of the latter place. The gradients are somewhat severe. From the Oykel there is an ascent of 1 in 72 to 75 for about eight miles to the summit, which is upwards of 500 feet above the sea-level. There are several heavy rock-cuttings. The scenery at some parts of the line is almost equal to the finest of the many picturesque views on the Highland Railway, by which company its traffic is to be worked. When completed, a passenger landing at Dover can go a distance of 768 miles to Golspie without even leaving the railway; or if he come upon English land, close to its end in Cornwall, he can go by rail from Penzance to within fifty of John of Groat's land. If he will insist upon coming through London, his distance will be 1,007 miles; but if he leave the line towards the Metropolis, at Bristol, and go from there through Birmingham, he will shorten the journey by 130 miles. He will save some money, but not much time, by changing.

M. Vandal, the *Directeur General des Postes Francaises*, says, in his *Annuaire* for the current year, that there is not a railway run from Dover to any part of the United Kingdom equal to the railway run from Calais to Nice, 863 miles. That is true at the present time to the extent of 122 miles. In a couple of months—that is when the Sutherland line is opened—it will be true to the extent of ninety-five miles; and, even if, as is expected, a railway be constructed which is to extend both to Wick and to sleepy*

* The following is an extract from a speech delivered in October, 1867, by the Rev. Dr. Guthrie, on the occasion of re-opening the parochial schools at Niddrie. "I was once present in a congregation in the town of Thurso, which contained as many as 1,200 people, and, perhaps, you will hardly believe me when I tell you that on that occasion I saw what I never saw before, and what, I am sure,

Thurso*, the tables will not be turned. The route from Calais to Nice will still be sixty-five miles longer than from Dover to John o' Groat's Land.

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you never saw, and what I hope I shall never see again—I saw 600 people asleep! 600 people asleep! I happened at the time to be living with Sir George Sinclair, a very excellent gentleman, who resides in the immediate neighbourhood of that town. I told him what I had seen in the church. "Oh," said he, "that is nothing to what I have seen myself; I have seen in almost every pew the whole people asleep, with only here and there an exception." The Rev. Doctor's opinion is that the cause of drowsiness in church, during sermon time, is "bad ventilation." No doubt———of the subject.

* The Post Office traducers of the railway are boastful enough of its services when it suits them to be so. Of Thurso it is thus written, at page 6 of the Postmaster-General's Eleventh Report (undated)—"The most northern town of Scotland is Thurso, 755 miles distant from London, and the combined effect of these accelerations was to admit of a letter despatched from London on Monday night being delivered in Thurso early on Wednesday morning, and of its reply, if posted about four o'clock on Wednesday afternoon ("about;" is that the way in which letter receptacles are closed in the north of Scotland?), reaching London in time for the first delivery on Friday morning." As the Post Office chooses to make unfair attacks upon railways, the Post Office must expect retaliation. Therefore, Mr. Seely, of the Admiralty, may we beg you to note there is no end of Post Office "pigs" that can be placed in your hands to work upon, and we beg you to take one, now, to start with. At the commencement of 1867, the department gave the year's notice it is bound to give, to the Peninsular and Oriental Steam Navigation Company, that its Mediterranean contracts should cease on the 31st of January, 1868. In March, 1867, advertisements were issued inviting tenders for the conveyance of these mails, the service to commence on the 1st of February, 1868. Attached to the form of tender are thirty-eight conditions. By the 31st of these it is stipulated that "the contract shall not be binding until it has lain on the table of the House of Commons for one month without disapproval, unless, previous to the lapse of that period, it has been approved by a resolution of the House." We believe we were the first to call the public attention to the fact that, as the day for receiving tenders was Monday, the 16th of September, 1867, and as the new contractors would have to commence on the 1st of February, 1868, they would, in that case, not only incur all the risk of providing vessels and suitable arrangements for carrying on the service for a period that might last six years, but they would have actually commenced it several days before the contract

The engine of the down trains from London, having rested at Stafford its appointed time, is again coaled and watered, and if she have brought the Scotch Mail, she takes her place at the head of the up-train, at 1·18 a.m., or an hour and

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could be laid upon the table of the House of Commons. This was in consequence of the House not usually meeting until the 3rd or 4th of February, and it might not be approved until the same date in the following month.

As soon as the blot had been hit it was discovered by the Post Office. It was therefore determined to postpone the commencement of a new contract for six months. The Peninsular and Oriental Steam Company was applied to, to continue the service for that period. The Company expressed its willingness to comply with the request, upon receiving an advanced price of ten shillings a mile instead of four shillings, the price now paid for the service. Mr. Hunt, the Secretary of the Treasury, in a debate upon this question and upon the attempt of the Post Office to place the conveyance of our eastern mails in the hands of *Compagnie des Messageries Imperiales de la France*, designated the demand of the Company as "preposterous." Whether that be so or not, the omission on the part of the officials of St. Martin's-le-Grand, an omission or blunder which a junior clerk in a large commercial establishment would at once be dismissed for being guilty of, is to cost the country rather more than £60,000, equivalent to what the Post Office pays for over two millions miles of railway conveyance for mail bags.

Punch, in its number for the 2nd of November, 1867, has a vignette of Toby holding the envelope of a letter for Lord John Manners, Chief Commissioner of Works, and says, "I will not, for the moment, adopt the tone of my friend, the *Pall Mall Gazette*, who bitterly says, a new principle governs the performance of official duties in England. Elsewhere, where certain men are appointed to take part in the Government of a country, they understand that they are to do the duties of their offices forthwith. With us the understanding is quite different: no work is to be begun except under such emphatic demand as in private life would answer to the practice of regularly kicking your footman to the coal-scuttle, when the fire needs replenishing." *Punch* then reminds His Lordship, that at the commencement of this year it was resolved that the water of the lake in Regent's Park should be drawn off, the mud of half a century be cleared away, and the lake be rendered shallow and safe for skaters this winter. *Punch* having learned that, practically, nothing is done as yet, proceeds, "Here I repeat, my dear Lord John, is November. We shall have frost soon, and when the ice forms, the foolish crowds will be rush-

twenty minutes after she had finished her downward journey. In precisely eight hours from the time she has left Euston she has completed her day's work, and in doing so she has gone over 267 miles of ground, and has conveyed some 120 tons dead weight of matter, besides her own weight, at a running speed of nearly forty-five miles an hour. She will perform the same double journey on the morrow, and then she will rest for a "shed-day;" out again for duty on the following day. She will work that and the succeeding day, then a rest as before, then work again for two days, and so on, taking shed-days, and times required for slight repairs, and occasionally for heavy ones and renewals. An engine is considered to do good service that is actually running on 250 days in a year. Quite enough, when it is remembered that she consists of 5,416 pieces, which must be put together like watch-work.

The watch, however, is not exposed to rough usage, fly-away speed, and exposure to weather the intensity of which

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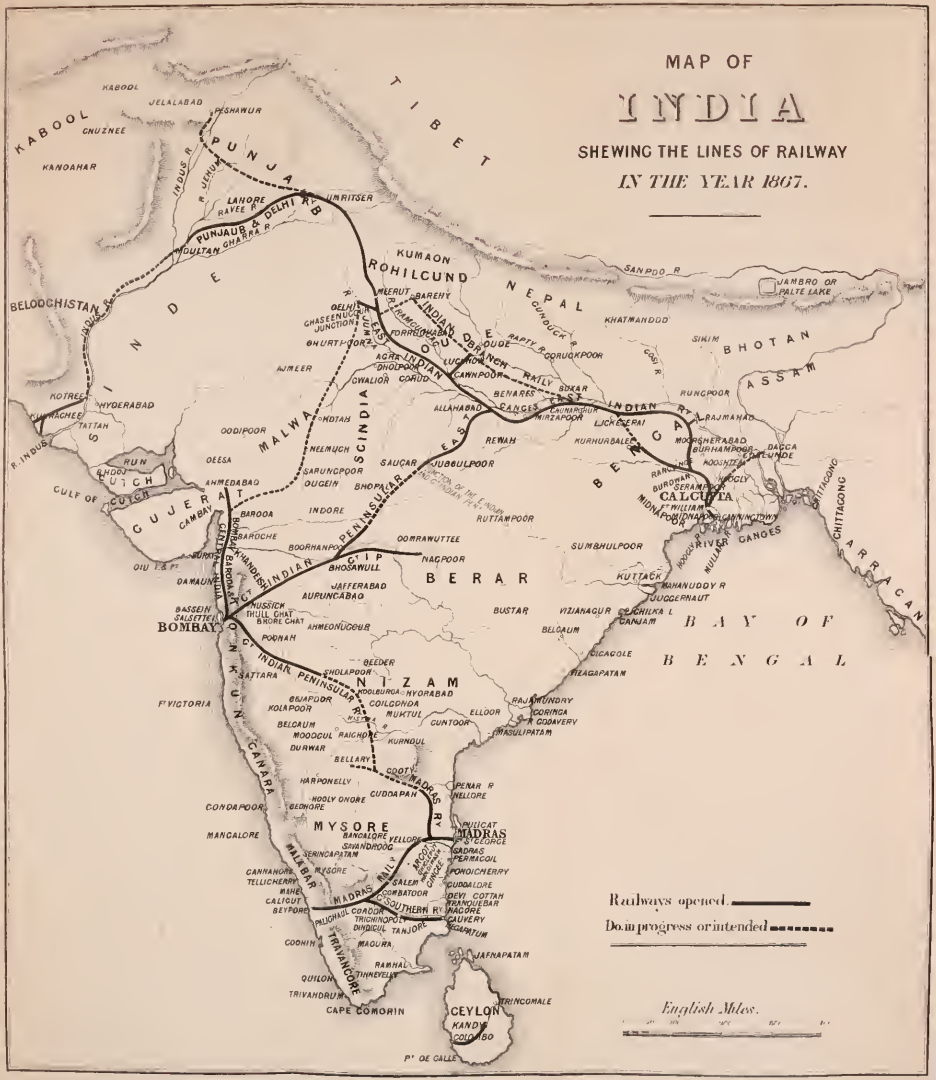
ing upon it. I say no more. The rate at which Government work is done, singularly contrasts with the rate at which private work is performed. But, of course, John Bull's servants never hurry themselves." On the 30th of September we wrote to the Post Office, complaining that a letter posted in a London pillar box by a member of our family was not delivered to its address in London in due course. On the *25th of October*, an answer comes, the whole gist of which is, that as the letter was not delivered at the time expected, it could not have been posted at the time stated. It is hardly necessary to say, that this allegation is unfounded. On the 2nd of October, and again on the 8th, we wrote to complain of the continuous irregularity in the transmission of our book packets; in one instance a letter to us and a book-packet having been posted at Lombard Street post office, and by the same fingers at the same time. The letter came in two hours and a-half, the packet in 39 hours and 20 minutes. Exactly on the day of our closing this sheet for the press (the 8th November), the promised answer to our complaints was delivered. *Mr. Punch* may well say, "John Bull's servants never hurry themselves." The Post Office not only never hurries itself, but, like Mr. Sturgey, the stock-broker, and other immaculate persons, considers itself always in the right.

may vary from 40 degrees below freezing point to 120 degrees of heat in the sun. We have seen the same engine at work in Canada at these identical temperatures within an interval of four months only. No wonder then that when her day's work is done she requires repose, quite as much as it is necessary for the horse of every day life. Her joints have become relaxed with labour, her bolts have become loosened, her rubbing surfaces, notwithstanding the oil the engine driver poured upon them, have become heated and are often unequally expanded, strained, and twisted; her grate bars and fire-box have become choked with clinkers, and her tubes charged with coke. *Hey presto!* the engine cleaners—the groom and hostlers of the iron horse—take her in hand, they clean out her fire-box, they scrape its grate bars; and, under the superintendence of superior workmen, they tighten all bolts and rivets, grease all moving parts, thoroughly cleanse her outside as well as in,—and the engine, thus washed, cooled down, refreshed, and purified, is, after an interval of five or six hours, again ready (if required) for whatever giant duty it may be necessary to employ her upon. But, let it always be remembered and borne in mind, she must not be over worked; she is infinitely more delicate and sensitive in this respect than the horse is.


MAP OF
INDIA
SHEWING THE LINES OF RAILWAY
IN THE YEAR 1867.
KABOOL
JELALABAD
PESHAWUR
KABOOL
GNUZNEE
KANDAHAR
TIBET
INDUS R.
JHELUM R.
PUNJAUB
LAHORE
RAVEE R.
AMRITSER
PUNJAUB & DELHI R.B.
MOULTAN
GHARRA R.
BELOOCHISTAN
INDUS R.
INDE
KUMAON
ROHILCUND
MEERUT
BAREILLY
DELHI
GHAZEEOODEENUGGUR JUNCTION
SUTLEJ R.
RAMGUNGA R.
FORRUCKABAD
INDIAN
OUDE
RAPTY R.
GORUCKPOOR
NEPAL
GUNDUCK R.
KHATMANDOO
SANPOO R.
VAMBRO OR PALTE LAKE
SIKIM
BHOTAN
ASSAM
GOGRA R.
RUNGPOOR
BHURTPOOR
AGRA
GHOLPOORA
GWALIOR
COLOO
LUCKNOW
CAWNPOOR
RAILY
SIKAR
BENARES
ALLAHABAD
RANGES
CAUNPOOR
MIRZAPOOR
EAST INDIAN RY.
RAJMAHAL
LICKEREAI
KURHURBALEE
MOORSHERABAD
BURHAMPORE
DACCA
LALLUNDE
KOTREE
HYDERABAD
KURRACHEE
TATTAH
R. INDUS
SINDE
MALWA
HOLKAR
OODIPOOR
NEEMUCH
SCINDIA
REWAH
SAUGAR
JUBBULPOOR
EAST INDIAN RY.
BENGAL
RUN
CHOOJ
DEESA
SARUNGPOOR
AHMEDABAD
OUGEIN
BHOPAL
RAMGUNGA R.
BURDWAN
SERAMPORE
HOOGLY
CALCUTTA
PHILLIBHEET
MIDNAPOOR
KIDDERPOOR
GUNNYTOWN
CUTCH
GULF OF CUTCH
GUJERAT
CAMBAY
BARODA
INDORE
RUTTAMPOOR
BAY OF BENGAL
CHITTAGONG
ARRACAN
BROACH
NERBUDDA R.
BARODA R.
BORDA
BARODA
BOORHANPOOR
OOMRAWUTTEE
SUMBHULPOOR
DAMAUN
KHANDESH
INDIAN
GIP
BHOSAWULL
NAGPOOR
BERAR
KUTTACK
MAHANUDDY R.
JUGGERNAUT
JAFFERABAD
AURUNGABAD
BASSEIN
SALSETTE
BOMBAY
MUSSICK
HULL GHAT
BHORE GHAT
AHMEDNUGGUR
BUSTAR
VIZIANAGUR
CHILKA L.
CANJAM
BELGAUM
CICACOLE
VIZAGAPATAM
PONAH
BEEDER
SHOLAPOOR
SATTARA
INDIAN PENINSULAR RY.
KONKUN
NIZAM
HYDERABAD
GOLCONDA
BIJAPOOR
KOLAPOOR
COILCONDA
MUKTUL
RAJAMUNDRY
CORINGA
GODAVERY
MASULIPATAM
ELLOOR
GUNTOOR
VICTORIA
BELGAUM
MOODGUL
RAICHORE
KURNOOL
DURWAR
BELLARY
MADRAS RY.
COOTY
HARPONELLY
HOOLY ONORE
CUDDAPAH
PENAR R.
NELLORE
CORDAPOOR
GUDNORE
MANGALORE
MYSORE
BANGALORE
YELLOR
SHANDROOG
SERINGAPATAM
VELLICAT
MADRAS
ST GEORGE
GADRAS
PERRACOIL
PONDICHERRY
CUDDALORE
DEVI COTTAH
TRANQUEBAR
NAGORE
CAUVERY
TRICHINOPOLY
TANJORE
CANNANORE
TELLICHERRY
MAHE
CALICUT
BEYPORE
MALABAR
MADRAS RAILWAY
SALEM
COMBATOOR
SOUTHERN RY.
PALGHAUT
COADOR
COCHIN
TRAVANCORE
MADURA
TINNEVELLY
QUILON
TRIVANDRUM
CAPE COMORIN
JAFFNAPATAM
TRINCOMALE
CEYLON
KANDY
COLOMBO
P.T DE GALLE
Railways opened
Do. in progress or intended
English Miles.

CHAPTER IX.

INDIAN RAILWAYS.

England is naturally in advance of all other countries as regards railways in her possessions and colonies. There is not one of them in which the system has not made some advance, but in two of them it has become of magnificent proportions. First as regards India.

Although the question of Indian Railways was first agitated as far back as 1840, it was not until 1846 that the British Parliament began seriously to occupy itself about them. In February and March 1847, the House of Commons ordered a vast amount of information, both official and unofficial, that had been collected from various sources, to be printed, and it may be said that the reports and documents then circulated, have formed the basis upon which the legislation for Indian railways has been framed. By the Act of the 12th and 13th Victoria, cap. 93. (1849), the construction of a line from "Calcutta towards the Northern Provinces," by the East Indian Railway Company, was authorised. The first divisions of the line, that is, from Howrah, opposite Calcutta, to Pundoah, 37½ miles, was not opened for traffic until September 1854; and by the 3rd of February, 1855, a further length of 92 miles to Raneegunge was completed. At the present time, the total length of the East Indian Railway is 1,354 miles. In mileage therefore it exceeds the London and North-Western Company of England by twenty-six miles, eight miles having been added to the latter company's lines since page 23 of this book was printed. The following is a brief sketch of the Great Railway as it now exists. At Burdwan (about ninety-two miles from Calcutta),

the separation between what is called the "Chord Line" (to be finished throughout in 1869) and the main line takes place. The latter runs due north to Rajinabad, thus connecting Calcutta with the Ganges, and enabling traders to avoid the navigation of 250 miles of one of the most dangerous parts of the river. At Rajinabad, the railway turns westward, and proceeds up the right bank of the Ganges, past Monghyr, where it is carried through the only tunnel in its course, 300 yards long, to Patna, Benares, and Allahabad. Shortly beyond Patna, it is carried across the River Soane, by a magnificent bridge, said to be the second longest in the world; it is therefore next in length to the Victoria Bridge at Montreal, to which reference is made hereafter. At Allahabad the line crosses the Jumna, by a bridge nearly as great as that over the Soane. In the crossings of these rivers, and of two others, the railway is carried at the top, with a roadway underneath for the ordinary traffic, in a somewhat similar way to the High-Level Bridge at Newcastle. These four bridges are constructed upon the wrought-iron lattice principle. That over the Soane consists of twenty-eight openings, with spans of 150 feet; that over the Jumna of fifteen openings, of which each span is 205 feet. The bridge over the Adjai consists of thirty-two openings, with spans of 50 feet; that over the Keeul, of nine openings, with spans of 150 feet; a smaller bridge over the Touse consists of seven openings, each with a span of 150 feet.

From Allahabad the East Indian Railway extends through Cawnpore to the heart of the upper Provinces, and at Ghazeeabad it meets the Punjaub Railway, whence it is carried to the Great City of Delhi.

At Allahabad it branches off to Jubbulpore, where the line of the Great Indian Peninsular Railway is to come from Bombay to meet it. The gap to be filled up is 225 miles,

and according to the interesting and instructive report of Mr. Juland Danvers, the Government Director of the Indian Railway Companies, issued in May last, it is fully expected that this gap will be completed for traffic, notwithstanding the difficult and costly character of several of the works upon it, by October or November of next year. Then railway transit from Bombay to Calcutta will be accomplished in forty-four hours ;* and it is not too much to hope that in two, at all events three years, the present contract time of mails from London to Calcutta, *viâ* Marseilles, will be reduced from 34 days to 23½ days. If the speed of the steamers which are to carry the Mails between Brindisi and Alexandria were to be twelve knots an hour, and not ten as specified in the invitations for tenders sent out by the Post Office, at the early part of the present year, and the speed of the steamers between Suez and the port of Bombay were increased from 9½ to 10½ knots an hour, a further acceleration of nearly two days to Calcutta would be gained, thereby reducing the time to 21½ days, or 2½ days less than the present contract time between London and *Bombay, viâ* Marseilles. Two to three hours would also be gained by the construction of a great bridge over the Hooghly, thereby extending the East Indian Railway, from its present terminus at Howrah, into

* The latest advices from India announce the commencement, in November, 1867, of a passenger service between Calcutta and Bombay, which is to be done in 116 hours, or 4 days 20 hours. Of these, 80 are to be by rail and 36 in dâk. The journey by dâk will be between Jubbulpore and Nagpore, but the latter station will cease to be on the line of railway communication between Calcutta and Bombay when the existing gap is completed. Eighty hours in the railway seem very long, especially as it is intended, when the through line is opened, to run the whole distance between the two capitals in forty-four hours. The fares for the temporary service are to be 231 rupees (£23. 2s.) first class, 165 rupees (£16. 10s.) second class. Passengers, whether first or second, pay 100 rupees (£10) each by dâk between Jubbulpore and Nagpore.

Calcutta. Such a work is stated by Mr. Juland Danvers to be, "in the opinion of those best able to judge, imperatively required, in the interests both of the railway company and of the public." No decision, however, has as yet been come to with reference to its construction being commenced at an early period.

The average cost of the upper portion of the East Indian Railway has been about £15,000 a mile. The lower, or Bengal portion, has been, at least, half as much again. It is expected that the Jubbulpore extension will come to £15,000 a mile, including rolling stock and maintenance of the line and works for a year after opening. The gross traffic earnings* during 1866 were £2,012,680, showing an

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* Can it be possible that the two following paragraphs, the first copied by *Engineering* from an Indian journal, the second an original article—correctly represent "Travelling in India" at the present time, or even recently?

"Proceeding to the Calcutta terminus of the East Indian Railway, a line 1,000 miles in extent, we find a wretched little building with brick flooring and no punkahs, where tickets are so slowly issued as to raise doubts as to how the demands of a Derby-day would be discharged. Scores of coolies dash down upon our boxes, and, after much altercation, succeed in carrying them off. The waiting-rooms resemble lock-ups intended for the worst species of pick-pockets, and are simply uninhabitable. Parcel's office, book-stalls, refreshment rooms, and other and more necessary conveniences are wanting. As there is no accommodation for any class of traveller, the public sit and stand about the verandahs and covered ways, choking the approaches, thus rendering impossible any attempt at order. The railway staff, represented by baboos and a few lounging slovenly policemen—there are no porters—are swallowed up in the crowd, whilst the two English sergeants content themselves with keeping the carriage-ways clear. All care appears to cease after the traveller has committed himself to the hands of the East India Railway. By-and-by the steam ferry-boat arrives, bells ring, and the living stream pours and crushes down a covered path, which, stopping suddenly, leaves some thirty or forty paces of open platform, upon which the sun and rain beat uninterruptedly, inconveniencing children, delicate women, old age, invalids, and what not. We are not in the least surprised; thirteen years of neglect has accustomed us to this sort of thing. Immediately afterwards, the Howrah side

increase of £338,239 as compared with 1865. The receipts

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of the Hooghly is reached, and another uncovered platform presents itself; and if the crushing has hitherto been excessive, the natives being hustled and driven together like sheep, what shall be said of the scene at the Howrah station platform—a narrow stone terrace of considerable length, where other crowds of travellers are already collected and arriving, shrieking and gesticulating? A dense mass of natives, from which an Englishman, by pure muscular power, may occasionally be seen to break, flows onwards, and fills the railway carriages to overflowing. Resistance is out of the question. The pressure onward and inward towards the train, by a simple law of gravity, accomplishes the desired end amid cries and protestations, and forces the human units into acquiescence and the railway carriages. Anything is preferable to being left behind, and such is the option offered to four-fifths of the travelling native population of India. Whether the crowd be great or small, we have never known it considered necessary, so remarkable is the elasticity of the carriages, to afford extra accommodation. Nothing is impossible to the policeman's baton and the brutality of a station-master, not even death itself. Last year no less than seven or eight corpses, if we remember rightly, were taken from the carriages of this line alone—victims to a barbarous system of overpacking. How many subsequently die from exhaustion will never be known. Men and women are often so crushed in third-class carriages as to be compelled to remain standing for the entire length of a journey, sometimes 400 or 500 miles, and at the hottest season of the year. Scenes daily occur at our Indian railway stations which make an Englishman's blood burn with shame and anger, not that natives should oppress natives, but that his countrymen should be guilty of, and tolerate in others, acts at once unjust, cowardly, and inhuman; for, as the confusion subsides, many railway officials may be discerned, some on duty, others from the adjoining offices, all connected with the line—all supremely indifferent to its proper management—all smoking, spitting, and gossiping.

"By the time the train has reached Sahibgunge and Jumalpore, this free-and-easy behaviour has passed into absolute rowdyism and terrorism. At one station some respectable natives, travelling by second class are permitted to be insulted and dragged from their carriage by a drunken barrack-sergeant. At another, villagers who had been forced into intermediate class carriages, in course of being knocked about by policemen, are crying and protesting against being charged a fare not voluntarily incurred. Nowhere are the natives treated otherwise than as wild beasts. Tickets for distances under those paid for are constantly issued to the ignorant; and the possession of a small bundle too frequently, under threat of arrest, necessitates the payment of a douceur.

per train mile in 1865 were 7s. 9d., in 1866, 8s. The

These, and hundreds of similar occurrences, are forced upon the attention of the most unobservant European traveller in the course of a few stages. Much remains unseen. With the exception of the private rooms of station-masters, generally extravagantly furnished for men drawing small salaries, five stations out of six are filthy and altogether uncared for, useless to the public, and a disgrace to the line. In all the distance between Calcutta and Delhi, the railway traveller is only reminded of travelling at home by the unbroken absence of every pleasure he has been accustomed to associate with that species of progression. If he has not suffered personally, or not excessively, he has witnessed the sufferings of others more poor and humble, and to a right-thinking Englishman the difference will not appear very material; he will also have witnessed an amount of neglect of, and contempt for, the public such as, we venture to assert, was never before exhibited either in England or abroad."

"Travelling in India.—In October, 1866, a petition was presented to the Governor-General of India by the British Indian Association of the North-Western Provinces, bearing the signatures of 3,251 persons, praying for the introduction of certain reforms, with a view to affording further and better accommodation for the native travellers, who constitute by far the greatest source of revenue to the railway companies. The construction of railways in India has, as a matter of course, put a stop to the old modes of transit, and the natives have therefore no alternative but to resort to them as a means of conveyance from one place to another; but the accommodation provided for them, either at the stations or in the railway carriages, would, from their complaints, appear to fall far short of what is required.

"One of the principal points to which attention is directed by the memorial is the want of shelter and accommodation at the different stations for third-class passengers. These passengers consist of the poor, the ignorant, and the helpless; many among them are weak and feeble, some sick and old, many women and children. These have always to wait in crowds of hundreds, for several hours at a time, in an open and unsheltered place to purchase their tickets. The few rich and wealthy have waiting-rooms, or the sheltered platform to accommodate them; but the masses of the poor have absolutely no shelter at all. It cannot be expected from these that they should come in only at the proper time, for most of them have but an indefinite idea of time, and a large number come in from surrounding villages and rural districts where no time is kept. But, besides this, the trains themselves arrive so very irregularly —sometimes six hours behind the time—that, without any fault of the passengers, they are compelled to wait; and whilst thus waiting, there is no shelter to be had from the fierce rays of the sun, from the heavy and drenching showers of

expenditure per train mile in 1865 was 3s. 8d., in 1866 a farthing a mile less. The train mileage in the year ending 30th June, 1866, was 4,625,705 miles.*

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rain, from the hot winds and clouds of dust, or from the cold cutting blast. In winter, in summer, and in the rains, at all times alike, these masses of weak, ill-clad human beings are left exposed to all the inclemencies of the wind and weather, and suffer and contract diseases which not rarely result in death.

"Another complaint is of the want of proper restaurants for the same class of people, the want of proper nourishment, especially in long journeys, being no less the fruitful source of disease and suffering than the want of proper shelter and accommodation, and, owing to their prejudices of caste, life is often sustained during the railway journeys under great difficulties by the Hindoos and Mohammedans. They also complain of the absence of medical assistance in the event of an accident, and request that some one possessed of medical experience and surgical training may be placed in medical charge of each through train.

"The subject of bad treatment to native travellers is also forcibly brought to notice, for not only are native passengers of all classes and grades, without distinction, subjected to disrespect, but they have also to suffer the greatest insolence, impudence, hard language, contempt, and even sometimes ill-usage, from the menials of the railway police and other officials. Indiscriminate abuse, and often on their superiors in the social scale, is freely lavished, without let or stint or a regard to its quality. Passengers have even been struck and otherwise treated with great indignity, and second-class passengers are not allowed to get in even to the platform, but are made to herd with the mass outside. The most respectable Hindoos and Mohammedans further complain that they are liable to ill treatment and loss of honour from their European fellow-passengers in the second-class carriages; and thus native gentlemen of birth and respectability, in striving to avoid the crowd and pressure and company to be found in third-class carriages, find themselves even worse off in a second-class seat. Lastly, this memorial draws attention to the utter impossibility of native ladies of respectable birth and breeding taking advantage of the railway, as matters are at present carried on. The absence also of any proper retiring-room at the station for such of the better class of native ladies as have to wait for trains, places further obstacles in the way, and tends to keep them from the use of railways whenever they can be avoided."

* For a very complete and interesting history of the East Indian Railway and of the existing arrangement for its management and control, the reader is referred to the letter and memorandum of Mr. R. W. Crawford, M.P., chairman of the board of directors, dated the 21st of March, 1867, and addressed to the Secretary of State for India.

The Great Indian Peninsular Railway Company was incorporated in 1849. It is to be the great line which is to unite Bombay with Madras, and also with Calcutta. From Bombay to Callian may be considered the parent line, as it is at this point it becomes divided, one branch going south-east in the direction towards Madras, and the other north-east towards Calcutta. The south-eastern branch is carried over the Bhore Ghaut by an incline nearly sixteen miles long, with a total elevation of 1,381 feet. The foot of the mountain is 196 feet above high water mark at Bombay. Its average gradient is 1 in 48. The steepest gradients are 1 in 37 and 1 in 40, for a total length of 9 miles and 44 chains; 1 in 37 extends in one length for 1 mile 10 chains, and 1 in 40 for 5 miles 6 chains. Short lengths of level gradients and of 1 in 330 are introduced into this incline to facilitate the ascent of the engine. The radii of the curves upon it range from 15 chains to 80 chains; but as much as 12 miles 45 chains have a radius of more than 30 chains, and 5 miles 33 chains are straight. It comprises twenty-five tunnels of a total length of 3,585 yards. The longest is 437 yards; and the longest without a shaft, which is carried through a mountain of basalt, is 346 yards. There are eight viaducts of a total length of 987 yards. The two largest are 168 yards long, and respectively 163 and 160 feet above the foundations. The total quantity of cutting, chiefly rock, amounts to 1,263,102 cubic yards. The maximum depth of cutting is 70 feet, and the greatest contents 75,000 cubic yards of trap rock. The embankments amount to 1,849,934 cubic yards, the maximum height being 74 feet; and the greatest contents are 209,000 and 263,000 cubic yards. The slopes average about $1\frac{1}{2}$ to 1. There are twenty-three bridges of various spans, from 7 feet to 30 feet, and sixty culverts from 2 feet to 6 feet wide. The rails weigh 85 lbs.

per yard. The cost of the incline has been nearly £800,000; at one time there were no less than 42,000 men (natives of India) employed upon its construction.

At the eleventh mile the incline is divided into two banks by what is called a reversing station. This subdivision, however, was not adopted for the purpose of making two banks of the incline, but of increasing the length of the base, in order to flatten the gradient and to reach a higher level, where it encountered the great features of the Ghaut margin, near Khandalla. Without the necessary expedient of the reversing station, the practicability of changing the direction of the line would have been confined to making curves of small radius; but with the device of the reversing station the direction was altered at a very acute angle, by means of points and crossings. In consequence of its adoption, the length of the line has necessarily been considerably extended.

The Bhore Ghaut is unquestionably a stupendous mass of works, unsurpassed by any others in the world; and probably the nearest rivals to them in magnitude and grandeur are those of the Thull Ghaut.

This incline extends from the village of Kussarah to Egutpoora. It is $9\frac{1}{2}$ miles in length, and has a total ascent of 972 feet. At the end of $3\frac{3}{4}$ miles there is a reversing station, similar to that upon the Bhore Ghaut Incline, by which the base is lengthened, the gradient flattened, and the incline divided into two banks. The steepest gradient is 1 in 37, for a length of 4 miles 30 chains; and the same introduction of a level portion is adopted here as on the Bhore Ghaut. The radius of the curves ranges from 17 chains to 100 chains; but of 7 miles 12 chains the radius exceeds 30 chains, and 3 miles 28 chains are straight. There are thirteen tunnels of a total length of 2,652 yards.

The longest are, one of 474 yards in black basalt with two shafts, and another of 483 yards without a shaft, in green-stone. There are six viaducts, of a total length of 741 yards, the largest of which are respectively 144 yards and 250 yards long and 83 feet and 182 feet high. The latter is of three spans with triangular iron girders measuring 150 feet, with a pair of semi-circular abutment arches measuring 40 feet at each end. There are fifteen bridges of which the span varies from 7 feet to 30 feet, and sixty-two culverts. The cost of the incline is about £500,000.

The Thull overcome, a branch line, runs south-eastward through the great cotton district of Oomrawattee to Nagpore, but the main line continues its course eastward to Jubbulpore, where it meets the East India Railway which comes to join it from Calcutta. From Bombay to Jubbulpore the distance is 615 miles, and from Bombay to Raichore, the point of junction with the Madras Railway, the distance is 441 miles. As soon as the whole system of the East Indian Peninsular Railway is completed it will consist of 1,267 miles.

Its train mileage in the year ending the 30th June, 1866, was 2,259,881 miles. The gross receipts for the year ending the 31st December were £1,252,962, showing an increase of £77,872 over 1865. The receipts per train mile in 1865, were 10s. 5d.; in 1866, 10s. 11d. The expenditure per train mile in 1865, was 6s. 2d.; in 1866, 6s. 4½d. For the half-year ending the 30th of June, 1867, the net receipts amounted to £530,568, being at the rate of £6. 9s. per cent. per annum on the whole of the paid-up capital of the company. As the guaranteed interest of the half-year advanced by the Government amounted to £398,452, the surplus profit was £132,116; but, in consequence of the

accidents that had occurred to the works, it has been decided by the shareholders that no more than at the rate of 5 per cent. per annum, shall be divided among them for the present. The Great Indian Peninsular Railway must always be liable to heavy cost, and occasional interruptions to its traffic, in consequence of several of the districts through which it passes being subjected to severe and sudden floods. At Bombay, the annual rainfall is about 85 inches (more than three and a-half times the rainfall of London), and although at other places on the line it is considerably less, it is nevertheless as high as 255 inches at Matheran, and as high as 265 inches at Mohableshwar. It may be that the works on the railway, as a whole, have not been constructed sufficiently with a view to this fact, but, from whatever cause proceeding, several serious disasters to viaducts and bridges have recently taken place; and, we regret to perceive, by a minute of the Governor-General in Council, that these disasters are attributed to original defective construction. It also appears, by the latest reports from India, that as many as seventeen bridges on the unopened portions of the Nagpore Extension have been condemned by the company's engineers. But might not this fact have been avoided if they had done their duty in the first instance?

It was not until the year 1852 that the Madras Railway was incorporated. The object of the company was to construct a railway from Madras to the western coast. The difficulties of construction of this railway have not been great, the only ones that presented themselves being the way in which several rivers should be crossed. By means of this line, railway communication with the important military station of Bangalore is obtained. It also passes through the cotton fields of Combatoore, and it finds its way through a passage in the Ghauts to the Port of Beypoor, on the coast

of Malabar. From Madras to Beypoor, the distance is 406 miles. The Bangalore Branch is 86 miles, and it attains a height of 3,000 feet on the Mysore Table-land. The north-west line, leaving the main line at Arconum, 42 miles from Madras, proceeds through Cudapah, crosses the River Pennar to Gooty, to which place the line is expected to be opened in January next. Near Gooty, a branch is given off to Bellary. The main line crosses the Toongabruda, and runs to Raichore, the point of union with the Great Indian Peninsular Railway from Bombay. This portion of the railway, when completed, will be 338 miles, thus making the distance from Bombay to Madras 821 miles, 160 miles more than by the ordinary road. The connection between the Bombay and Madras Railways is expected to be complete in 1869. When the whole main line and branches are completed, the length of the Madras Railway will be 825 miles. Of these, 645 are at present open.

The traffic of the line has been injuriously affected in 1866 by the failure of the Monsoon rains, the consequent scarcity and famine, and the state of trade. But good service was rendered by it during the famine, in conveying to the districts so lamentably affected by it nearly 23,000 tons of food, an amount which Mr. Danvers says would have employed 17,000 carts every day for three months. The gross traffic receipts of 1866 were £438,787, showing an increase of £33,787 over 1865. The receipts per train mile in 1865 were 6s. 1d.; in 1866, 6s. 7¾d. The expenditure per train mile in 1865 was 2s. 10¾d.; in 1866, 3s. 2d. The train mileage for the year ending 30th June, 1866, was 1,306,998 miles.

Beypoor has for some time been felt as an unsuitable terminus, on the western coast, for the Madras Railway. It provides the conveniences neither of a harbour nor of a port,

and the advantages of the railway to the western side of India are, in consequence, greatly diminished. Proposals have, accordingly, been made to extend it northwards to Calicut, or southwards to Cochin, sixty miles from Beypoor. The former would hardly be much better than Beypoor, but Cochin appears to offer considerable advantages. Independently of possessing a fine harbour, there is close by, the remarkable roadstead of Narrakal, accessible to ships at all seasons. The only drawback is, that the line would pass through a foreign territory; but this would be slight if the Rajah of Cochin would support the project. The matter is now under the consideration of both the Supreme and the Madras Governments.

It is expected that by means of the Madras Railway the French East Indian settlement of Pondicherry,* situated not far from the south-eastern extremity of the continent, will eventually be linked by the railway system with all the chief cities of British India. The French Government has just decided upon granting a subsidy for the construction of a line that, in the first instance, is to be carried between the City of Pondicherry and Conjeveram, and subsequently to some point on the Anglo-Indian system. Such a connection will materially improve postal and passenger communication between France and its dependency. At present there is only direct intercourse between them once a month, through the medium of the steamers of the *Messageries Imperiales*—a company that is largely subsidised by the French Imperial Government.

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* Whilst the area of British India is 956,436 square miles, with, in 1861, 143,271,210 inhabitants, the area of the "Native States," is 596,790 miles, with 47,909,197 inhabitants, and the area of Portuguese India is 1,066 square miles, with 313,262 inhabitants, the area of the French settlement of Pondicherry is only 188 square miles, with a population of 203,887 souls.

The Bombay, Baroda, and Central India Railway was formed to connect Bombay with the Cotton districts of Guzzerat and Central India. The works were commenced in 1856. Taking a northward direction along the coast from Bombay, it passes Damaun and Surat. Here it crosses the River Taptee by an iron bridge 2,000 feet long. But at the Nezbudda River the bridge is nearly double that length, being 3,800 feet. This has been the most formidable work of construction on this railway. The line then continues its course to Ahmedabad, which is 310 miles distant from Bombay.

This line, when completed, will prove to be the most expensive in India. Its cost will be more than £20,000 a mile. To cover the interest a large traffic will be required, and such may be reasonably expected. But its capabilities are at present cramped by the want of a good terminal station at the Port of Bombay,* and by the imperfect road com-

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* Bombay will have to go a-head in various ways, if she wish to manage with credit the immense traffic of which she is destined to be the centre almost immediately. First, as regards her docks and docking accommodation. At present there are two belonging to the Government. They were built by the old East India Company. One, though useful at the time it was built, and for many years afterwards, is no longer available for the steam vessels that now navigate the Indian seas. She second, the "Duncan" Dock, has only sixteen feet of water at the Lock Gates. This unfits it for many vessels, and will render it useless for most of the steamers that will shortly navigate to and from Bombay. The Peninsular and Oriental Company have two docks, one of which, although only 390 feet long, has 20 feet 6 inches at the lock, and will admit any vessel afloat except the "Great Eastern." But the company requires both docks for its own purposes, and it will find it difficult to lend them, even occasionally, for docking the new transport steamers shortly to be put on between Suez and Bombay, until further docks are provided. It may be stated, *en passant*, that these steamers will, with the exception of the "Great Eastern," be the largest vessels afloat—length of each, 381 feet; breadth, 49 feet; tonnage, 500 tons. When placed on the line between Suez

munications with the stations. This last is a complaint that can truly be made by all the railway companies of India. The railway sustained very serious damage by floods during

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and Bombay, all British troops destined for or from the East will be conveyed by them, instead of by vessels taking the passage by the Cape of Good Hope.

An illustration of the value of eligible docks constructed for the accommodation of important lines of ocean communication connected with arterial railways, is afforded by what has occurred at Southampton since 1840. They have proved themselves to be not only an advantageous investment, but to their presence are, no doubt, due the immense commercial development, and the equally great increase which has taken place in its population in the last twenty-five years. The docks were opened for business in 1840, and at the end of four years the revenue yielded by them was only £4,018; but in 1844 Southampton was made the port of arrival and departure of the Peninsular and the West India Mail steamers. The revenue of the docks had therefore risen to £20,614 in 1850. Five years afterwards, by which time the steamers of the several companies had increased in magnitude and in frequency of arrivals and departures, the dock revenue had risen to £55,442. In 1860 it was £54,558; in 1861, £55,342; in 1862, £58,121; 1863, £57,739; 1864, £58,358; 1865, £62,449; and in 1866, £66,011. In 1854 the inhabited houses within the postal limits of the town and neighbourhood, of which the Post Office is the Head-centre, were 14,290, and the population had risen from about 45,000 in 1844 to 78,829. In 1863, the population was 108,079, the inhabited houses 19,969. In 1867, the population and the inhabited houses within the same limits had increased still further. The estimated population of the actual borough, in the middle of 1867, was 56,107, and the inhabited houses, 9,263.

Bombay is also very defective as regards hotel accommodation. The defect, however, is, to a certain extent, about to be remedied. One is in course of erection on the Esplanade, and nearly ready for opening, which will be a valuable acquisition, as well as an ornament, to the city. Messrs. Ordish & Lefeuvre, of London, are the architects. The building (of four stories), will be 190 feet long, 90 wide, 85 high.

It is by works such as these, and others suited for great commercial purposes, that Bombay may eventually become successful in its aspirations to be the capital city of the Indian Empire. In population she already exceeds those of the two other great capitals of India. The population of Calcutta, is, according to the latest estimates, about 700,000; of Madras, according to the Administrative Report for 1863, 427,771; whilst that of Bombay was, according to the census of February, 1864, 816,562.

the Monsoons of 1866. Their destructive character is said to have been unprecedented, and for upwards of a month the traffic was totally suspended on about thirty miles of the line. Nevertheless the growth of the traffic is not unsatisfactory. In 1866 the gross receipts were £407,688, being £85,872 more than in 1865. The gross receipts per train mile in 1865, were 12s. 6¾d. (the highest in India), but the working expenses were also the highest—8s. 1¾d. a mile. The train mileage for the year ending the 30th June, 1866, was 745,961 miles.

Very considerable desire exists in India to extend this railway from Baroda, across central India to Delhi, nearly parallel (but at a distance of from 350 to 500 miles during two-thirds of its course) to the main line of the Great Indian Peninsula to Jubbulpore, and thence to Allahabad. The length of this line would be about 570 miles, and surveys are already being carried on with the view of ascertaining the best route and making complete estimates of cost. At present it is assumed that the line will cost about £12,000 a mile, or £6,850,000. If the results of the surveys be satisfactory, arrangements will probably be made for constructing this railway. A main difficulty is that it will, for the most part, be carried through the territories of native princes; negotiations must, therefore, before the works can be commenced, be entered into for the abolition, at all events the relaxation, of the existing onerous transit dues.

The tendency of the construction of this extension would be to still further concentrate European traffic at Bombay, as by means of it not only would Delhi and the north-western provinces be accommodated, but there would be a second route from Bombay to Calcutta, a round-about one to be sure,—but a second route notwithstanding.

The next railway we have to refer to is the Scinde Rail-

way, which was incorporated in its present shape in 1857. "Although," says the editor of *Engineering*," the affairs of this company are under a single board, the operations of the company, in reality, embrace four separate concerns." The object of the combined undertaking is to establish railway communication between the port of Kurrachee and the Punjaub, and to connect the chief cities of that province with the East Indian Railway, which has already been mentioned as extending to Delhi.

The first portion of this great connection is a most important section of 109 miles in length, crossing the rivers Bahrun and Mulleer, and through the Karatolla Hills to Kotree on the Indus, opposite Hyderabad. It has since its opening in May, 1861, developed a considerable trade in cotton, which had not been previously seen on the Indus, as well as Indigo, grain, wool, and other products.

Usually, the violence of the monsoons does not extend on the western side of India, so far to the north as Scinde, but, in August, 1866, it was not less destructive to the works of the Scinde Railway than to those of the Bombay and Baroda. In two days, forty inches of rain fell, and the floods produced by this sudden down-pour were such that they as completely swept away a viaduct as if it had never existed. Iron girders, sixty tons in weight, were hurled along for a distance of half-a-mile, and rails were carried away 300 feet from the line. The traffic was, in consequence, interrupted for several weeks. As in the case of the Bombay and Baroda Line, the cost of repairing the damage will, in consideration of the exceptional circumstances which caused it, be allowed as a charge against capital. In 1865, the gross receipts of the Scinde Railway were £82,493, and the net, £3,507; in 1866, although the gross receipts had fallen to £53,166, the net earnings were £10,083. The train miles in 1866 were 283,062.

The second portion of the system connected with the Scinde Railway as it now exists, is for the navigation of the Indus from Kootree to Moultan, eventually to be superseded by what is designated the Indus Valley Railway. The Indus Steam Flotilla consists of thirteen steamers, three tugs, and twenty-six barges. The vessels which formed the early portion of the company's fleet did not turn out satisfactorily, but now the service is efficiently carried on. The gross receipts of the company for the year ending the 30th of June, 1865, were £73,958, and the net, £16,400; for the year ending the 30th of June, 1866, they were respectively, £80,640, and £22,283.

As regards the Indus Valley Railway, the object of its projection is to unite by means of a line that would be about 500 miles long, the existing Scinde and Punjaub Railways, and thus to provide a continuous line of railway communication, about 2,200 miles long, from the Port of Kurrachee to Calcutta, *viâ* Hyderabad, Moultan, Lahore, Delhi, and Allahabad.

The project is indeed a grand one, and its effect would be (assuming that the line be made between Baroda and Delhi) to give a *third* line of communication between the western coast of India and Calcutta, and also three lines of communication between that coast and the North-Western Provinces, of which two (one, however, circuitous) would be from Bombay, and one from Kurrachee.

When we have, as we shall undoubtedly have, sooner or later, the Euphrates Valley Railway,* it will, in the first

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* "Sir Bartle Frere sees at a glance the immense importance, both politically and commercially, of the Punjaub lines in the whole economy of the railway system of India; he sees, too, no doubt, their bearing and intimate connection with that direct route to Europe through the Euphrates valley, which, by the untiring exertions of the very able Chairman of the Punjaub and Scinde Railways, must sooner or later be a *fait accompli*. Nor does he stand alone

instance, be carried from the ancient Port of Seleucia, on the Mediterranean, to Ja'bar-Castle, on the Euphrates, below

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in the view he takes of this great question. The Lieutenant-Governor of the Punjaub is strong on the same side, and the whole press of India is unanimous in urging the completion of those lines with the utmost speed.

"At the recent Meeting of the British Association for the Advancement of Science, at Dundee, in August last, Sir Samuel Baker, President of the Geographical section, when speaking of our Indian possessions, said: 'It appears to many of us as the affair of yesterday that the overland route to India was established by the indefatigable Waghorn (whose name should ever be held in honour); but in the short space of about fifteen years the camel has ceased to be "the ship of the desert" upon the Isthmus of Suez. A railroad connects the Red Sea with the Mediterranean; a canal already conveys the sweet waters of the Nile through deserts of arid sand to Suez, and a fleet of superb transports upon the Red Sea conveys our troops to India. Who can predict the future? Who can declare the great French work to be impossible, and deny that within the next half century the fleets of the Mediterranean will sail through the Isthmus of Suez upon the Lesseps Canal? England has been the first to direct to general use the power of steam. Our vessels were the first to cross the Atlantic and to round the stormy Cape to India. But have we not thus destroyed the spell that kept our shores inviolate. Not only ourselves, but the French, possess a magnificent fleet of transports on the Red Sea. We can no longer match the dexterity of our sailors against overwhelming odds. Steam breaks the charm. Wars are the affairs of weeks or days. There are no longer the slow marches that rendered inaccessible far distant points. The railway alters the former condition of all countries. Without yielding to exaggerated alarm, we must watch with intense attention the advances of Russia upon the Indian frontier, and, beyond all geographical enterprises, we should devote extreme interest to a new and direct route to India by the Euphrates Valley and Persian Gulf, thus to be independent of complications that might arise with Egypt.'

"So long as the Indian Empire exists, the connection between India and this country must be kept up; and if that connection were interrupted for many months, the doom of our Eastern Empire would be practically sealed. England maintains her position in India by force of arms; and it is a principle, both of war and of common sense, to take efficient means to keep open the lines of communication between the base and the field of operation.

"It is impossible to contemplate, without a shudder, the consequences which must result if the Government should ever neglect to maintain effectively

which point there is water communication by the Euphrates and Tigris to the Persian Gulf.* Kurrachee† will then be the port of call between Europe and India. At whatever

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the means of communication with the East. The present route, *viâ* Egypt, might at any time be rendered unavailable by political combinations in Europe, and yet our Government have hitherto been content to rely upon one means of communication, notwithstanding that it is in their power to establish not only an alternative, but an infinitely better one by way of the Euphrates Valley.

"But we feel well assured that the great design of connecting Europe with Central Asia, by the telegraph and the rail by the Valleys of the Euphrates and Indus, is at length approaching its accomplishment. The Euphrates and Indus Railways completed would be the grandest pledge that could be given for the peace and the prosperity of the world."—*Allen's Indian Mail.*

* The length of the Euphrates, in its direct course from North to South, is about 700 miles; but with its various windings, it is nearly 1,800. The current is sluggish, not exceeding two and a-half to three miles an hour, except during the floods, when it increases to about five miles. The river navigation would extend from Ja'bar Castle to Bir, 120 miles, or to Bussorah, 70 miles from its mouth, and the vessels must not draw more than eight feet. The draught of the ocean vessels into which the mails and passengers would be transferred at Bir or Bussorah, must be limited, as there are not more than twelve feet on the bar at the mouth of the Euphrates at low water.

† The intelligence respecting Kurrachee Harbour is unsatisfactory. It is quite clear that with any increase of trade there, the capabilities of the place as a harbour will be surpassed, notwithstanding the fact that, on the recommendation of the late Mr. James Walker, upwards of a quarter of a million sterling has, since 1859, been expended on works for increasing its capacity. But now, according to the opinion of Messrs. Stevenson, of Edinburgh, all this outlay has been useless, although it has had the effect of adding from 70 to 100 acres to the dimensions of the harbour. Naturally the report of Messrs. Stevenson has given rise to much disappointment, for it means that the money expended, if not absolutely wasted, has not been usefully laid out, and that all the valuable time consumed between 1859 and 1866 has been virtually lost. One of the subjects specially referred to Sir Seymour Fitzgerald, on his appointment, early this year, as Governor of the Bombay Presidency, was Kurrachee Harbour. In the meantime the works were to be suspended and not to be resumed until the Home Indian Government had received the additional data for a satisfactory settlement of the question, which Sir Seymour was directed to collect. His report has not yet been received at the India Office.

time these eighty miles shall be constructed, and proper lines of steamers established in connection with them, there will be a gain of fully four, if not five days over the existing Red Sea Route.

But will progress in shortening time between England and India stop at the construction of only eighty more miles of railway?* It would be out of reason to suppose that such

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* Perhaps there is an additional reason of more or less weight for urging on the early construction of at least the section of the Euphrates Valley line from the Mediterranean to navigable water on the Euphrates. If the Isthmus of Suez Canal be completed, France will, in all likelihood, hold the keys of it—a very dangerous fact for England in case of war between the two countries. That the canal will be finished seems more than probable. Mr. Daniel A. Lange, the English representative and director of the company for its construction, in his published letter of the 2nd of November, 1867, says that "by the last official reports from Egypt, there remained on the 30th of September last 44,000,000 cubic metres of earthwork to be done. During the month of September 1,342,000 cubic metres have been excavated, the highest figures as yet obtained, and this work has been performed with only forty-three dredging machines, thus leaving, at the same rate, on the 1st of January next, 40,000,000 cubic metres for excavation, the original total required to be removed being 74,000,000 cubic metres. When the full complement of seventy-eight dredging machines now being fitted up on the spot is in working order, it may readily be calculated that the returns will show a result of at least two millions of cubic metres per month, which, in other words, means that the time required for completing the entire earthworks of the Suez Canal will not exceed twenty months from the present time. The construction of the jetties at Port Said is being pushed forward with similar rapidity. The manufacture of blocks on the spot during the month of September amounted to 9,472 cubic metres, which, together with those already made, gives a total of 164,031 cubic metres, leaving 85,969 to be manufactured, the total required for both the jetties being 250,000 cubic metres. The entire quantity already sunk in the sea at the end of September amounted to 142,776 cubic metres; remained to be immersed, 107,224 cubic metres—total, 250,000 cubic metres for both jetties. Taking 6,000 cubic metres per month, both the jetties will be completed in eighteen months from the present time. It may not be out of place to mention that these so-called blocks weigh about twenty tons each." Mr. Lange concludes thus:—"Having said thus much on the subject of the progress of the Suez Canal works, I trust

will be the fact. It may therefore be taken for granted that continuation of the whole 800 miles of Euphrates Valley line will be accomplished somehow or other. Whenever that time comes,—and every day is accelerating its advent,—the gain will be at least two days, possibly even a little more on the homeward journey. Then, India—the India of England—will, at its nearest point, be under fourteen days from England. Then the postal communication between the two empires will not be as it is now, forty-eight times a year; it will not be the two and fifty, so long proposed, so long and so miserably resisted by Post Office narrow sight and want of appreciation of imperial grandeur and importance.* No!

I may be permitted to add, that the time is near at hand when these gigantic works will be completed for the benefit of all nations, as by means of them the passage from sea to sea will be secured for the largest ships."

* Mr. Frederick Hill was the principal witness from the Post Office examined by the Committee of the House of Commons, that sat in 1866, upon the postal and telegraph communications of England with the East. The whole tendency of Mr. Hill's evidence was, that no further accommodation or increased frequency of mails should be given to the public, unless the Post Office were indemnified against all hazard of loss—even temporary—either by increasing the rates of postage, or by the obtention of a special appropriation from the Government of India. It was in consequence of the character of this evidence, and of correspondence which had passed between the India Office, the Treasury, and the Post Office department (which appears in the Appendices to the Report) that the Committee inserted the following paragraph:—

"Your Committee cannot assent to the doctrine that interests so important from every point of view, whether political, social, or commercial, as those which connect the United Kingdom with the largest and most valuable possessions of the Crown, should be prejudiced by an insufficient postal service, because the establishment of an efficient service might leave an apparent loss of no great magnitude to be borne by the two countries. They submit that a question of profit or loss, within reasonable bounds, is a consideration entitled to little weight in the case of so important a postal service as that between England and India. They concur in the views expressed on this subject in a letter addressed by the Indian Office to the Assistant Secretary to the Post

It requires no great foresight, or fore-reading of events to feel conviction that the service will be daily, and that despatch will succeed despatch on each of the working days of the year, as well from west to east, as from east to westward.

Office, on the 5th October, 1865, in which it was said, 'Sir Charles Wood cannot, however, regard the question as one merely affecting the charge on the Imperial revenues. It has been the perception of the bearing of increased postal communication on the wealth and progress of a country that has induced statesmen of late years to consent to fiscal sacrifices for the purpose of obtaining it. There can be no doubt that increased postal communication with India implies increased relations with that country, increased commerce, increased investment of English capital, increased settlement of energetic middle-class Englishmen; and from all these sources the wealth and prosperity of England are more greatly increased than that of India.'"

It seems extraordinary, it is nevertheless a fact, that Sir Rowland Hill, whose name and reputation have been built solely upon the foundation of cheap postage, should, through the medium of several Postmaster-General's Reports, urge the necessity of increased postal charges whenever an ocean mail communication did not pay *per se* in postages realised.

In 1853, a Commission, consisting of the late Lord Canning, the Right Hon. Wm. Cowper, Sir Stafford Northcote, now Secretary for India, and the late Sir R. Madox Bromley, Accountant-General of the Navy, was appointed by the Lords Commissioners of the Treasury to report upon the contract packet services of the country. The Commissioners went very fully and elaborately into the whole subject, examined witnesses, and had various returns prepared for their consideration. The gist of their views and opinions upon oceanic communication, by means of first-class contract steamers, is as follows:—"The value of the services thus (by the establishment of large vessels built for the conveyance of ocean mails at high speed) rendered to the state cannot be measured by a reference to the amount of mere postal revenue, or even by the commercial advantages accruing from it. It is undoubtedly startling at first sight to perceive that the immediate pecuniary results of the packet service is a loss to the revenue of about £325,000 a-year; but although this circumstance shows the necessity for a careful revision of the service, and though we believe much may be done to make the service self-supporting, we do not consider that the money thus expended is to be regarded, even from a fiscal point of view, as a national loss. The objects which appear to have led to the formation of these contracts, and to the large expenditure involved, were to afford a rapid, frequent, and punctual communication with those distant

Even now, the postal service of England with the east is the grandest combined land and ocean communication of the world.* No other maritime service approaches it. It is five times as great as that of the Cunard Company. It is more

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ports which feed the main arteries of British commerce, and with the most important of our foreign possessions; to foster maritime enterprise, and to encourage the production of a superior class of vessels which would promote the commerce and wealth of the country in time of peace, and assist in defending its shores against hostile aggression. These expectations have not been disappointed. The ocean has been traversed with a precision and regularity hitherto deemed impossible; commerce and civilisation have been extended; the colonies have been brought more easily into connection with the Home Government, and steam ships have been constructed of a size and power that, without Government aid, could hardly, at least for many years to come, have been built by private enterprise unaided."

M. Vandal, in his *Annuaires des Postes*, published on the 1st of January 1867, having given in detail the whole of the ocean postal service of France, thus expresses the views both of the French Government and of the department of which he is the head: "And these great results have been obtained, not by the exclusive action of private industry, for industry would have been rash to have attempted them; and also not by the exclusive action of the State, for the State, which governs, is unfitted for commerce, but by the happy combination of the two elements—the State and private enterprise. On the one side, it is the duty of the State to study the whole subject in view to its own wants and to those of the public. Therefore it is that, in order to open new routes of communication to the spirit of industry and enterprise of the nation, the State pays subventions to the amount of upwards of twenty-four millions of francs, and by means of them industry invests its capital with the encouragement of the Government. The benefit is common to both sides. The State obtains the advantage of increased influence throughout the world, and at home increased customs revenue, with increased and general prosperity, and on the other hand private enterprise is adequately remunerated for its capital and investments."

* The whole of the sea service of the Indian, China, Japan, and Australian Postal Communications of Great Britain is, with the exception of that between Dover and Calais, performed by the Peninsular and Oriental Steam Navigation Company. This company is the largest Ocean Steam Company in the world. It has a fleet of 53 steamers, with an aggregate tonnage of 86,411, and

than double that of the two great routes of the Royal West India Mail Company. Notwithstanding that its ramifications extend thousands of miles, the component parts of it fit in so harmoniously, and work together in such complete and accurate accordance, the one with the other, that whether we take the outward journeys with their divergent fragments, or the homeward journeys, continuously aggregating and

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19,230 horse-power; its largest ship is of 2,800 tons; its next largest is of 2,600 tons, five are between 2,000 and 2,500 tons, and eighteen are between 1,500 and 2,000 tons each. Its routes extend from Southampton and from Marseilles to Alexandria, from Suez to Bombay, from Suez to Point de Galle and Calcutta, from Bombay to Calcutta, from Point de Galle to Singapore, Hong Kong, Shanghai and Yokohama, Japan, and from Point de Galle to Melbourne and Sydney. The total number of *knots* performed by the postal vessels of the company in 1866 was 1,194,952.

The total contract land mileage of our Eastern mails is at the present time as follows :—

Route.	Length, Miles.	No. of Journeys.	Total.
London and Dover	88	96	8,448
Calais and Marseilles	740	96	70,080
Alexandria and Suez	250	192	48,000
London and Southampton	78	96	7,488
			133,916

It should be explained that the "heavy mails" which are conveyed between Southampton and Alexandria are taken across the Isthmus of Suez by separate trains from those which convey the light mails *viâ* Marseilles; hence there are 96 trips of Eastern mails per annum across the Isthmus for the Marseilles mails, and 96 for those *viâ* Southampton. Thus the total annual length of this great postal service is—

Water	1,374,194	English miles.
Land	133,916	,, ,,
	1,508,110	,, ,,

or 4,132 miles *per diem*, 173 *per horam*, nearly 3 *per minutam*.

increasing as they approach completion—the mails arrive almost with the rarely failing fidelity of clockwork—punctuality the rule, absence of it the rare exception.

But shall we always be satisfied, even when we have achieved communication by railway from the Mediterranean to the head of the Persian Gulf, and thence by water to English India? There can be but one answer to the question—It would be contrary to all human progress if we were to be so. Only in the summer of the present year, France and England were each honoured with a visit from the Sultan, and it is said there was nothing which struck His Majesty during his short residence in Western Europe as of more importance to the well-being of a state than the construction of railways. It is therefore not surprising that he has already given the subject attention for his own country, and that concessions have been granted for several important lines. Even now the break which separates the railways that extend continuously from Calais to Basiach, on the Danube, 419 miles to the south-east of Vienna (accomplished by the express train in seventeen hours), are only separated from Rustuch by less than 300 miles, and, as the railway—138 miles long—from Rustuch to Varna is open, there is in fact only the Basiach-Rustuch break in a complete railway communication from Calais to the Black Sea. Before ten years from this time, not only will this gap be filled up, but the City of the Golden Horn will be equally put into connection with the whole of the European system of railways. The Queen's messenger, and the mails now go from London to Constantinople,* *viâ* Marseilles, in about

* *In summer* the journey from London to Constantinople, *viâ* Paris, Strasburg, Vienna, and Basiach by railway, and thence by steam on the Danube and Black Sea, can be accomplished in seven days.

eleven days. When the Brindisi route is established, the time will be diminished some three days, and on the completion of the railways to Constantinople, the interval in time between it and London will not exceed five days.

So far with regard to a railway journey, the accomplishment of which, within ten years, is certain. Nothing, except the coming of chaos, can prevent it.

But when the railway has arrived as far east as the City of the Golden Crescent, will it stop and end there? In one sense it must, unless indeed some of the engineers who are now competing for the honour of tunnelling under, or placing tubes upon the bed of the ocean between Dover and Calais, shall suggest a scheme for tunnelling under the Hellespont, and their proposals shall be accepted. At all events, even if a railway were only to extend a hundred or so of miles eastward in Asia Minor, one will certainly be made for that distance, and opened for traffic by the time the line, coming from the far west to its terminus at Constantinople, shall be completed. It will go through a country rich and productive, as well as covered by a prosperous and money-making population. Fact and reality ended, we approach a "dream of the future." A dream not new to us, for we have often dreamt of it, and occasionally discussed it with others, whom the reader will probably feel disposed to consider as dreamy as ourselves. And yet the time will come—possibly even a few of those now grown to manhood may see its fulfilment before they die; the Long Railway will first traverse Turkey in Asia, anciently the seat of the kingdoms of Troy and of Lydia; the birth-land, possibly of Homer and Herodotus, certainly of Thales, Pythagoras, and others hardly less distinguished. From classic land it will cross to Persia, and from Persia it will pass to Affghanistan, the grandest in physical aspect, and perhaps for 600 miles, the most diffi-

cult country in the whole world for railway construction. When it has gone beyond those kingdoms, it will be on British soil. There it will attach itself to the then Great Indian Railway, the unbroken course of which will be from the Persian Gulf to the mouth of the Ganges.

When the now far distant day of accomplishment has arrived, how will Calcutta and London be to one another in point of postal distance? Possibly, fifteen; certainly, not more than seventeen days asunder!

The third portion of the Scinde connection is the Punjaub Railway, 253 miles long. Its present western terminus is at Moultan, where eventually it will be united to the Indus Valley Railway. From Moultan the line follows nearly a straight course up the left bank of the Ravee to Lahore; whence it proceeds, taking a westerly course until it reaches Umritser. But surely the statements recently made respecting wholesale corruption, both in England and in India, on the Punjaub Railway cannot be true. It can hardly be possible that, but for the interference of the Governor-General, Sir John Lawrence, the contract price for the construction of the line would have been £5,000 a mile higher than it now is; neither is it to be believed, although so broadly asserted, that the iron-masters have to pay "the usual commission" of from five to ten per cent. for orders given to them by the officials of Indian Railways. However, the Government of India has very properly appointed a Commission to inquire into these allegations, and the facts must shortly come to light in their reality. It is evident, from a passage in Mr. Juland Danver's Report, that he has had, for some time, serious doubts as to the efficient character of the traffic management of this railway.

In the year 1865 the gross earnings of the Punjaub Railway were £25,250; and if the traffic accounts be correct, the

net receipts were £6,009. In 1866 the gross receipts were £90,269; the net £25,395. The number of train miles for the year ending the 30th of June, 1866, were 354,239. The Punjaub, while rich in agricultural produce, is a comparatively new and uncivilised province of British India; and the benefits which the railway is destined to confer upon it cannot be shown until proper access is obtained by the construction of roads leading to it from the neighbouring districts.

The Delhi Railway will, when completed, be 320 miles long, and it forms a link in India pretty much as the Lancaster and Carlisle does in England in connecting English and Scotch railways together. By means of the Delhi Railway a junction will be effected with the Punjaub Railway, the North-Western Provinces, the Indus Valley, and the Scinde Railways. 87 miles of line are now opened; 117 will be opened next year, leaving 116 to be finished in 1869. As the line crosses several important rivers, the bridges at them constitute the measure of time for the completion of the railway. It is, therefore, satisfactory to know that the piers and abutments of all the large bridges have been successfully got in.

The Eastern Bengal Railway Company was formed to give accommodation to the densely populated and prolific districts lying north and east of Calcutta. Its length is 114 miles; but in August, 1865, it was determined to extend the line forty-five miles farther, to Goalundo, at the confluence of the Bramapootra and the Ganges, with the view of intercepting the traffic from Assam, Bhotan, and the more distant north-eastern countries.

The Calcutta and South-Eastern Railway Company was established in 1857 for the construction of a line, twenty-nine miles long, in a south-eastern direction, to a town and

harbour which it was determined to establish on the Mutlah estuary, the object being to avoid the dangerous navigation of the Hooghly. The necessary wharves and jetties required at "Canning Town" have been constructed; but unfortunately, just as the traffic was beginning to make progress, the bed of the river shifted, in consequence, it is supposed, of certain operations on the shore close by, and it was partly carried away. The "Port Canning Company," which has already expended £600,000 at the place, is re-establishing the jetty. A new town is now gradually rising at the place; "so that," says Mr. Juland Danvers, "when the dangers and difficulties of its infancy are passed, the whole scheme of establishing a port on the Mutlah will be in a more promising condition. Upon the whole, we may look with hope, if not with confidence, to the future."* The Calcutta and South-Eastern Railway exhibits a deficit in its revenue accounts.

The Great Southern of India Railway was constituted in 1857, its objects being to construct railways in the southern provinces of India. The line runs from the east coast of the Great Indian Continent, by Tanjore to Trichinopoly, through a country extensively cultivated with rice and cotton crops. Seventy-nine miles were opened in 1862. An extension of eighty-seven miles has been since authorised, by which a junction will be effected with the Madras Railway at Errode.

With the exception of the Indus Valley and the Rajpootana Railways, all the lines above enumerated are entitled to

* Almost immediately after the above extract was made from Mr. Juland Danver's report we read the following portion of a telegram, dated Calcutta, October the 9th: "Unprecedented floods have inundated the districts of the Ganges. Numerous villages have been swept away, and the Eastern Bengal Railway has suffered severe damage."

the payment of interest from the Government of India, at the rate of 5 per cent. per annum, on all capital, the expenditure of which is duly sanctioned by the Government. At the close of 1865, the number of miles thus guaranteed was 4,944, and the amount of the guarantee would be about £81,000,000, when all lines are completed. This year, the guarantee has been extended to 700 more miles, making the total now sanctioned for guarantee 5,644 miles, and the total capital £88,000,000. By means of it, the Indian Branch Railway undertakes to construct a system of railways through Oude and Rohilcund, with branches to various places on the East Indian Railway. These districts are populous, and highly productive, and have obtained the name of the Garden of India. There are no engineering difficulties on the lines, and very few works of great magnitude, except some bridges over the Ganges, which will have to be made, if the full benefits of the lines are to be secured. The form of guarantee to the Indian Branch Railways differs in some details from the form originally adopted, but in the main the terms are the same. In the old contracts, the guarantee is given for ninety-nine years, and at the end of that period the railway lapses to the Government; but these provisions are practically annulled by the power which each company has of surrendering the railway to the Government at any time before the expiration of the ninety-ninth year (at the ninety-eight year for example), and receiving back from the Government the capital expended. In the new arrangements, no period is fixed for the termination of the guarantee, but the Government has the power of taking possession of the line after the first twenty years, or at the expiration of any ten years afterwards. If it exercise this power within a hundred years, it will have to pay a sum equivalent to the average value of the stock during the three preceding years.

If the power be not exercised until after a hundred years, it then has only to pay back the capital expended. *Per contra,* the company has the power of surrendering the railway to the Government any time after the line has been opened six months. In this event, the Government is not to pay back more than the capital actually expended.

The amount of guaranteed capital raised up to the 1st of April, 1867, has been £67,254,802, of which £51,800,377 consists of share capital, and £15,454,425 of debentures. It may here be observed, that it has been determined, as a rule, henceforth to restrict, as far as possible, the issue of debenture capital, especially such as is not convertible into stock. Perpetual debenture stock has, however, been sanctioned, to some extent, in the case of the Great Indian Peninsular Company, and its issue will, probably, under certain circumstances, be permitted to be made by other companies.

The Indian railway capital is well diffused all over Great Britain, as, on the 31st December, 1866, there were 34,849 shareholders, and 8,170 debenture holders. In India, there were at that date 816 shareholders, of which 396 were Europeans, and 420 natives. Neither Europeans in, nor natives of India were debenture holders at that date.

The total amount of guaranteed interest on railways which has been paid by the Government of India from the year 1849, to the 31st of December, 1866, has been £18,929,576; of course during the early period of the Indian railways, it was all expenditure and no profit, for, although guaranteed interest commenced in 1849, the first length of Indian railways was not opened for traffic until 1853, and then the length was only 22 miles. In 1854, the miles opened were 55; in 1855, 98; in 1856, 102; in 1857, 145; in 1858, 145; in 1859, 75; in 1860, 208. In 1861, 759, which is the

largest number of miles opened in any one year; the following year, 1862, was nearly as much, being 747. Since then, the amount has been increased at the average annual rate of about 300 miles, and the total mileage now is 4,070.

The companies have repaid to the Government, out of net earnings, about £7,000,000; making the present debt of the railways to the Government nearly £12,000,000. Their net earnings for 1865 were £1,341,550, and for 1866 they were about £2,170,000. The amount paid by the Government for guaranteed interest during 1865 was £2,796,676, consequently the net amount of money which the Government had to find, and to debit against the companies was £1,455,126; but, in 1866, whilst the amount paid in guaranteed interest was £2,964,073, as the net earnings were £2,170,000, the Government had only to debit the companies with about £800,000. It is expected that the sum deficient this year will not be more than £600,000, notwithstanding that the amount of interest for which the Government is responsible will be about £3,300,000.

In 1866, for the first time, the net receipts of the East Indian, and of the Great Indian Peninsular Railway Companies exceeded the 5 per cent. guarantee. The excess of the first named was £108,073; of the second, £75,878. In accordance with agreement, half these amounts, or £91,976, were retained by the Government towards re-payment of guaranteed interest which it has already advanced. Mr. Juland Danvers notices, as a very satisfactory circumstance, that "the guaranteed interest which was exceeded by the receipts, was paid on account of capital greater than that which produced those receipts, a large portion having been expended upon unfinished works or lines not opened for traffic, and consequently unprofitable." How long it will take to extinguish the debt against the companies on this

account is difficult to say. Some no doubt will be able to do so in the course of the next twenty to twenty-five years, some very probably never. It will be seen, by referring to page 255, that the surplus profits of the Great Indian Peninsular Company, for the first half-year of 1867, were £132,116; half of this will go in diminution of its interest debt due to the Government.

It is quite clear that the guarantee system—without which experience has shown it is impossible to obtain the construction of railways in India—is not to stop at 5,644 miles, involving an expenditure of £88,000,000 sterling. We have already referred to the extension of the line proposed from Baroda to Delhi, called the Rajpootana Line, and that of the Indus Valley. Their lengths (jointly) are about 1,070 miles, and the capital required for their construction—the works for them being, on the whole, not of a difficult character—would be under £13,000,000, or about £12,000 a mile. The construction of these lines, with the guarantee on the capital, will, no doubt, be commenced before long; and there is a third, the capital for which, whenever constructed, can only be raised on the same system—the line to connect Lahore and Peshawer together. This railway has been the subject of a great deal of discussion and debate, both within the walls of the British Parliament, and outside them. Whenever made, it can hardly be looked upon other than as a military and political line, for its commercial importance is very trifling indeed. It will also be very expensive in its construction. Besides the Indus,* there are three rivers, the

* When the railway to Peshawer is made, it will have to cross the Indus either by a bridge, or to go under it by a tunnel at Attock, a thousand feet above sea-level, and 942 miles from the river's mouth. For many miles above this great fortress the river flows in a wide divided stream at no great velocity; but as it approaches Attock, it becomes contracted and united, the velocity increases,

Ravee, the Chenab, and the Shelum, great hurling and devastating torrents at the period when the rains set in, and when the Himalayan snows are melting; but with almost dry beds for at least six months every year. These three rivers must each be transversed by a long and costly bridge. The length of the line would be about 250 miles, and the cost about £20,000 a mile, or a total of £5,000,000. It has been decided that, at all events for the present, the construction of this line shall not take place, and that the two other railways seeking the guarantee shall have precedence over it. Mr. Ayrton, M.P., whose opinion is entitled to much consideration, from his knowledge of India, is decidedly adverse to its construction at all; whilst, on the other hand, Mr. Laing, M.P., laments that the Governor in Council has come to the determination of not recommending the work to be proceeded with at once. As these three railways progress, they will add to the guaranteed capital about £18,000,000, making its total £106,000,000, and the amount of interest for which the Government of India will be annually responsible, £5,300,000, against which will be the net incomes of the railway companies up to 5 per cent. on the capital invested in each. We have just seen, that even with increased responsibility in the shape of guaranteed interest for the present year, the net amount will be less by £200,000 than it was last year. Nevertheless, on the £88,000,000 guarantee, when it shall have all been expended, the Government may,

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and during the wet season it flows past the fortress at the rate of fully thirteen miles an hour. Numerous schemes have been tried for bridging the Indus at this point, but none have been successful, owing to the enormous difference of the water level at different periods of the year. It was therefore proposed, in 1859, to carry a tunnel under the river, and some progress was made with the work. Further reference to this subject will be found at a subsequent page.

we think, look to being liable on balance for at least a million per annum for some years to come, and to still more during the construction, and subsequent to the opening of the lines likely to obtain the guarantee that is to raise its total amount to about £106,000,000.

We now come to speak of the very important subject of working expenses. On these working expenses depends, in fact, the fate of the Indian railway system, and in considering them we must bear in mind that there are three elements of outlay of a character to which railways are, at most, very partially subjected in England—terrific inundations, destruction of materials, and cost of fuel. As regards the first, it would almost seem as if scarcely any provision that the engineer may make is sufficient to counteract their devastating effects upon the railway. Nor can this be wondered at when we read of rivers rising twenty—thirty—fifty feet in a few hours, as also that in places where there was a dry river bed one afternoon there is an impetuous torrent, hurling villages along in its devastating course next morning. On the Indus at Attock, on the high road between Lahore and Peshawer, the floods of 1858 appear to have risen 80 feet above the usual cold weather level of the river. In 1841 they were 92 feet above it, and from the nature of the river at this time it is possible that they may rise even higher. It is the same, though not to the same degree, at other places, and even if railway bridges and viaducts be not carried away, the ordinary permanent road suffers to an extent such as we know nothing of in this country.* No doubt experience

* Colonel Glover, late Director-General of Indian Telegraphs, in his recent memorandum, pointing out the difficulty of maintaining telegraphic communication in India, says—"In many parts of the country the wires are laid through forests, jungle, and desert, where means of transit do not exist; where there are literally no roads; where unbridged rivers of first magnitude cross

will in process of time suggest means of protection as regards both construction and maintenance. Still, let man do

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the route, rendering inspection difficult, and at times impracticable; where the population, whether dense or sparse, only affords labourers unskilled, and as such, of use only for the amount of brute force they are capable of exerting, adding considerably to the cost and difficulty of construction and repairs. In many parts the climate at certain seasons of the year is of a character so deadly that inspection is carried on by European officers at the risk of life; while native subordinates simply refuse to face it. In some places the rainfall and natural humidity are of a magnitude almost unknown elsewhere, and the case of Arracan may be instanced, where 240 inches of rain fall annually, of which 224 inches fall during the months of June, July, and August. On the western coast the climate is very similar, and Assam can scarcely be considered more favourable. Storms and hurricanes are of regular and not exceptional occurrence, and during the last monsoon they occurred with unusual violence, destroying the telegraphic wires for miles, as well as the embankments of the railways in Scinde, Goozerat, and Bengal. These and other influences peculiar to the country involve an unexceptionally heavy expenditure in repairs and renewals, and necessitate the retention of a large conservancy establishment."

In India, owing to the dense forests and jungles, swarming with birds and animals, it is necessary to make the wires very much stronger than they are made in Europe. They are, in fact, small bars of iron three-eighths of an inch in thickness. An amount of rigidity is thus obtained, which is necessary to meet the requirements of the country. The bars of iron are placed on the top of bamboos at a sufficient height to allow the country carts to pass underneath them, and even to give passage to loaded elephants. The size of these conducting bars is necessitated by the heavy rains of India. Even in England, the rain dripping in a stream from the telegraphic wire to the post is sufficient to stop the working of the wire, inasmuch as the electric current escapes directly to the earth, and is then dispersed. Notwithstanding the difficulties that the construction and maintenance of the telegraph system have to contend against in India, there were 13,400 miles of lines of communication open in the three Presidencies on the 30th of April, 1867. The first cost of their erection and of furnishing the necessary instruments, batteries, &c., was £1,345,328. As regards rainfall, taking the Registrar-General's return for the first six months of 1867 and doubling it, it would appear that the highest annual rainfall in the United Kingdom is, at Bristol, 41·0; at Glasgow it is 40·2; Sheffield, 36·4; Birmingham, 31·0; Manchester (including Salford), 29·5; Edinburgh, 28·0; Dublin, 26·2; Leeds, 26·0; London, 25·2; Liverpool, 20·2; and Newcastle, only 16·2.

what he may, there is no foe that he has ever faced on earth, or that he is likely to face, equal to the elements in anger. It is God's will that they should be so, and although He places in our hands means to resist them, He has never given, and for His own wise purposes probably never will give us complete power to control and subdue them.

No matter how highly timber used for sleepers on Indian railways may be saturated with creosote, or any other analogous preparation, they are all powerless to resist the ravages of the red ant. Iron "pot" sleepers have therefore been generally adopted, and they have been found very serviceable, especially on lines where the speed is not high. Some of the engineers are in their favour, even where trains are run at high velocities. Thus the District Engineer and the Locomotive Superintendent of the Punjaub Railway report strongly in recommendation of them. "I have never," says the latter, "travelled over a finer piece of road, than the seventy to eighty miles of pot sleepers road laid between Montgomery and Mooltan. Our speed does not exceed thirty-five miles per hour, and I have never heard of breakages to permanent way resulting from this rate." The agent to the Madras Railway Company says, "I have all along strongly advocated the use of cast-iron pot sleepers upon our lines of railway, believing that a road laid with iron was more easily and economically maintained, insured greater safety from accidents, and from its smoothness of surface, less prejudicial in its effects upon our rolling stock than any other form of roadway."

In 1862 Mr. Henry Rouse, the Chief Resident Engineer to the Egyptian Railway, in the course of a report upon the use of these sleepers, says, "I may assert with unerring confidence, that after ten years' use of them, had a system of permanent way to be again selected for adoption on the fine

alluvial soil of Egypt, no more fitting choice could be made than was, in fact, made by Mr. Robert Stephenson in 1851, when he determined on the adoption of Greaves's cast-iron pot sleeper road."

Captain Sherard Osborn, R.N., the late agent to the Great Indian Peninsular Railway, quotes the report of Mr. Rouse, and confirms it with the recommendations of Mr. Hardcastle, Mr. Perry, and Abul Meyd Effendi, Civil Engineers, each in charge of portions of the Egyptian Railway. On the other hand, the Chief Engineer of the East India Line says, "I do not consider these sleepers would be suitable for the through roads of this railway, although they might be used with advantage on sidings and in station yards. From general knowledge I am of opinion that, with small ballast, iron pot sleepers would answer well in countries where rain-fall is not excessive, and is evenly distributed over many months in every year, but that they are not adapted to large ballast under any circumstances, more particularly when the road is liable to much periodical injury from rain. They might be used with advantage on long lengths of bank in dry districts with very considerable economy in ballast. In rock cuttings, however, where the jar is at all times great, iron pot sleepers would be liable to much damage from trains at high speed." It may here perhaps be incidentally noticed that the use of cast-iron sleepers has not been adopted in the construction of Peruvian railways. In Brazil, with one exception, they have been used on all the railways in that country. The running speed of the trains there is, however, not more than twenty miles an hour. They have also been adopted in the construction of the railways of the Argentine Republic.

Upon the whole, the balance of opinion seems decidedly in favour of the general adoption of iron sleepers. They are

certainly preferable to stone blocks; and timber is impossible* upon Indian Railways.

Several miles of steel rails have been sent from England during 1866. Their first cost is, of course, much greater than that of iron; but, irrespective of any other advantages, if we take into consideration the cost that is always incurred in sending materials from Great Britain—a cost which, in some cases, where the inland carriage is of considerable length, almost doubles the original price of the rails—it is certainly worth while, within certain limits, to ship steel rails in the first instance.

It is impossible to exaggerate the importance of the fuel question.† Cheap or dear fuel may, in many instances,

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* In the report of the Directors of the Madras Company for the half-year ending the 30th June, 1867, it is stated, as regards the South-West Line and Bangalore Branch—"The maintenance of a great part of this line and branch is still enhanced in cost by the replacement of wooden sleepers, as they decayed, by iron sleepers and by the greater expense of maintaining the wooden road in the western district, though wooden sleepers were good and cheap there. It has been found impossible to bring down the cost of maintaining a line with wooden sleepers to anything like an equality with the iron sleeper line." On the North-Western section of the line, where iron sleepers only are used, the cost of maintenance for the past half year had been at the rate of only £66. 18s. per mile per annum, whereas on the South-Western Line and Bangalore Branch it had been at the rate of £159 per mile per annum.

† Coal in India.—The chief part of the following information is taken from *Engineering*, one of the best "Class" papers ever published in any country. The article is compiled from all the Government reports and statistical statements that the editor could avail himself of.

"Viewed as a coal-producing country, it may fairly be asserted that the British territories in India cannot be considered as either largely or widely supplied with this essential source of motive power. Extensive fields do occur, but these are not distributed generally over the districts of the Indian empire, but are almost entirely concentrated in one and that a double band of coal-yielding deposits, which, with large interruptions, extends more than half across India from near Calcutta towards Bombay. This band extends throughout about 5° of latitude, that is, between the 20° and 25° parallels of latitude.

on Indian railways, be translated into complete success or very nearly total failure. Even at the commencement of

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All the country lying to the south of the 20° parallel, and all the country lying to the north of the 25° parallel up to the foot of the Himalayas, with the exception of the widely detached coal-beds of Eastern Bengal, Assam, and the Khasia hills, and the poor coals of Tenasserim, presents, so far as those portions of the country are known geologically, either no probability whatever of any deposits of coal being found within their limits, or if coal does exist, it can only be expected to be found at such a depth below the surface that it could not be profitably worked or economised. As British India stretches from 8° north latitude to 35° or 36°, or through some 28°, the very local disposition of its deposits of coal becomes evident; and it would seem that they are so far removed from several of the railway systems of India as to preclude the hope that such lines could ever profitably employ the extracts from those beds as fuel, for they could be more cheaply supplied from England, the cost of land carriage on the one hand being so much more expensive than the freight by sea on the other.

"Up to the present time it may be said that little more than surface workings have been carried on in India. The deepest pits there scarcely exceed seventy-five yards, while certainly one-half of the Indian coal used up to the present date has been produced from open workings or quarries, in which the coal has been worked like any ordinary stone. In parts of the Raneegunge field these open workings are of marvellous extent and size, covering hundreds of acres.

"Many causes have combined to lead to this mode of working. Cropping out at the surface with a very small dip, and, in most cases, with a very limited covering of clay or rocks, the valuable mineral could be removed at a very small cost. No expense was incurred for lights; drainage was easily and cheaply effected; all the coal was obtained, and the heavy waste incurred in cutting or hewing brittle coals, such as are most of the Indian coals, was avoided. But even more than all these considerations, the facility of obtaining labourers who would work in the daylight, and the difficulty, or even impossibility, of procuring those who would work in a pit, combined with the ease of inspection and measurement in the one case, and the cost and difficulty in the other, all led to the vast extension of open-work quarrying of coal, and, consequently, to the economy with which the mineral could be obtained and sold. This system is, however, now rapidly disappearing. Much of the coal accessible in this way has been removed, while at the same time the managers and proprietors are daily becoming more alive to the injudiciousness of exposing valuable seams by these diggings towards the outcrop. Every year is also adding to the number of labourers, and also of the tribes or castes to which they belong, who will work underground.

"Even in the only Indian coal-field which has as yet been worked to any

the present year, before freights had risen so much in consequence of the Abyssinian expedition, the value of coal and

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extent, namely, Raneegunge field, very much more must yet be done before safe and satisfactory conclusions can be reached as to the amount of coal and its position. Up to the last year or two, in no single instance was a survey of the underground workings made or plans kept. The memory of the 'old men' was the only source from which information could be obtained as to the extent of the workings, the mode of occurrence of the seams, the disturbances to which they had been subjected, &c. This system, however, or rather want of system, has been changed in some cases, and plans are now kept. On this subject Professor Oldham justly remarks, 'Considering the many ways in which danger to public safety (putting aside altogether the serious risks to private property and to individual life) results from abandoned mines and excavations, and from an ignorance of their true limits, I am compelled to think that the keeping and recording of such plans ought to be rendered compulsory. The cost to the colliery proprietors would be slight, while the advantages, even to them, would be inestimable. In hundreds of cases the safety, nay, the very possibility, of working certain mines, or parts of mines, will depend upon the accuracy of the knowledge of the limits of adjoining excavations, or upon sacrificing much valuable material by leaving unwrought greatly larger barriers than may be necessary. Such plans ought, I think, to be therefore insisted on, under penalties for neglect of this precaution.'

"The following list gives the names of the several coal-fields of India in the order of their successive geographical distribution, commencing with those nearest to Calcutta and proceeding westwards, taking first those which occur in the great band of coal-fields stretching from Calcutta towards Bombay, and then those which are comparatively distant or isolated:—

1. Rajmahal Hills.
2. Raneegunge.
3. Kurhurbali.
4. Jherria.
5. Bokaro.
6. Ramghur.
7. Karunpoora, North and South.
8. Eetcoora.
9. Palamow.
10. Sirgoojah, Singrowlie.
11. Upper Sone.
12. Koorba, or Belaspore.
13. Talcheer.
14. Nerbudda, and Pench River.
15. Chanda.
16. Kota.
17. Cutch.
18. Sind.
19. Salt Range.
20. Murree, and other places.
21. Darjeeling.
22. Assam.
23. Khasia Hills.
24. Garrow Hills, Cachar.
25. Cheduba, Sandoway.
26. Burmah.
27. Tenasserim Provinces.

"The Raneegunge coal-field is at a distance of 120 to 160 miles north-west of Calcutta. It extends from a few miles to the east of the village of Raneegunge

coke before it was landed in India was about 50s. a ton. When the landing charges and the cost of conveyance along the lines are added, the average price of coal for the railways on the western and southern sides of India becomes about 60s. a ton. It is a fortunate circumstance for the East India Railway that its line runs through the finest portion of the Raneegunge coal-field,* thereby reducing its cost of fuel to $3\frac{1}{4}$d. per ton, and also affording it the opportunity of having a large coal traffic. Nor will this be the only source from which the railway can be supplied with coal, for the chord line between Raneegunge and Lucheserai passes through another coal bed, that of Kurhurbali. The coal of this field

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to several miles west of the Barakur, the greatest length being, near east and west, about 30 miles, and the greatest breadth about 18 miles. The area included by the coal-bearing rocks is about 500 square miles. The coal of this field, like most Indian coals, is a non-coking bituminous coal, composed of distinct laminæ of a bright jetty coal, and of a dull more earthy rock. The average amount of ash is some 14 to 15 per cent., varying from 8 to 25 per cent. The Raneegunge field has the advantages of two branches of the East Indian Railway, which traverse its richest portions, and afford great facilities for the removal of coals.

"The small, but valuable, coal-field of Kurhurbali is about eighty miles distant from the Luckieserai station of the East Indian Railway. When the chord line from Luckieserai to Raneegunge is opened this colliery will be put into active working. Patches of coal or lignite have been found along the outer range of the Himalaya Mountains, and at the foot of the Darjeeling Hills. In Assam several good coal seams have been discovered. There is also very good coal in the Khasi Hills; but the coal beds exist at an elevation of 4,000 feet above the adjacent country. It is known that there is not any coal in British Burmah. On the whole, the East Indian coal, especially that accessible to railways, is so inferior in quality that it comes nearly as expensive as English coal. It is, therefore, evident that companies will have in the main to rely upon wood as fuel for their locomotives."

* "The coal mines of the East India Coal Company Limited, situated in the district of Raneegunge, Bengal, were sold by auction to-day by Mr. Murrell for £20,000 under the Winding-up Act."—*Times* (City article), 13th November, 1867.

is described as excellent, although it does not exist in as large quantity as at Raneegunge. On the other hand, the Great Indian Peninsular Company, not having entered into arrangements with the Nerbudda Coal Company, its fuel cost was 1s. 6¼d. per train mile in 1866, the estimated average cost of coal over the whole line being £3 per ton, of coke £3. 12s., and of "Patent Fuel" £3. 8s.

Mr. Oldham, Superintendent of the Geological Survey of India, does not speak encouragingly as regards the prospect of coal being found in parts of India where it would be of great value to the railways. "Extensive coal-fields do occur," says Mr. Oldham; "but they are not distributed generally over the districts of the Indian empire, but are almost entirely concentrated in one (a double) band of coal yielding deposits which, with large interruptions, extends more than half across India, from near Calcutta towards Bombay." He, however, adds, that much still remains to be surveyed, and, until careful mapping has been carried out, of all the fields, any estimate of the coal resources of British India must be defective.

In the meantime coal from Labuan and from Australia are in course of being tried. Much must not be expected from the former; but there are great hopes that the latter will be largely available for India. But all persons who have written upon, or are interested in, the subject, come to the same conclusion, which is that the railways must mainly look to wood for their fuel. We are happy to perceive that the subject is engaging the most serious attention of the Governments both at home and in India; and there is no doubt but that an extensive system of planting timber suitable for fuel purposes will be immediately carried into operation, all the more necessary when it is borne in mind that a plantation of twenty acres will be

the average proportion necessary for the requirements of every mile of railway.

The working expenses of the railways exhibit very great differences both as respects actual amounts and their per centage proportions to traffic. Thus, for instance, on the Great Southern of India Line they were for the year 1865 2s. 7½d. a mile, and only 2s. 3d. a mile in 1866; yet the fuel cost was £2. 18s. a ton; exactly the same price as on the Bombay and Baroda line, the working expenses of which were 8s. 1¾d. in 1865 per train mile. In 1866 they had fallen to 6s. 8d.; so that the *difference* between these two amounts is exactly two-thirds of the *total* working cost per train mile of the Great Southern Company. The East Indian was 3s. 8d. per train mile in both 1865 and 1866. But the Madras cost was only 2s. 10¾d. per train mile in 1865. It went up, however, 3¼d. in 1866, being 3s. 2d. Yet the average price it pays for coal is the same as that paid by the Great Indian Peninsular, the cost per train mile of which in 1865 was 6s. 2d., in 1866, 6s. 4½d. No doubt the two Ghaut inclines add heavily both to locomotive and to permanent way charges, but they do not explain why the working cost per train mile should be double that on the Madras Line. It is a remarkable fact also, and it is one which should be recorded to the honour of the Madras management, that, although its traffic receipts per mile are almost the lowest on the whole system of East Indian railways—£13 a mile a week—its per centage of working expenses is actually the lowest, 43½.* The per centage of

* The Madras Railway continues to exhibit very striking results, both as regards its progress of development and its working expenses. During the half-year ending the 30th June, 1867, the number of passengers conveyed over the North-Western line was 1,019,164 as against 930,845 in the corresponding

the East Indian, with a weekly mileage receipt of £43, is 44½. The Great Indian Peninsular, the weekly receipt per mile of which is £48, is 59¾; and on the Bombay and Baroda the weekly receipt per mile is £29, the working expenses being 64½ per cent. The Scinde working expenses were 85½ per cent. of the receipts; but the unlucky Calcutta and South-Eastern spends £109. 10s. for every £100 it earns.

Accidents have hitherto been rather numerous on Indian railways. The returns for 1866 were not complete at the time of Mr. Juland Danvers' last report. In 1864 there were 345 accidents on an average of 2,699 miles of railway open, and the number had fallen to 284 on an average of 3,153 miles open in 1865. The Madras line, on the whole, has had fewer accidents than any other company—only five in 1865. Accidents by fire are rather numerous, especially in those districts where wood is used as fuel. This is, perhaps, also to be expected, in consequence of the conveyance of cotton forming so important a portion of the business of the two companies having their termini at Bombay. Accidents from fire, however, sensibly diminished

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half-year of 1866. The goods were 164,334 tons as against 132,052 tons in the first half of 1866. The gross receipts were £241,010, against £213,676; the net £141,182, against £117,873. While the receipts had increased upon the half-year 12¾ per cent. the expenses had only increased by 4¼ per cent. Of the general goods traffic of the railway, salt still held its place as the largest item; the quantity carried in the half-year was 24,697 tons, yielding a gross receipt of £20,191. The quantity of cotton carried to Madras was 9,422 tons, against 3,486 tons in the corresponding half of 1866.

The receipts per train mile on the South-Western Line and Bangolore Branch were 6s. 11¾d. in 1867 as against 6s. 9¼d. in 1866. The expenses, in 1867, 3s. ½d. as against 3s. 1¾d. in 1866. On the North-Western Line the receipts per train mile were in 1867, 7s. 10¾d. as against 6s. 5d. in 1866, the expenses 2s. 5½d. as against 2s. 1¼d. in 1866.

in 1865, which is ascribed to the extended introduction of covered waggons for carrying cotton, to the greatly increased use of coke, which gives out less sparks, and to the custom that prevails now of invariably placing several waggons (even running empties for the purpose, if none others are available) between the engine and cotton waggons.

But although the number of accidents was less in 1865 than in 1864, they were more destructive in their character in the former year, 316 persons having been killed or injured in 1865, as against 256 in 1864. But in these numbers are included the persons injured through their own fault or imprudence. It deserves to be recorded that in eleven years the Madras Railway has carried nearly twelve millions of passengers, hitherto without a case of injury to any of them. But, on the other hand, owing to two serious collisions on the line, a large number of the company's servants have been fatally or seriously injured. Native passengers are reckless; but native servants are especially so, for out of 49,398 employed on all lines in 1865, 96 were killed and 97 injured, or 193 in all, against 147 in 1864, with about the same number of servants. Of these casualties, 136, or 1 in 363, occurred in 1865 through incaution or misconduct; 42 were killed or injured in attempting to get upon or off, or falling from, engines or carriages in motion; and 52 were run over or struck whilst incautiously crossing, standing, or walking upon the line.

Reference to page 176 will enable the reader to compare the number and character of Indian railway accidents with those on the railways of the United Kingdom.

There is one more subject connected with the working expenses of railways in India to which reference must be made—the staff. It is quite evident that on railways, as in every other department of Anglo-Indian service, whether it

be governmental or corporate, all the persons in leading positions—not only those to direct and command, but those in the scale some degrees subordinate to them—must be European British subjects; not merely of European descent, but of actual birth as such. Without them the great railway system of India can never be efficiently worked. The returns of persons employed on the lines in 1866 show this fact very clearly, for whilst "native" servants were (excluding the Southern of India, which has not sent in any return of its staff) 30,838, the Europeans and East Indians were only 2,736. All the highest appointments were filled by Europeans. East Indians could rise to the class of station-masters; so could the natives, in an inferior degree, but these last constituted the whole of the humblest classes of servants. On the East Indian Railway the comparative estimation of the three nativities for the appointments of station-masters was thus shown:—Out of 114, 35 are Europeans, who receive salaries the lowest of which (irrespective of ample lodging accommodation) is £180, and they range up to £420 a year. Five East Indians, very choice and exceptionally superior men, have from £180 to £300 a year; whilst the salaries of the 74 natives vary from a minimum of £25 to a maximum of £250 a year.

It will always be necessary to recruit the upper ranks of railway officials in India from amongst the railway officials of Great Britain; and up to now, as far as our knowledge and acquaintance extend, no gentleman has left this country to fill a railway appointment in India at much less increase than three times his English emoluments. It is possible that efficient gentlemen may henceforth be obtained at smaller comparative salaries; but we doubt that such will be the fact. The character of the climate of India, so telling, as a rule, upon Europeans, but espe-

cially upon those who do not go to it when very young, and who are liable to exposure out of doors in the broiling hours of the day, and during the down-pours of the deluging rain torrents every year, and the necessary separation of a man and his wife from their children during the period of their education, must naturally deter officials from leaving comfortable appointments in England, except under the influence of strong pecuniary temptations. The risk of health-failure is also accompanied by knowledge of the fact that men cannot insure their lives, except upon payment of very high annual premiums.

The manner in which the East Indian Railway Company proposes to meet this last difficulty is by the establishment of a Provident Fund, the principles of which are explained by the following extract from the last Report of the Directors :—

"One of the most difficult questions which has presented itself to the board in the organisation and management of their staff in India has been how to meet the claims that have been constantly urged for the payment of pensions, after a given period of service, founded upon the analogy of the Indian services. The company's permanent European staff consists of gentlemen drawn chiefly from the best-managed English lines. It is felt that without some provision being made for them in case of sickness, involving their retirement from the service, or in cases where, after a certain period of time, they may wish to retire, or when it may be considered desirable that they should do so, the railway service in India does not present sufficient attractions. Various schemes, with a view to make the service more popular, have been suggested, both here and in India; but, until recently, every proposition which has been made has been found, from one cause or other, to be impracticable. After much anxious consideration—and being satisfied of the almost insuperable difficulty of applying the principle of pensions to a constantly-varying service such as this must necessarily be—it has been thought that the best mode of meeting the difficulty is to establish a Provident Fund, in the advantages of which all the servants of the company, European and native, receiving a monthly pay of Rs. 30 and upwards shall participate, the Fund being supported by contributions from the staff, assisted by the company. It is proposed—1st. That the present staff shall contribute to the fund only if they think fit; but that all persons joining

the service on or from a given date, with a monthly pay of Rs. 30, and those who may be promoted to this pay shall be required to do so. 2nd. That the staff shall be divided into two classes,—class A consisting of all European servants of the company, and class B comprising all servants of the company not Europeans. 3rd. That those in class A shall contribute 5 per cent., and those in class B 2½ per cent. on their respective monthly salaries or wages. 4th. That the company shall contribute annually 1 per cent. on the surplus net earnings, after 6 per cent. per annum has been appropriated to the company and the Government, in the terms of their contract, together with 1 per cent. on the 6 per cent. so appropriated, so far as the surplus will admit of the said contributions. 5th. That the moneys of the fund shall be invested, from time to time, either in Indian Government Securities or in the Railway Stock, and that, subject to rules and regulations to be prescribed by the board, the fund and all accruing interest shall be the property of the respective members of the staff in the ratio of their subscriptions.

"It is estimated that when the line earns over 6 per cent., the contributions of the company and the staff will be about equal; as the profits increase, the company's contribution will most probably be the larger of the two. The board are of opinion that the creation of such a fund will be most acceptable and beneficial to the staff in numerous ways; and so far as the company is concerned, the effect of it being to give every servant, who can influence its success, a direct personal interest in the economical working of the line, it can scarcely fail to be advantageous."

Although the Secretary of State for India has sanctioned the arrangement, and the shareholders of the company, at their meeting held on the 2nd of July last, approved of, and agreed to its adoption, we doubt whether it is one that is likely to prove satisfactory to the officials, especially to those from Europe. The practical operation of the scheme is this. Henceforth, the Europeans are, from the moment of their appointments, to be subjected to a deduction of 5 per cent. from the nominal amount of their salaries, but the company is not to contribute to the fund until after the net earnings have amounted to 6 per cent. and upwards; thus, if these earnings were declared at the rate of £5. 19s. 11d. per annum, the shareholders would receive, firstly, 5 per cent., and secondly, the half of 19s. 11d., under the contract

between the Government and the company; the Government would receive the second half of the 19s. 11d., and the Provident Fund *nil*. This scheme should be altered. The deduction of 5 per cent. from salaries is too high, and the contributions of the shareholders and of the Government should commence at a much earlier step in the scale of net earnings.

The rolling stock provided for Indian railways is miserably insufficient. The number of locomotives possessed by all the companies on the 1st of January, 1867, was only 795, not quite one engine for every five miles. The other descriptions of plant are equally defective in point of numbers. The East Indian Company announced, in its report of January last, that it intended to make up its rolling stock for a traffic of £60 a mile, at a cost of about £300,000. The other companies will have to outlay at least half-a-million on rolling stock almost immediately.

Apart from every consideration purely political, the railways of India have been the means of rendering the greatest service to England, at a moment of greatest peril. Through them she has received supplies of cotton that otherwise could never have got even as far as a port of shipment. There are seven districts from which these supplies come. By far the largest and most important is the Oomrawattee Cotton District, which both the main line of the Great Indian Peninsular Railway, and its Nagpoor Extension pass through. When the extension line of this company to Jubbulpore is completed, it will, jointly with the East Indian Railway, open up the Sassegur District, and, on the opening of the Madras Connection, it will touch upon a fourth. The Bombay and Baroda goes into the midst of the great Guzzerat Cotton Fields; the Madras Line through that of Combatore. There is a comparatively small one at nearly the

extreme south of the continent; and the smallest of all is in the Punjaub, between, and to the northward both of Delhi and Lahore. Of the production of these cotton districts, we shall speak presently.

If England have found almost exclusively the capital for the construction of Indian railways, she has not only made a safe—or, it might rather be said, a first class—investment, but she has also benefited largely in her manufactures and commerce through their construction. The amount of capital expended in the United Kingdom in consequence of Indian railways between 1851 and 1866 has been as follows:—In 1851 it was £154,212; in 1852 it was £174,920; in 1853, £252,484; 1854, £960,878; 1855, £1,939,101; 1856, £1,752,813; 1857, 1,324,873; 1858, 1,940,052; 1859, £2,507,949; 1860, £2,396,924; 1861, £1,596,010; 1862, £1,854,289; 1863, £1,411,661; 1864, £1,387,699; 1865, £2,192,090; 1866, £3,942,598. It is expected that the amount expended in England during 1867 will be about £2,457,250. The industry of the mother country has thus been greatly assisted by the valuable orders represented by these figures. If all these amounts be added together, it will be found that they are nearly £26,500,000, or between a third and a half of the £67,932,550 that have been expended up to April last on account of Indian railways. The tons weight of goods despatched have been 3,195,862; and as the number of ships they were conveyed in was 4,827, it followed that the average load which each carried was 662 tons.

We have dwelt upon Indian railways at greater length than we had originally intended, but the subject is a great one; for it must not be forgotten that the capital expended upon them at this date is a seventh of that to the same account in the United Kingdom. Presently it will be a

sixth, and hereafter it will be a fifth; because also the mileage of these railways is, even now, nearly a third of the railways of Great Britain; presently it will be more than a third. On the 1st of January, 1867, it was nearly half that of France; only 1,413 miles less than that of Prussia, 1,138 less than that of Bavaria, 69 more than that of the Austrian dominions, 1,030 more than that of Italy, 854 more than that of Spain, 2,160 more than that of Belgium; 2,177 more than that of both Russia in Europe and Russia in Asia; and 1,574 more than that of Canada.* On the 3,638 miles which, towards the close of 1866, constituted the length of Indian railways, the train miles run amounted to 10,120,920. The gross receipts earned by those trains were £4,537,235, just 1,425,000 more than in 1865; of these gross earnings, £1,278,580 were received from passenger traffic, and £3,091,723 from that of merchandise. The number of passengers carried in 1866 was 12,867,000, being 367,000 more than in 1865. This, of course, in no way represents the proportion due to population in British India, for in 1861 that population was 143,271,210, dwelling on 956,436 square miles of land.

Let us proceed some few steps farther with reference to the development of India. Its revenue has increased from £27,832,237 in 1852, to £45,652,897 in 1865. But on the the other hand, the expenditure, which was £27,098,462, or £750,000 within its income, in 1852, was £46,450,920, or

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* The following are the lengths of some of the European Railways open for traffic on the 1st of January, 1867:—France, 8,989 miles; Prussia, 5,483; Austrian Dominions, including the non German Provinces of Austria 4,001, excluding them 2,066 miles; Bavaria, 5,208; Saxony, 1,587; the total length of railways in Germany and the German Provinces of Austria were 12,450 miles, not including amongst them those exclusively used for coals and minerals; Belgium, 1,910; Italy, 3,040; Spain, 3,216; Russia, 2,893.

£800,000 in excess of income in 1865. Then, as a further but doubtful proof of prosperity, the public debt of India had risen from £55,114,693 in 1852, to 98,518,145 in 1865.* The tonnage of vessels entered and cleared in India during 1852 was (exclusive of coasting trade) 1,591,937; in 1865 it was 4,268,666. The value of imports (including bullion and specie) into India in 1840 was £8,415,940; in 1852 they were of the value of £17,292,549; and in 1865 they had increased to £49,514,275. The value of its exports rose in fifteen years from £20,798,342 to £69,471,791.† In

* The Debt of India.—"The public debt of India has expanded very considerably of late years. In 1840 it was £34,484,997; in 1841, £35,922,127; 1842, £38,404,473; 1843, £40,478,640; 1844, £41,833,451; 1845, £43,502,750; 1846, £43,891,849; 1847, £46,884,225; 1848, £48,757,213; 1849, £51,050,512; 1850, £53,934,768; 1851, £55,099,315; 1852, £55,114,693; 1853, £56,233,686. During several of the foregoing years wars of more or less magnitude prevailed. In 1854 the debt was reduced to £53,683,468; but it rose in 1855 to £55,531,120, and in 1856 to £57,764,239; then came the Indian Mutiny. In April, 1857, the debt was £59,461,969; but by April, 1858, it had risen to £69,473,484. In April, 1859, it was £81,171,308; April, 1860, 98,107,460; in April, 1861, £101,877,081; April, 1862, £107,514,159. By April, 1863, it had fallen to £104,495,235; April, 1864, to £98,518,145; April, 1865, to £98,477,555. During 1866 and 1867 there has been some increase of the debt, making it about £100,000,000. The charge for interest in 1840 was £1,595,778. In 1845 it had risen to £2,009,039; in 1850, to £2,558,939; in 1855, it had fallen to £2,189,433; in 1860, it had risen to £3,889,191; in 1865, to £4,482,385. The increased charge for interest in 1865, over that for 1860, was £593,194, whilst the increase of capital was only £370,095, thus showing that India pays a higher rate of interest on her loans than formerly."—*Times*, 28th of August, 1867.

† The value of the imports into the United Kingdom only, from British India, £36,897,743, deducted from the gross exports from India, will show that our Eastern Empire has done trade of the value of more than twenty millions sterling with other nations. In 1865, the value of the British Indian merchandise imported into Great Britain was £37,395,425; in 1864, it was £52,295,595; in 1863, £48,434,740; in 1862, £34,133,551; in 1861, £21,968,752; in 1860, £15,106,597; in 1859, £15,244,869; in 1858, £14,989,030; in 1857, 18,650,223. The high price of cotton and the large imports of that staple from India since

1852 the total amount of cotton which British India sent to the United Kingdom was only 84,922,432 lbs., just a ninth of that received from the United States, which was 765,630,544 lbs. In 1866 the amount of cotton imported from India was 615,302,240 lbs.,* exactly 95,244,840 lbs. more than from the United States, and not far from one half of the total amount imported from all places, namely, 1,377,129,936 lbs. Thanks to India, the total quantity of cotton imported in 1866 is only 13,000,000 lbs. less than it was in 1860, the year of our greatest cotton importation. In that year the quantity received from India was little more than a seventh of the importations from all sources. It is, therefore, not to be wondered that Manchester has altered its cotton machinery, and has rendered it suited for working the cotton, the importation of which will, thanks to Indian railways, soon make England, as regards supplies, independent of all other countries in the world.†

1861 have, of course, swelled the totals of the last few years. But quite apart from this trade, our commercial relations with India have experienced both a solid and a permanent extension.

* The cotton importations of the first nine months of the present year have amounted to 988,314,096 lbs., being 9½ per cent. less than in the same period of 1866, and 62 per cent. more than in 1865. The supply of American this year, however, has been 5 per cent. beyond that of last year, while the quantity from India has experienced a reduction of 29 per cent. Of the total arrivals, the proportions this year have been as follows:—American, 46 per cent.; Indian, 33 per cent.; Egyptian, 10 per cent.; Brazilian, 6 per cent.; Turkish, 1 per cent.; and other countries, 4 per cent.

The total amount of the cotton crops of India is about 2,400,000,000; so that England only receives about a fourth of it. The average weekly consumption of cotton for all purposes in Great Britain is about 45,000,000 bales. The weight of a bale is 320 lbs.

† The only other British Colonies from which we receive cotton, are the West Indies, including the Bahamas and Bermuda. In 1852, they only sent to the mother country 703,606 lbs.; in 1865 the quantity had risen to 19,814,480 lbs.

Let us say, finally, that if we have dwelt at such length upon the yet *infant* railway system of the Indian Empire, it is because India is a land that has a well-recorded history dating back nearly 4,000 years, with national monuments and buildings still existing, and in comparatively sound preservation, that were erected 400 years before Rome was created; and, last of all, BECAUSE of the now standing army of India, numbering 190,195 men, 71,880 first saw the light from Heaven in the United Kingdom. It is at that number our reinforcements will have to be never-failingly kept up, if we wish to avoid the dangers and horrors of a second Indian mutiny.

Postscript.—Immediately after page 271 was printed, we met a gentleman who, in consequence of his professional connection with Persia, has, for several years, made the subject of a communication from the north-western side of Asia Minor, through Persia and Affghanistan to India, his constant study. He takes a different view from us as to the starting point of the LONG RAILWAY, but in many other respects our opinions are identical. It is probable that they may be brought jointly before the public in a more detailed and substantive form, in the course of a few months. We may here mention that, as early as 1847, Mr. Austin H. Layard, M.P., was alive to the importance of this communication, for in his work on the 'Ruins of Nineveh and Babylon" (London, Murray, 1853), he says, that the route of the Euphrates, the adoption of which he urgently recommends "must be the second Indian route until civilisation and Christianity afford a reasonable basis for those gigantic schemes which would carry a line of iron through countries almost unknown, and scarcely yet visited by a solitary European traveller."

CHAPTER X.

CANADIAN AND AUSTRALIAN RAILWAYS—THE RAILWAYS OF OTHER BRITISH COLONIES.

The progress of Canada—we speak of the whole dominion recently created by the confederation of Upper and Lower Canada, Nova Scotia, and New Brunswick*—has been marvellous, and in no respect, perhaps, has the growth of the country shown itself in a more marked manner than in the development of its railway system. It was in 1848, or almost immediately after the completion of the magnificent canal system of Canada proper, and by which vessels of 800 tons could pass from the ocean to Lake Ontario, and *vice versâ*, that the Canadians discovered it was necessary, notwithstanding their unrivalled inland navigation, to combine with it an equally good railway communication—that was if they were to continue to be the carriers of the products of the western states through the valley of the St. Lawrence. They found that their neighbours to the south had commenced their railways in all directions, but more particularly

* The *New York Albion*, of September 15th, 1867, very truly says:—"A oneness of purpose, and that mutual sympathy which inspires mankind with a collective and national patriotism, is rapidly taking root throughout British North America, and it is in these deep-rooted, but slow-growing sentiments that we implicitly place our trust for the future. When the Canadian is animated by the same feeling which wrought the 'seven days' wonder' last year in Central Europe, and which still adheres to 'German Unity' as its watchword; or is inspired with the enthusiasm that recently made Italy one, 'from the Alps to the Apennines;' or with the national pride of even the Frenchman or Russian, there will be no fear of her policy being fixed or her destinies materially influenced by the outer world, no matter how boisterous the demonstrations, or unprincipled the purposes of her assailants."

to connect the cities on the Atlantic Coast with the Western Lakes, and accordingly in 1849 an Act was passed by the Canadian Government pledging a 6 per cent. guarantee on one-half the cost of all railways made under its provisions. Under this Act, the Northern Railway, which runs from Toronto to Collingwood, the Great Western Railway, which runs from Windsor on the Detroit River (opposite Detroit) to the Niagara River, and the St. Lawrence and Atlantic, now forming part of the Grand Trunk line, running from Montreal to Portland, were commenced. In 1852, however, the Government, fearing the effect of an indiscriminate guarantee, repealed the law of 1849, and passed an Act guaranteeing one-half of the cost of one main trunk line of railway throughout the province, and it was under this Act that the Grand Trunk Railway was projected. These terms were subsequently modified by granting a fixed sum of £3,000 per mile of railway forming part of the main trunk line. It is true that prior to these dates railways existed in Canada. There was, for example, the horse railway from La Prairie, nine miles above Montreal, to St. John's, on the Richelieu River, which was opened in July, 1836, and was first worked with locomotives in 1837. There was also the horse railway between Queenstown and Chippewa, which was opened in 1839; but with these exceptions and the length of the Lachine Railway, a line running from Montreal for seven miles to the westward, the railway system of Canada cannot be said to have commenced until after the passing of the Railway Act in 1849, and even then it was not for about a year that any substantial progress was made. But after that date the works of the several lines were pushed forward rapidly, and in 1853 the lines from Montreal to Sherbrooke, from Toronto to Bradford, and from Hamilton to Suspension Bridge were opened. In 1854 the line between Mon-

treal and Quebec was opened, the first train having carried Lord Elgin, who was then *en route* to England. In the same year the Great Western Railway* was finished to Windsor, and in the two following years the whole line from Montreal to Toronto, and thence to London was constructed, and in 1859 the entire Canadian Railway system was completed, including the keystone of its arch, the Victoria Bridge, the details of the construction of which will be found in a subsequent page.

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* "Easy Travelling.—The Pullman Sleeping Car Company have just placed on the Great Western Railway of Canada a new passenger car, which they call an 'Hotel Car,' and which combines the comforts of a first-class hotel, the luxuries of a drawing-room, and the speed of an express train. Like all American passenger cars, it is open at each end, with a platform in front of the doors; its length to the end of the platform is 71 feet 4 inches, width 10 feet 6 inches, with a ceiling 10 feet 6 inches from the floor. At each corner of the car, making four in all, is a private bedroom or state cabin, containing a sofa, two arm-chairs, and a centre table. These are convertible into comfortable beds, with mattresses, pillows, sheets, &c. The rooms are adorned with mirrors of large dimensions. The doors and fittings are of black walnut; carved and gilt ornaments of bronze are introduced. Each of these rooms will contain six passengers. Then follows a small room, fitted as a kitchen and steward's pantry. Here meals will be cooked, coffee or tea prepared, and drinks dispensed. A bell with wires communicating all over the car—or shall we say the edifice—will summon the steward. A central passage runs down the length of the car from door to door, and on each side are three other compartments, each intended for four passengers. Berths are made up exactly as on board a steamer, the bed appurtenances being conveniently stowed away during the daytime. The partitions dividing the compartments being moveable, when used as a drawing-room rise no higher than the backs of the seats, which are covered with rich Genoa velvet; the floor is carpeted, the ceiling is painted in *fresco*, and the walls richly carved and gilt. A stove heats the interior, with provision for ventilation, and a washing-room and other conveniences complete the internal arrangements.

"The exterior is painted a rich lake crimson, relieved with gold ornaments. On two oval panels on either side are copies in bronze of Thorwaldsen's figures of Sight and Hearing. The car is placed on two trucks of eight wheels each, with lateral motion springs."—*Railway News.*

Whilst, as has been already explained, the Government of Canada owns no portion of the 2,148 miles of railroad now constructed, although the moneys granted in their aid amount to upwards of £6,000,000, Nova Scotia has built and owns all the railways constructed in that province. They consist of a trunk line from Halifax on the Atlantic, by way of Truro, to Pictou, in the Gulf of the St. Lawrence, with a branch line to Windsor, in the Bay of Fundy. The distance from Halifax to Truro is sixty miles, and from the main line to Windsor thirty-three miles. From Truro to Pictou the distance is also about sixty miles. The railways to both these points were completed in 1858; the total cost of construction, including the extension to Pictou, being a little over £8,000,000. The line from Halifax to Pictou was originally intended to form part of the European and British North American Railway, running from Halifax to the Great Lakes through British territory, and this has now all been accomplished, with the exception of the intermediate link through New Brunswick, from the St. Lawrence River to the Bay of Fundy. This incompleted section, the projected Intercolonial Railway will now fill in, so that within three years from the present time the dominion of Canada will have direct railway communication between its extreme limits—that is to say, the iron road will be laid between the ocean and the Great Lakes.

New Brunswick, like her sister maritime province, also owns a railway, being the line from St. John to Shediac—a distance of 108 miles. It is called the European and North American, and it is intended to extend the line westwards from St. John to the boundary line of the State of Maine, the present railways of that State being in like manner extended until a junction is effected between the two systems. With the completion of these extensions and

the construction of the Intercolonial Railway, a passenger landing at Halifax will be able to take his train to any city in the States or in the Dominions. In addition to the European and North American Railway, New Brunswick possesses two other lines—the New Brunswick and Canada, eighty-eight miles long, running from St. Andrews to Woodstock, and the St. Stephen's branch railway, a short line of eighteen miles in length. It is not unlikely that some portion of the Woodstock line may be utilised as part of the Intercolonial Railway; but, until the route of the latter is finally settled, it is impossible to say whether this will be so or not.

From the foregoing figures it will be seen that, whilst in 1852 Canada could only boast of thirty miles of railway, she has now, including the railways of New Brunswick and Nova Scotia, 2,495 miles. The population of the dominion is estimated at 4,000,000, so that, with the exception of the United States, which possess a little more than a mile of railway for about every thousand inhabitants, the rate of Canada, which is nearly five-eighths of a mile for the same proportion of population, shows a greater mileage system per head of population than any other country.

The following is the length and cost of the several railways in the dominion :—

Name.	Length in miles.	Cost.
Grand Trunk	1,377 ..	£16,583,033
Great Western	345 ..	4,901,892
Northern	97 ..	1,121,462
Brockville and Ottawa	86½ ..	534,657
Prescott and Ottawa	54 ..	412,808
Port Hope, Lindsay, and Beaverton	43 ..	327,437
Carried over..	2,002½	£23,881,289

Name.	Length in miles.	Cost.
Brought forward ..	2,002½ ..	£23,881,289
Port Hope and Peterboro'.. ..	13 ..	82,191
Cobourg and Peterboro'	14 ..	184,931
London and Port Stanley.. ..	24½ ..	212,229
Welland	25½ ..	333,460
Carillon and Grenville	13 ..	19,536
St. Lawrence and Industrie ..	12 ..	11,116
Stanstead, Shefford, and Chambly	44 ..	249,862
Nova Scotia	133 ..	1,300,000
New Brunswick	214 ..	1,700,000
	2,495½	£27,974,614

The magnificent harbour of Halifax—than which there is none finer in the world—will, on the completion of the Intercolonial Railway, be the Atlantic terminus of the Canadian system of railways—a system that will yet extend across the Rocky Mountains to British Columbia; and there, ere long, will be seen the lumber from New Brunswick, Maine, and Canada, the beef, pork, wheat, flour, and corn of Western Canada and the Western States, with the other products—

From the forests and the prairies,
From the great lakes of the northland,
From the land of the Ojibways,
From the land of the Dacotahs,
From the mountains, moors, and fenlands,

all being transhipped for consumption in our Cis-Atlantic markets.

Australia has not made as rapid progress in respect of the construction of railways as might perhaps be expected. She has not, however, been altogether unmindful of her interests in this respect. Of the four great modern divisions

of the Australian Continent, New South Wales had, at the commencement of the present year, 263 miles, and the expenditure upon them had been £2,746,373; Victoria, 272, with an expenditure of £9,905,631; Queensland, 78, with an expenditure of £617,658; and South Australia, 56. The expenditure for railways in this last-named colony is not stated in the returns before us. It will thus be seen that the aggregate length of the Australian railways is 669 miles.

In the New South Wales Province there are three main lines, all of which commence at Sydney—the Great Southern, the Great Western, and the Great Northern. The first is to extend through Goulburn to the Murray River at Albury. Although some of the works on this line are very heavy, and there is a long tunnel to complete through the Gibraltar Mountains, it is, nevertheless, expected that the line will be completed in 1868. The Great Northern will extend to Muswell Brook on the Hunter River, sixty miles north-west of Maitland, and 153 miles from Sydney. The third, or Great Western Line, is to extend to Bathurst on the Macquarie River, 122 miles from Sydney. New South Wales has its Windsor and its Richmond, and these places are accommodated with railway communication from Sydney. When the several lines now open, and those now in process of construction, are completed, the Colony will have 500 miles of railway within its limits.*

* We learn from the *Sydney Empire*, that the first locomotive made in New South Wales was launched from the yard of Messrs. Vale and Lacy, engine manufacturers, in January last. She is upwards of seventy horses power, and is now employed on the inclines and zig-zags of the Great Western (of Australia), between Redfern and Pyemont. "The trial," says the *Sydney Empire*, "was pronounced by the scientific gentlemen present to be very satisfactory."

The Victorian railways consist of two main lines, one from Melbourne to Castlemain (Mount Alexander Gold-fields) and Sandhurst (Bendigo Gold-fields), 101 miles long, and the other from Melbourne to Geelong and Ballarat, with a branch to Williamstown (the Port of Melbourne). The total length of this second line is ninety-six miles. The Geelong and Melbourne Railway was purchased from the shareholders by the Government in 1860. An extension from Sandhurst to the Murray River at Echuca, fifty-six miles long, is in progress, and will be opened next year. Echuca is 150 miles distant from Albury, the terminus on the Murray River of the intended southern extension of the New South Wales Railways. There will, therefore, not be direct railway communication between Sydney and Melbourne, at all events for the present. The gauge of the New South Wales and Victorian Railways is 5 feet 3 inches.

The railways of Queensland consist of two main trunk lines, one for the southern districts from Brisbane, at the head of the Moreton Bay Navigation, and one for the northern districts from Rockhampton, at the head of the navigation at Keppel Bay, running nearly due west into the interior, passing through Westwood and other townships, and traversing the extensive Leichhardt district, whence it will be eventually extended to Claremont, a township of the Peak Downs, distant 220 miles from Rockhampton. This extension, when completed, will open out a vast territory, and will give the same facilities for the inhabitants of the province to transport their enormous yields of wool to the sea-board as India now possesses for its cotton. The first section of this railway from Rockhampton is on the eve of completion.

As regards the Southern line, it has been open more than

a year from Brisbane to Ipswich. Its extension to Toowoomba (sixty-two miles) will, it is expected, be ready for traffic early next year; and later, two forks, one extending north-west towards Dalby, and the other south-west to Warwick, in the direction of Dumaresq River, which forms the boundary between the southern inhabited portion of Queensland and the northern of New South Wales, will be completed.

The gauge of the Queensland railways is 3 feet 6 inches, and the reason for its adoption in these narrow proportions was to save the great additional cost which construction on a wider gauge would have entailed in passing through the extremely difficult country between Ipswich and Toowoomba. Two ridges of hills have to be crossed, one 700 feet and the other 1,400 feet above the level of the land at their bases. The main range incline is sixteen miles long, and upon it there are eleven tunnels, the longest of which is over three-quarters of a mile, all of which require lining with stone or brick. The total number of bridges is 47; their total length is 5,196 feet, or 84 feet less than a mile. In one locality they are so crowded together, that there are eight in three-quarters of a mile. The longest is 535 feet, the greatest in height is 73 feet over the rails. The steepest gradient is 1 in 50; the longest at that rate of inclination is 1,820 yards; the total length of 1 in 50 is 4 miles 280 yards. The average gradient of both inclines is 1 in 70.

On the lesser range there are two tunnels, one of 586 yards, and the other 120 yards, on a curve of 120 yards, or five chains radius. The low-lying country at the base of these two mountain ranges is intersected by streams and water-courses, which in the wet season become roaring torrents, overflowing their banks, and thus necessitating an amount of bridging and water-ways as great as, for a like distance, in any other country of the world. Notwithstanding these heavy works, the passages through the mountain have been con-

structed at a cost of about £15,000 a mile. On the lengths presenting only ordinary difficulties they have been made at about £6,000 a mile.

The South Australian Railway extends from Adelaide in the direction towards Murray River, not far from where it flows into Lake Alexandra.

The number of passengers conveyed on Victorian lines in 1866 was very great—3,361,312. They also transported 482,314 tons of goods. The number of passengers carried on the New South Wales railways was 751,587; but the amount of goods was nearly equal to that on the Victorian lines—416,707. The South Australian carried on its fifty-six miles of railway 402,550 passengers and 261,183 tons of goods.* Owing to the failure of the harvest, there has been a considerable falling off in the business of the South Australian railways in 1866.

New Zealand opened its first railway—from Christchurch

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* The Telegraph system of Australia deserves a few words of record:—At the end of 1866, New South Wales had 2,624 miles, upon which, during the year, 138,175 messages had been sent; Victoria, 2,626 miles, its messages 256,380; Queensland, 1,131 miles, messages 47,697; South Australia, 855 miles, messages 112,344. The reason of South Australia having so many messages in proportion to its mileage, is that St. George's Sound is on the direct course of the mail steamers to and from Suez. It is, therefore, the first Australian land touched at on the outward passage, and the last on the homeward.

The lowest telegraph charge within New South Wales is one shilling for 17 miles; from 20 to 50 miles, it is two shillings; all above 300 miles, four shillings. The longest telegraph distances in New South Wales are from Sydney to Moama, and from Sydney to Hay, each 520 miles. The Border passed, there is a uniform charge with the other colonies; to Victoria (excepting a few Border Stations), eight shillings; Queensland, nine shillings; South Australia, nine shillings. Within Victoria the highest charge is three shillings. To the other colonies there is a uniform rate; to South Australia (with one exception, to Port Augusta, seven shillings), six shillings; to Queensland, nine shillings. In Australia each single message consists of ten words only, exclusive of the addresses of sender and receiver.

to Lyttelton—six miles in length, in the summer of 1867. Further reference will be made to this railway in a subsequent page. Tasmania is also becoming alive to the importance of its having railways running from its sea-boards to the interior.

Railways have made progress in some of the other colonies of great Britain. The oldest British railway, out of the United Kingdom, is the Demerara Railway. The company was constituted so far back as 1844 for the construction of various lines, including one from George Town to Mahaica, a length of twenty miles. This is the only railway as yet open in the colony. It is, however, prospering, the receipts having increased very much during late years. Its total cost has been about £320,000; £115,000 is 6 per cent. preference capital. The ordinary capital now earns a dividend of 3 per cent.

The Jamaica Railway Company is entitled to be spoken of with respect, for it stands in the unique position of having "its capital closed, no money has been borrowed, and the railway is entirely free from debt." The capital upon which dividend is payable is £150,000; but, owing to the discount at which nearly half the share capital was issued, the actual money received was only £96,675. The railway was opened for traffic in 1850. Its length is sixteen miles. It runs from Kingston to Spanish Town, the seat of the Colonial Government, and thence to the Angels. At Kingston the company possesses a wharf suitable for receiving the largest vessels alongside it. The dividends have never exceeded £1. 10s. per cent. per annum; they are usually not more than half that amount.

Notwithstanding that the Secretary of State for the Colonies has sanctioned a guarantee of 6 per cent. on £300,000 by the Colonial Government for the construction

of a railway through the isle of Trinidad, no progress has been made with the works, and the line is in abeyance for the present.

Central American Honduras—not a British Colony, notwithstanding that its imports and exports appear in the statistical abstract of the Board of Trade "for the several Colonies and other Possessions of the United Kingdom"—is about to have a railway constructed immediately across its territory, from the Carribean Sea to the Pacific Ocean. For this purpose the Honduras Government has recently introduced with success on the London and Paris markets a loan for £1,000,000 sterling, under special treaties between England, France, and the United States. The line (about 150 miles long) has been surveyed, on the part of the British Government, by Colonel Stanton and a detachment of the Royal Engineers, sent out from England for the purpose. As regards interoceanic communication, the line will be of great importance, as it will effect a saving of 1,300 miles, or five days, between the Atlantic and Pacific ports, as compared with the Panama route. The harbours at the respective termini—viz., Puerto Caballos on the Carribean Sea, and the Bay of Fonseca on the Pacific, are capacious and safe, affording every facility for direct embarkation and disembarkation.

Proceeding to Africa, we have the Cape Railway, the terminus of which is at Cape Town. The total length of its lines in operation is sixty-three miles. The Cape of Good Hope Government guarantees 6 per cent. upon a sum not exceeding £500,000, and "it is to be considered as a rate in aid towards making a dividend of 6 per cent." The net dividend and the guarantee combined only yield 4 per cent. on the gross capital, which, at the date of the last report issued by the company in October, 1867, was £746,722. This rail-

way has suffered severely in its traffic, in consequence of the great commercial depression in the colony during the last two years, but its prospects are now reviving. The Directors have recently completed arrangements with the Colonial Government for the construction of further extensions.

The young and enterprising colony of Natal contemplates (as yet it has done nothing more) two lines of railway, one from Durban to Maritzburg, which will be about sixty-nine miles long, and a mineral line from Durban to Zuguela. Its length would be sixty-nine miles, and it would run through districts said to abound in fine coal, limestone, and iron.

The Island of Mauritius has a railway consisting of two portions, each having its terminus in common at Port Louis. The northern line is 36½ miles long, and the Midland 34 miles. They are now both open in their entire lengths. The traffic is reported to be highly satisfactory, and in advance of the expectations which had been formed of it. The cost of the whole 70½ miles has been about £1,300,000, of which the Government advanced £300,000 out of its accumulated surplus revenue. The balance of the capital has been principally found in England.

Shortly after the British Government took possession of Ceylon, at the invitations of the native chiefs, the formation of a large system of roads through the principal parts of the island was decided upon. These, as well as several canals, were constructed at heavy cost, for the country is extremely difficult and mountainous in several parts. Now the railway is beginning to supersede the old roads, and in a few years more there will be a tolerably comprehensive net-work throughout the island. From Colombo, its capital, situated on the west-coast of the island, to the foot of the incline over the Allagalla Mountain, the peak of which is 8,400 feet above the level of the sea, the line has been opened since

the early part of 1867. Its length is fifty-three miles, and it is expected that before the close of the year the whole line to Candy will be completed. The railway will subsequently be extended from Candy to Trincomalee.

Of the small islands in the vicinity of the British coast, the only one which as yet has railways, is the beautiful little Isle of Wight, the climate of which is said to be the most salubrious of any part of Great Britain. It is, at its nearest point, about 85 miles from London, and, thanks to express trains and rapid steamboats, it is not farther in time than three hours, *viâ* Portsmouth or Stokes Bay, to Ryde, or *viâ* Southampton and the Solent, to Cowes. For an island, the length of which is only 22 miles, and the extreme breadth (as nearly as possible at its centre) 13 miles, the whole of which is necessarily, from its picturesque character, extremely undulating, it is very abundantly supplied with railways. The most important, and the most costly is the Isle of Wight Railway, running from Ryde to Ventnor, with its long tunnel near the latter place. The length of this railway is 12 miles, and the last section (through the tunnel) was opened for traffic in October 1866. By recent enactments, the company has obtained powers to construct 26 miles of extensions, so as, by means of them, to connect with the Newport and Cowes Line ($5\frac{1}{4}$ miles long), and thus to establish a sufficient network of railways over the frequented portions of the island.

The Isle of Man is about to construct a railway, which is to run from Douglas, its capital, into the interior of the island.

There are no railways in Jersey or Guernsey, although possibly one may be soon made in the former island, from St. Helier's to St. Aubin's. Its length would be five or six miles, and, from a cursory inspection of it on the occasion

of a visit we made to the island a couple of years ago, there appear to be abundant elements for traffic, if the line were cheaply constructed. The expense of carrying it farther from the capital would not be justifiable, both on account of the expensive works that would be necessary, and the comparatively small traffic, except during the tourist season. Then it is very considerable.

We have now brought our Rambles on British Railways to a conclusion.

CHAPTER XI.

PARIS TO ST. MICHEL—"ABOVE SEA-LEVEL"—THE HOLBORN VIADUCT—THE MONT CENIS RAILWAY.

If the reader will refer to page 16 *ante*, he will see that we left an imaginary travelling companion of ours, to refresh himself at one of the innumerable restaurants of Paris, whilst we were to employ the time in giving some account of the four greatest existing railways in Europe, and of the Pacific Union Railroad, now constructing across the continent of North America. But one thing has led to another, and descriptions which we had originally intended should only occupy some fifty or sixty pages, have grown to more than 200. We now revert to our original plan, which is, to take the reader, in the shape of an imaginary traveller, to the Mont Cenis Railway, and having given the best explanation of it in our power, to impart (*apropos* of the Tunnel of the Alps) the information we have recently collected about tunnels, ancient and modern, canal and railway, in Great Britain, and in other parts of the world. From the Alps, we shall proceed, by means of the existing railways, to the extreme south-eastern end of Italy, whence we shall cross over to Sicily, the most southern part of Europe to which railways extend. In this manner we propose to bring the present volume to a conclusion.

Taking place in the train of the Paris, Lyons and Mediterranean Railway, at the Mazas Station, built nearly opposite to Paris's great prison of the same name, we travel on the main line, 275 miles, as far as Lamartine's birthplace, Macon, forty-four miles short of Lyons, and 262 short of

Marseilles, which is 537 miles from Paris. We must leave the detailed description of the route to *Murray's Hand Books*, of which Hand Books in general we have recently said, and now repeat, that an experience of upwards of thirty years' very frequent travelling in many parts of the continent enables us to state that, for lucid description, accuracy, and impartiality, they are the only English ones that completely merit the confidence of the public. *Per contra*, the omissions and inaccuracies met with in other so-called "Guides" are a source of continual annoyance and disappointment to the inexperienced continental traveller. To mention only one instance, a Hand Book which we were assured, at the office of its publication, was published in June 1866 (of course there is no date of publication on the title-page), is, with a few trifling alterations, a reprint of pages in stereotype published twelve or thirteen years previously, and the routes given to reach the country which it professes to describe are those that were in use, by ordinary road and by steamboat, until railways, opened now between six and ten years, superseded them.

At Macon we turn off from the main line of railway to the left, and pass successively Bourg and Culoz, near to which was the boundary between France and Italy, until the "rectification of frontier" in 1859 transferred the line of demarcation to the summit of the Alps, and converted Niceois and Savoyards into Frenchmen. At Culoz there is a further separation of railway—one branch turns north-east to Geneva 45 miles—the other, formerly the Victor Emanuel Railway, but lately swallowed up by the Paris, Lyons and Mediterranean Company, continues direct into the *Savoie Propre*, and after passing Aix les Bains and Chambery, runs up the Valley of the Arq to St. Michel, at present the terminus of the lines in this direction. When the stupendous

task of piercing the Alps is achieved, this line will be continued to Modane, twelve miles farther up the valley, where it will enter the great tunnel. The works on this length, as will be explained hereafter, will be exceedingly difficult and costly.

At St. Michel, the traveller at the present time has to exchange from the luxurious first-class carriage to the jolting, crowded, slow diligence. But very shortly he will only be called upon to move from the first-class carriage of the Mediterranean Company into the equally comfortable one of the Mont Cenis Railway, a specimen of which was exhibited at the recent Paris Exhibition. In this he will travel from St. Michel to Susa in less than half the time, and at a little more than half the expense of the journey *en Diligence*.

St. Michel is 146 English miles from Macon, 421 from Paris, 717 from London. The traveller who leaves London any morning of the week, at twenty-five minutes past seven, will (with a break of two hours in Paris) find himself at St. Michel at noon the following day, notwithstanding the fact, that the railway from Macon onwards is far from being a first-class one; its gradients are steep, its curves numerous and abrupt. Between Calais and St. Michel, including various ups and downs (for railways are subject to the fluctuations physically that man experiences bodily), the traveller has risen 2,493 English feet, but principally in the seventy-two miles and a-half from Culoz onwards. He has, in fact, completed more than a third of the total elevation he has to conquer, in order to be at the summit of the Mont Cenis Pass. This summit is 6,658 feet above the sea level at Calais and elsewhere.

"Above sea level!" What does this mean? We shall endeavour to illustrate; we shall therefore ask our reader to

be so good as, in the first instance, to place himself, either in imagination or reality, exactly parallel with those at-one-time-considered impregnable fortresses at Albert Gate Knightsbridge, Malta, and Gibraltar, so called, because, for a long time, no one could be found to take them. The ice, however, was broken as regards one of them, Malta, by a monarch of former days—for the most part wrongly accused and unfairly deposed—the Railway King. He sold it to our "natural enemy;" it has, therefore, for many years, been in possession of France, as the residence of the French ambassador, and let us *en passant* express a fervent hope—long may it continue to be so. Gibraltar, less dignified, has, probably, not been less useful; it fell, however, through the fatal influence of gold; it has long been a tributary or branch of one of our leading joint stock banking establishments.

So much for our starting point, and now for the ground to be got over. It has just been stated that the summit of the Mont Cenis Pass is 6,658 feet above sea level.* Converted

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* The following are the heights, at their summits, of all the passes of the Alps available for carriages. Two of them, however, are not carriage roads throughout their entire extents—the Little St. Bernard and the Great St. Bernard. Commencing at the Western extremity the height of the Col di Tenda is 5,890 feet; Mont Genevre, 5,850; Mont Cenis, 6,658; Little St. Bernard, 6,780; Great St. Bernard, 8,200; Simplon, 6,636; St. Gothard, 6,808; Benardine, 7,115; Splugen, 6,940; Stelvio, 9,272; Brenner 4,650. These passes are referred to, *ante*, at pages 8 to 13.

Mr. John Ball, late President of the Alpine Club, in the Indices to his two Guides for the Western and Central Alps (1863 and 1866) enumerates 370 Alpine Passes for the former, and 239 for the latter. The following are the names and heights of those exceeding 9,500 feet:—On the Western Alps, the Col d'Argentière, 12,556 feet; Blanchet, 9,544; De Bréona, 9,574; De Collon, 10,269; Cristillan, 9,771; Cula, 10,076; Dora Blanche, 11,668; Pas de la Forcetta, 9,898; Galambre, 10,200; Garin, 10,393; Grancron, 11,034; Lauzon, 9,500; Levornea, nearly 10,000; Pas de Lore, 10,049; Maison

into terms which we can more readily appreciate for such lengths, it means one mile and a quarter with fifty-eight feet over for good measurement. Placing this distance on the flat instead of the perpendicular it represents the whole of the ground that intervenes between the whilom fortresses and the corner of Coventry Street and the Haymarket; that is, a person wanting to walk 6,658 feet on or nearly the level, must go over ground equal to that which we have named as between these two points of measurement. But when we come to ascend a height, be it great or small, only a few feet or a mountain, we know by a universal law that we cannot mount exactly perpendicularly. Even in the nearest approach to the upright straight rise—the ladder—we are obliged to have some slope in it. We therefore, in all ascents by steps must mount gradually, so gradually in fact that the place for placing the human foot is usually greater than the rise made at each step it takes forward. In ordinarily built houses of the usual proportions, the rise of a step in a staircase is seven inches, but what the foot steps on is eleven inches wide; consequently, for every seven inches that we rise we must go forward eleven inches. But this is

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Blanche, 11,212; Grand Motte, about 11,500; Nenaude, 10,036; Del Color del Porco, 9,604; Des Rayes Noires, 9,680; Mont Rouge, 10,958; Jeleccio, 9,600; Torrent, 9,593; Traversette, about 10,000; Turbat 9,800; Vacornère, 10,335; Val Pellina, 11,687; Zwischenbergen, 10,742.

Those among the central Alps are Passo di Boudo, about 10,000; Capütschin, about 10,600; Cereen, 10,030; Diavolezza, 9,670; Diavolo, 9,541; Fex Forcla, 10,112; Forus, 11,100; Hohenferner, 10,000; Jungfrau, 11,095; Langenferner, 10,765; Lobbia Alta, 9,956; Lobbia Bassa, 9,541; Lötschen Lücke, 10,512; Madritsch, 10,252; Matsch, 10,750; Oberaar, 10,264; Orteler, 11,000; Peter's Grat, 10,550; Presena, 9,647; Salet, 9,565; Seerseen, 9,912; Sforzellino, 9,950; Strahleck, 10,994; Sterla, 9,515; Zufrid, 9,905.

Mr. Ball also enumerates 398 peaks or mountains in the Western Alps, and 685 in the central.

not all: at every twelve or fourteen feet we must have breaks in the ascent—landings; therefore, for any height above twenty feet or so, the proportion between elevation and step forward is, as near as can be, one to three. Taken by this standard, a person wanting to rise 6,658 feet by means of staircases or steps, must be continually ascending for a length that measures not only from Albert Gate to the Haymarket; but a farther distance represented by Leicester Square, Cranbourne Street, Long Acre, Great Queen Street, Lincoln's Inn Fields, Holborn, Newgate Street, Cheapside, and to the Bank of England.

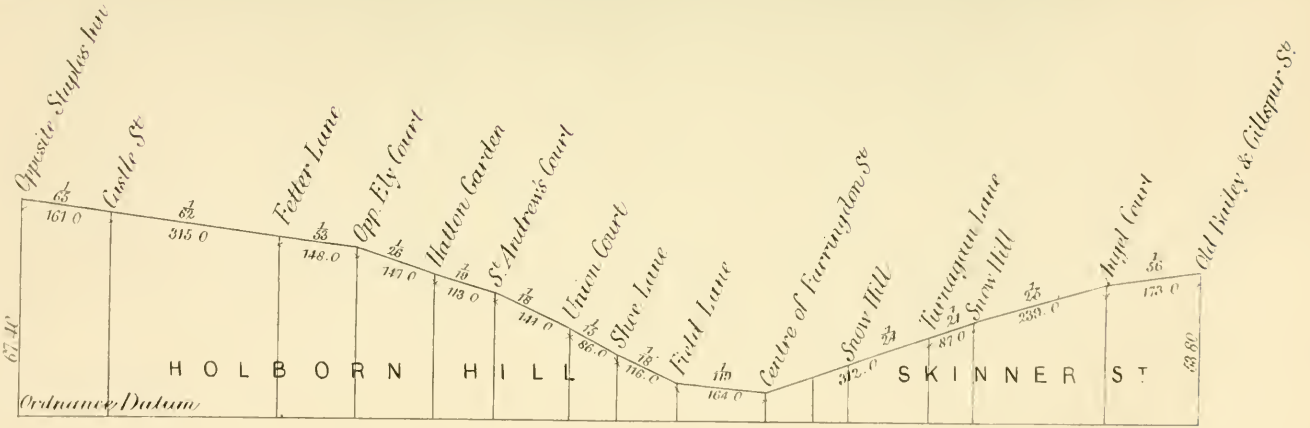
Let us look at "above the level of the sea" in another light. The staircase height of each of the houses we have referred to is about sixty feet, a fatiguing ascension even for the lightest of us. The summit of the Mont Cenis Pass is exactly 111 times 60. The top of St. Paul's Cathedral is 404 feet from the ground at St. Paul's Churchyard. The summit of the Mont Cenis Pass is sixteen and a half times higher.

Elevation by steps is only available for man, and for man's ever faithful, as well as for man's doubtfully faithful, companions, the dog and the cat. They therefore are able to ascend and descend a *staircase* gradient of 1 in 2; not so all other useful and domestic animals—the horse, the mule, the sheep, and the cow can only go along a continuous roadway; the mountain goat can skip occasionally from rock to rock, but its normal step is that of the other animals we have just enumerated. Were the steps of a staircase covered over, say, with boards, and the ascent made uniform, man could not ascend or descend a gradient of 1 in 2, 1 in 3, 1 in 4, and scarcely 1 in 5. He could not, in fact, ascend or descend the last-named gradient without having something beside him to hold on by. But the muscles of man's legs, and the organisation of his feet, enable him, by one of the innumer-

able and beautiful arrangements of the all-provident Creator, to ascend elevations by steps with complete facility, and at any moment. The steepest gradient that a horse can ascend or descend for any distance with a load is 1 in 10; occasionally there are short slopes in roads, especially old ones, of 1 in 6 or 7, but they overtax muscular strength in which ever direction an animal is going. It is a good mountain road the gradient of which does not exceed 1 in 15, or 352 feet in a mile, excellent, if it be anything like 1 in 20, or 264 feet in a mile. A strong, well-fed English horse with a moderate load behind him, could trot up this latter gradient for a short distance, and then he would fall into a walking pace, but he would draw a heavier load and with less distress to himself if he be started at a walk and be never pressed out of it.

Being anxious to show by an illustration, which would be familiar to most persons, who are either resident in, or have visited London, what is a gradient, we applied for information to Mr. Wm. Haywood, the engineer of the Corporation of London, under whose direction the Holborn Viaduct and Embankment are now in course of construction. He has kindly and courteously furnished a diagram—a copy of which is annexed at the end of the volume, showing in minute detail the variations of gradient, from Staples Inn to opposite the Old Bailey and Giltspur Street. The total length from point to point is 2,202 feet, a little more than two-fifths of a mile. The steepest gradient is 1 in 15 (352 feet in the mile) for 86 feet, the next 1 in 18 (293 feet in the mile) for 257 feet, and 1 in 19 (278 feet in the mile) for 113 feet. These gradients are all on Holborn Hill, between Hatton Garden and Shoe Lane. The steepest on Snow Hill is 1 in 21 (251 feet in the mile) for 87 feet, and 1 in 24 (220 feet in the mile) for 312 feet. All these gradients will, however, in a year or so, be matters of history, for it is hoped that

GRADIENTS OF
HOLBORN HILL & OF SNOW HILL
LONDON



Horizontal Scale, 352 feet to an Inch
Vertical Scale, 44 feet to an Inch

the Holborn Viaduct will be opened for traffic at the beginning of 1869.*

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* During the progress of these sheets through the press, we lighted upon the following most interesting account of "Holborn Past and Present," in the *Morning Advertiser* Newspaper. Its introduction here, will, we are sure, not be considered inappropriate.

"Perhaps no part of London has undergone such an alteration and business-like remodelling within the last few years as High Holborn, consequent on the construction of the Holborn Viaduct and other contemplated improvements. A few particulars relating to this locality, therefore, may not be thought, perhaps, uninteresting at the present time to our readers.

"Holborn extends from the north end of Farringdon Street to Broad Street, Bloomsbury. It was anciently called Oldbourne, from being built upon the side of a brook or bourne, which Stow says 'broke out of the ground about the place where now the Bars do stand, and ran down the whole street till Oldbourne-bridge, and into the river of the Wells or Turnemill-brook.' Holborn was first paved in 1417, at the expense of Henry V., when the highway 'was so deep and miry that many perils and hazards were thereby occasioned, as well to the King's carriages passing that way as to those of his subjects.' By this road criminals were conveyed from Newgate and the Tower to the gallows at St. Giles's and Tyburn; whither a ride in the cart 'up the heavy hill' implied going to be hung, in Ben Jonson's time. As an instance of the way persons were conducted to the place of execution in by-gone times, we can quote Swift's lines:—

> 'As clever Tom Clinch, while the rabble was bawling,
> Rode stately through Holborn to die of his calling,
> He stopt at the George for a bottle of sack,
> And promised to pay for it when he came back.'

And as to the lessons of morality taught in those days, it is said that an old councillor in Holborn used every execution-day to turn out his clerks with this compliment,—'Go, ye young rogues; go to school and improve.'

"The average annual amount of traffic between Fetter Lane and the Old Bailey, which has been increasing rapidly during the last thirty years, was in 1838 assumed to be 20,000,000 pedestrians, 871,640 equestrians, 157,572 hackney coaches, 372,470 carts and waggons, 78,876 stages, 82,256 carriages, 135,842 omnibuses, 460,110 chaises and taxed carts, and 352,942 cabs. It was Alderman Skinner, who built Skinner Street, that first proposed to construct a bridge from Snow Hill across the valley to Holborn Hill, and part of the late Mr. Charles Pearson's plan was to lift the valley seventeen feet.

"On the north side of Holborn Hill, approaching Farringdon Street, is Ely

It is, however, a misnomer to call it a viaduct. It is true that, by means of a massive construction, the opposite sides

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Place. All that remains of this once celebrated Palace, anciently called Ely House, which was then the town mansion of the Bishops of Ely, is the Chapel of St. Etheldreda. The crypt of this chapel during the interregnum became a kind of millitary canteen, and was subsequently used as a public cellar to vend drink in. It is now a Welsh Church, at the entrance being written—

'Y.R. E.G.L.W.Y.S. C.Y.M.R.A.E.G.'

underneath

'St. Etheldreda's Chapel.'

"Evelyn records the consecration here of Dr. Wilkins, Bishop of Chester, in 1668, when the famous Dr. Tillotson preached; and here, on the 27th April, 1693, Evelyn's daughter Susannah, was married to William Draper, Esq., by Dr. Tenison, then Bishop of Lincoln.

"At the south-east corner of Middle Row (now in course of demolition), Sir James Branscomb kept a lottery office sixty years ago; and at the 'Golden Anchor,' Holborn Bars, Dr. Johnson lived in 1748.

"At Ely House, 'Old John of Gaunt, time-honoured Lancaster' died, February 13, 1399, and Shakspeare has made it the scene of Lancaster's last interview with Richard II. Here were kept divers feasts by the serjeants-at-law in olden times. At an entertainment given by them in 1495, Henry VII. was present with his Queen; and again in 1531, on the occasion of his making eleven new serjeants, Henry VIII. and Queen Katherine were banqueted here with great splendour, 'wanting little of a feast at a coronation,' and open house was kept for five days. In 1576, at the mandatory request of Queen Elizabeth, Bishop Cox leased to Sir Christopher Hatton, for twenty-one years, the greater portion of the demesne, on payment at Midsummer-day of a red rose, ten loads of hay, and £10 per annum, the Bishop reserving to himself and his successors the right of walking in the gardens and gathering twenty bushels of roses yearly. Hatton largely improved the estate, and then petitioned the Queen to require the Bishop to make over the whole property, whereupon ensued the Bishop's remonstrance, and the Queen's threat to 'unfrock' him.* In 1578,

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* Sir Harris Nicolas, in his *life of Sir Christopher Hatton*, written to expose and disprove the almost innumerable blunders of Lord Campbell in his lives of the Chancellors of England, gives the exact words of this celebrated letter.

"Proud Prelate, I understand you are backward in complying with your agreement; but I would have you to know that I who made you what you are, can unmake you; and if you do not forthwith fulfil your engagement by G———d, I will immediately unfrock you.

"Yours, as you demean yourself,

"ELIZABETH."

of a valley—at their summits more than two-fifths of a mile apart—are connected together on the level. But, in reality,

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the whole property was conveyed to Hatton, and Elizabeth further retaliated by keeping the See of Ely vacant for eighteen years from the death of Bishop Cox, in 1591.

"An old map, still in existence, shows the vineyard, meadow, kitchen garden, and orchard of Ely Place, to have extended northward from Holborn Hill to Hatton Wall and Vine Street, and east and west from Saffron Hill to nearly as far as Leather Lane; but except a cluster of houses (Ely Rents), on Holborn Hill, the surrounding ground was entirely open and unbuilt on. The Bishops of Ely made several attempts to recover the entire property, but during the imprisonment of Bishop Wren by the Long Parliament, most of the palatial buildings were taken down, and upon the garden were built Hatton Garden, Great and Little Kirby Streets, Charles Street, Cross Street, and Hatton Wall. During the interregnum, Hatton House and offices were used as a prison and hospital. In 1772 the estate was purchased by the Crown; a town house was built for the Bishops of Ely in Dover Street, Piccadilly; and the present Ely Place was built about 1775, the Chapel remaining on the west side. At Ely House was arranged the grand masque given by the four Inns of Court to Charles I. and Queen Henrietta Maria at Whitehall on Candlemasday, 1634, at a cost of £21,000, when the masquers, horsemen, musicians, dancers, with the grand committee, including the great lawyers, Whitelocke, Hyde (afterwards Lord Clarendon), and Selden, went in procession by torchlight from Ely House, down Chancery Lane, along the Strand, to Whitehall.

"Holborn, in past times, was famed for its fruit gardens. Before 1597, John Gerrard, 'citizen and surgeon,' had a large physic garden near his house in Holborn, where he raised 1,100 plants and trees—'a proof,' says Oldys, 'that our ground could produce other fruits besides hips and haws, acorns and pig-mess.' Baldwin's Gardens were so named after Richard Baldwin, one of the Royal gardeners, who began building here in 1589. Gray's Inn Gardens were laid out under the direction of Lord Bacon, and in these gardens he erected a summer-house, where it is probable he frequently mused upon the subjects of those great works which have rendered his name immortal. At the corner of Furnival's Inn, and in Queen Street, Cheapside, Mr. Edward Kidder, the famous pastry-cook, who died in 1739, had two schools, in which he taught 6,000 ladies the art of making pastry.

"The Holborn end of Fetter-lane was formerly a place of execution. Proceeding farther eastward we come to a part which was once supposed to be the worst part of London, and where stood Field Lane, described as

the viaduct is a great metropolitan work, worthy of the Corporation of the City of London, which, although well abused by persons who do not understand its operations, is never-ceasing, to the extent of its means, in carrying out improvements within its limits. A list of the works and changes effected by the Corporation in the last thirty years would show that it has expended millions in altering the face of the City,* and in increasing facilities for traffic,

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'an infamous rookery of the dangerous classes,' which extended from the foot of Holborn Hill northward, parallel with the Fleet Ditch. In 1844 was taken down the first part of Old Chick Lane, which turned into Field Lane. Here was a notorious thieves' lodging-house, which was formerly the 'Red Lion' Tavern, where were various contrivances for concealment, and the Fleet Ditch in the rear, across which the pursued often escaped by a plank into the opposite knot of courts and alleys. But these places, in common with the Fleet Prison, are now nearly forgotten. Dickens, writing about Field Lane in 1837, thus describes it:—'It is a commercial colony of itself—the emporium of petty larceny, visited, at early morning and setting-in of dusk, by silent merchants, who traffic in dark back parlours, and go as strangely as they come.'

"Skinner Street and Snow Hill would hardly now be recognised by their old inhabitants. Skinner Street, extending from Newgate Street to Holborn Hill, was built at the commencement of the present century, to avoid the circuit of Snow Hill. In Skinner Street, in 1817, was hung Cashman the sailor, who had joined a mob in plundering a gunsmith's shop (No. 58). At the sign of the 'Star' on Snow Hill, at the house of his friend Mr. Strudwick, a grocer, died on the 12th of August, 1688, the famous John Bunyan, and was buried in that friend's vault in Bunhill-fields burial-ground.

"The foregoing are only a few of the many interesting circumstances connected with this immediate locality; and no doubt, as improvements rapidly progress, very little of this portion of 'Old London' will be allowed to remain standing, and large mercantile buildings will be erected on the few spots where small tenements are now standing, and Holborn will be only a reminiscence of the past."

* "The 'City' has an area of less than one square mile. During the past fifty years the number of houses in the City have been reduced to 5,581, yet the value of the remainder has so increased that the present few outbid the former many. During the last ten years only, the annual value of the City has

especially at points of aggregation. The manner in which the new street that is to run from the Mansion House to Blackfriars Bridge, within City boundaries, is advancing, contrasts markedly with what is doing beyond them. According to present appearances, the City will have completed its work and opened its portion of the street for traffic about the time that the Metropolitan Board of Works will have made a fair start upon what it has to accomplish.

The next great work that the Corporation has to take in hand is the widening of the Poultry, infinitely more important, and more absolutely required, in the opinion of all people who frequent the City, than the widening of Newgate Street, upon which the Corporation is now engaged. The expense, of course, will be enormous, but it must be met—somehow: land to be paid for by the square *inch;* splendid constructions to come down; historic Bucklersbury to disappear; even the Mansion House will stop the way, and His Lordship will have to find residence either at the rear of Guildhall, as was suggested some short time ago, or elsewhere. Metropolitan fellow residents, metropolitan suburbanists, and inabitants who dwell to the extent of six miles outside the Post-Master General's twelve mile postal circle, you may all rest assured that the granite pillars you see at the eighteen mile distance post from London, on railway and

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increased no less than a million and a-half sterling, or at the rate of 273 per cent. The 17,413 inhabited houses of 1811 had decreased to 13,431 in 1861, but the rental of 1811, which was £565,243, had increased to £2,109,935 in 1866. Therefore, the fewer houses of 1866 are worth more by £1,544,692 than the more numerous houses of 1811. The houses in the City were worth £32 per house, annual value in 1811. They are now worth £137 each, annual value. They were worth, to capitalise them at twenty-five years' purchase in 1811, £14,131,075; they are now worth, by the same process, £52,748,375, equal to the total revenue of Great Britain only a few years since, and equal to five-sixths of the present revenue."—*City Press, April*, 1867.

roadway, on river bank and canal tow-path—the columns of Luxor of the Corporation—with inscriptions on them destined, in remote future times, to represent the hieroglyphics of ancient Anglia—will remain and be found among the few signs then extant, of the by-gone civilisation which the prophesied New Zealander is to make his musings upon. Of the London coal tax as of the river:—

> "Rusticus expectat dum defluit amnis; at ille
> Labitur et labetur in omne volubilis ævum."*

The tax exists *ex necessitate rerum*, and must continue notwithstanding fervescence frequent—always at boiling point—in Parochial Parliaments, with echoes occasional in that of St. Stephens.

By means of the Viaduct, as already said, the two summits of the valley will be connected together almost on the level. The roadway will be 80 feet wide. Commencing at the western end of Newgate Street, it will be carried in a straight line to Farringdon Street, occupying the whole of the space which recently formed Skinner Street, as well as the sites of

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* The following, from the "Brook," may be taken as an English reading, with additions and variations, of the above lines:—

> "With many a curve my banks I feet,
> By many a field and fallow,
> And many a fairy foreland set
> With willow, weed, and mallow:
>
> I slip, I slide, I gleam, I glance,
> Among my skimming swallows,
> I make the netted sunbeams dance
> Against my sandy shallows,
>
> I chatter, chatter, as I flow,
> To join the brimming river,
> For men may come, and men may go,
> But I go on for ever."

several of the houses on that thoroughfare. It will include also a portion of the church of St. Sepulchre, the dismal bell of which tolls "the knell of parting day" to those miserable beings upon whom the law enacts terrible and life-destroying vengeance. From Farringdon Street the Viaduct is carried by a gentle curve to Hatton Garden, occupying the present roadway and the sites of the houses which formerly stood on the southern side of Holborn Hill. It will also occupy part of the churchyard of St. Andrew's, Holborn.

At the entrance to St. Sepulchre's Church a street from Farringdon Road will join the Viaduct on its northern side, and it is at this point that whatever little gradient there is on the Viaduct may be said to commence. From there to Farringdon Street it will be 1 in 153, or at the rate of 34 feet in the mile; from Farringdon Street to Hatton Garden, 1 in 143, or at the rate of 35 feet in the mile. For all purposes of traffic the Viaduct may therefore be said to be level.

The Viaduct in its formation will include vaultage beneath each footway for the accommodation of the future houses on either side of the roadway; outside these vaults will be a subway for the gas and water pipes, and between each subway, and forming the centre of the Viaduct, the roadway will be carried on a series of arches.

The general height of the subways will be about 11 feet 6 inches and their width 7 feet; they will be of brickwork, excepting where they are carried over the London, Chatham, and Dover Railway; there they will be of iron. In each subway provision is made for water, gas, and telegraph pipes, all of which will be so placed that their joints can be inspected, and repairs made without difficulty.

The mode of construction of sewers, drains, and street gullies is such that it will never be necessary to break up the surface of the Viaduct to repair or cleanse them.

Farringdon Street will be crossed by a cast-iron bridge of an ornamental character. It will be in three spans, supported by piers, one row being on the outer edge of each footway. These piers, as well as the outer abutment piers, are to be formed of polished granite. The height of the bridge next to the curb stones will be 16 feet, and in the centre the minimum height will be 21 feet, considerably more than sufficient for the traffic. At each corner of this bridge flights of steps will be constructed for pedestrians to pass between the upper and the lower levels. These will be enclosed in stone structures, ample light and ventilation being given to them.

Shoe Lane, now at its northern end but 14 feet wide, is to be increased to 30 feet in width, and to be continued northwards, under the Viaduct, to a new street which is to be formed from the corner of Hatton Garden to Farringdon Road. A complete net-work of streets is to extend from the Viaduct to all the existing adjacent streets, and as at the place at which Holborn ends and the Viaduct commences several of these streets concentrate, with the view to remedying the inconvenience which would arise from a too limited area for traffic; and to add to the character of the work in an architectural point of view, Mr. Haywood has formed at this point a large circus 180 feet in diameter. This open space will, in addition to its other advantages, afford an opportunity for architectural display that we are sure will be judiciously availed of.

The magnitude of the work may be represented, in one shape, by the number of bricks required for its construction. From seventeen to eighteen millions, of which rather more than two-thirds are in the actual viaduct, and somewhat less than one-third in the constructions connected with the side streets. Of course these amounts are independent of what

will be used in the houses and buildings to be erected hereafter. These will be millions in their numbers also.

Of gradients in reference to railways we speak hereafter.

The distance from St. Michel to Susa is 78½ kilometres—48¾ English miles. It is divided into two portions nearly equal in distance, but very different as regards gradient. For the first half of the distance the road continues to follow the valley of the Arq for twenty-five miles up to the village of Lanslebourg, which is situated at the foot of the Mont Cenis Pass, and here commences the second portion of the route forming the passage of the mountain.

Before proceeding farther we had better state that a French metre is equal to 3 feet 3·371 inches; consequently, 1,000 metres (or a kilometre) are equal to 1093·6389 English yards; an English mile is 1760 yards or 1609·31 French metres; 100 kilometres are 62¼ English miles; but a rough conversion of kilometres into English miles can always be made by multiplying the number of the former by 5 and dividing by 8; *vice versâ* to convert English miles into kilometres—multiply the number of the former by 8 and divide by 5.

In the 25 miles, or 40 kilometres, extending from St. Michel to Lanslebourg, there is only a rise of 670 metres, or 1,994 English feet. The steepest gradient is for 2½ kilometres (1½ miles) just beyond Modane at the French entrance of the great Tunnel of the Alps, of which we shall speak presently, the rise is 1 in 19, or 278 feet in the mile; and beyond Bramans, five miles farther, there is a rise of 1 in 20, or 264 feet in the mile, for 2 kilometres. The remaining gradients are as follows—1½ kilometre, 1 in 47; 8½ kilometres (5¼ miles) 1 in 60; 4½ kilometres (nearly 3 miles) 1 in 100; 7½ kilometres (4¾ miles) 1 in 108. In fact, with the exception of 4 kilometres (2½ miles) post-

horses go at the trot over the whole distance between St. Michel and Lanslebourg. It is at this latter place that the real elevation of the pass commences, and the traveller who wishes to see a considerable portion of the ascent that is before him, can do so by taking a look out of the comfortless-looking, but, in reality, comfortable *Hotel Imperial,* the ground-floor of which is occupied as a refreshment room for passengers, and by *Messieurs les Employés de la Douane Imperiale de la France.* The frontier which separates France from Italy is exactly at the summit of the pass, and it is 10,500 metres or 6⅓ miles from Lanslebourg. In these 6⅓ miles it is necessary to mount 2,171 feet, or at the continuous rate of 350 feet in the mile. The gradient is consequently 1 in 15 in the whole of these 6⅓ miles. From the summit to L'Hospice, 4⅕ kilometres along the bank of the Cenis Lake, which yields capital trout six months in the year, and is frozen over for the other six, the gradient falls 1 in 25, or 211 feet in the mile. There is a short length of 3 kilometres to the Posting House of La Grande Croix, with a gradient of 1 in 60, or 88 feet in the mile. The severest gradient on the whole pass is in the next 10 kilometres (6¼ miles), 1 in 14, or 376 feet to the mile; and from Molaretta to Susa, 10⅓ kilometres (6½ miles), it is not much better, being 1 in 15, or 350 feet in the mile. There is a difference in the comparative elevations above the sea, of St. Michel and Susa of 715 feet, Susa being the lower of the two. Consequently, the Italian side of the pass is more precipitous than the French, for, whereas the total rise from St. Michel to the summit (a distance of 31 miles) is 4,165 feet, the descent from the summit to Susa (a distance of 18 miles) is 4,880 feet; in fact, the descent of the mountain only terminates as the town is entered. Of course, what are ascent and descent

when going from France to Italy are reversed when coming in the opposite direction.

Mr. John Fell,* a gentleman about whom we have now to speak, has been occupied during many years of his life in the construction of railways and other works in Italy, being associated in several of them with Mr. Thomas Brassey, the eminent contractor, and other English gentlemen, among whom may be mentioned Mr. William Jackson, now M.P. for North Derbyshire. Connected with the laying out and subsequent construction of the magnificent railway between Pistoja and Bologna, by which the Apennines are traversed and overcome by the locomotive, Mr. Fell's attention was directed to the mighty cost of construction of this railway, as well as of that across the Sœmmering and of the Giovi Incline, by means of which last-named, Genoa obtains railway connection with all parts of the Italian system. Reasoning and reflecting, Mr. Fell's mind was, by a most happy incidence, brought to bear upon the effect that would be developed if the adhesion of the locomotive were increased by the application of horizontal wheels to a third or intermediate rail. But, in order to understand and to appreciate the full force of this conception, it is necessary to explain that the power or motive force of a locomotive is derived

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* A writer in one of the French journals, describing the passage of the first locomotive and train over the Mont Cenis, doubtless, having Switzerland and her legendary hero in his mind, says, that "the railway is laid on the system of the distinguished Swiss engineer, M. Guillaume Tell!" The Edinburgh Review, in 1865, described Mr. Fell as an American. He is, however, of English birth and of Saxon descent. In the course of an excellent description of the trial trip on the 26th of August, published in one of the London papers, reference is made to the railway over the Brenner, and the writer adds that, in point of precedence, the Austrian engineers had beaten their English *confrères*, but the printers, by omitting one letter, made it appear as if the Austrian engineers had *eaten* those of England!

from two sources—the amount of steam evaporated and the amount of adhesion, or, as it is familiarly called, "bite," that the wheels have on the rails. If a railway were completely level, it would only be necessary, in the construction of engines for working it, to make them with as little weight of material as possible, consistent with the strength and solidity required for their complete efficiency. But as a railway on, or very nearly on, the level, does not exist, it is necessary, in building engines, to give them such weight as, in addition to their steam power, will ensure them efficient adhesion upon the railway. On railways with favourable gradients the additional weight of engine is trifling; but exactly in proportion as gradients become unfavourable, so has it been found necessary to increase the weight of engines. Mr. Fell's system increases adhesion without increasing the weight of the engines,* except to the very trifling extent of that appertaining to the four horizontal wheels, and the machinery connected with them. These horizontal wheels—

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* It is wonderful how ingenious men can be when they are out of temper, and want to vent anger and disappointment. A writer in a professional paper, from whom better things might have been expected, and who has fairly and honestly won reputation in fields where imaginery grievances have not warped and overset truthful judgment, argues that because Mr. Fell's engine must go up the mountain by the centre rail system, it is most costly, and therefore practically useless on account of the great loss of power occasioned by the necessity of the engine coming down again. Nearly as much power, says the writer, is thus lost in the descent as is required to get the train up to the summit. This may be so, and very probably is so, but is not this loss the penalty that has to be paid for crossing the mountain at all. If the writer have crossed the Mont Cenis he could not fail to have seen that instead of the eight or ten horses or mules that are required to draw a carriage or a waggon up the pass, only two are required in the descent for the former, and one for the latter, all the other horses coming down the mountain loadless. After all, the disease is not half so bad as the remedy suggested for curing it—twenty-four to thirty miles of tube or tunnel, to say nothing of the mode of propulsion through it.

A WITH A CURVE OF 44 YARDS.

A CENTRE RAIL ENGINE AND TRAIN ASCENDING A GRADIENT OF 440 PER MILE WITH A CURVE OF 44 YARDS.

two on each side of the engine—are made to rotate along the *sides* of the centre rail by identically the same steam that operates upon and causes the rotation of the perpendicular wheels upon the upper surface of the two ordinary rails. In this fact is contained the whole secret of the extra-ordinary development and marvellous increase of power which are obtained by the introduction of the centre rail, combined with the action of the horizontal wheels upon it.*

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* An article appeared in the *Times*, of the 18th September last, upon the subject of engines ascending steep gradients and sharp curves. The Fell system was condemned, and grooved rails, within which the phlanges of the wheels were to move, were recommended in substitution of the centre rail, and of horizontal wheels upon the engine. Railway men could at once recognise the writer of the article, both from its style and from the extensive reference made to the plans of one individual who was specially named more than once in it. It does not require to be an engineer to know that the plan recommended would, instead of giving increased *adhesion*, create friction to an extent that would soon render a locomotive fixed and buried in its own sand, for it should be mentioned that the continuous pouring of sand from the sand-box of the engine on to the rails, and into the groove, was one of the sources from which it was stated, increased adhesion was to be obtained.

Mr. J. M. Heppel, C.E., declining to enter into criticism or controversy upon this point, and doubting the necessity of using sand with the Fell engine, unless in very limited and exceptional cases, proceeds to state, in answer to the assertion, that its vertical and horizontal wheels would not act together:—

"The vertical and horizontal wheels of Mr. Fell's engine are all driven from one pair of cylinders, and so coupled that they must all revolve exactly together; so that, abstracting for a moment from the slip or scrub of the vertical wheels which takes place on curves, if one slips they must all slip; and so long as the total adhesion is sufficient to take up the power, it is a matter of very little importance how it is distributed among them.

"The adhesion of the vertical wheels is due to the weight of the engine, and for any given condition of the rails, is a constant quantity. On the other hand, the adhesion of the horizontal wheels is, within its *maximum* limit, completely under control, and is given by a powerful screw motion, acting upon springs, which keep them always pressed against the rail with a force practically uniform. Notwithstanding any small inequalities of dimensions, all therefore that

But before we go farther, let us endeavour to settle a question of priority as regards this invention or discovery, and we are able to do so all the more easily through the information furnished by Monsieur P. Desbriere at page 61 of his *Etudes sur la Locomotion au Moyen du Rail Central, Contenant la relation des experiences enterprises pour la traversée du Mont Cenis.* Paris 1865.

"Claims having been recently started," says M. Desbriere, "as to the priority of the invention of the centre rail, we present the following historic *resumé.* The first patent taken out for its application was on the 30th of September, 1830, jointly by Messrs. Charles B. Vignoles, the eminent English engineer, and Ericsson, the Swedish engineer, the gentlemen who constructed the first monitors and marine engines to be driven by means of heated air. On the 15th of October, 1840, a patent was taken by Mr. Henry Pinkus, an English

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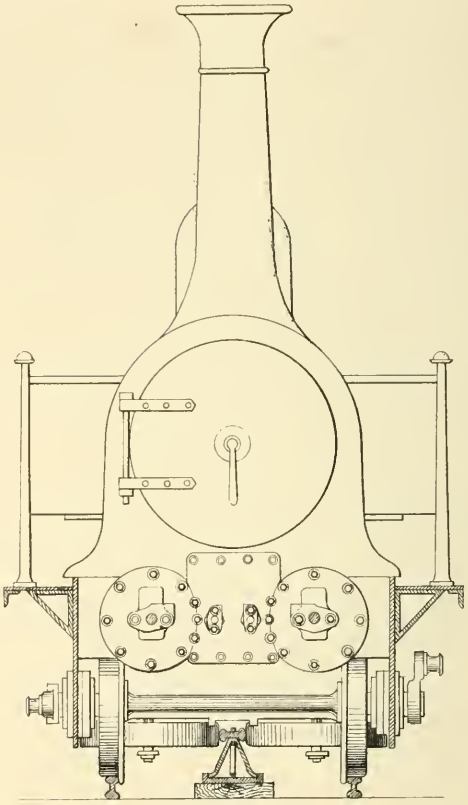
is requisite in ascending a heavy incline, is to set up the screws till the adhesion of the horizontal wheels makes up with that of the vertical ones, the total amount required for utilising the traction power of the engine.

"One obvious advantage of this arrangement is that it admits of all improvements of construction by which an engine, at the same time powerful and light, is obtained, a most important point on steep gradients, where gravitation is so formidable an obstacle, and one which has, as far as I am aware, been obtained by no other system in a way to be practically useful.

"Another great advantage is the power of regulating the adhesion to suit the requirements of the case, thereby avoiding superfluous and useless friction, which is always the necessary concomitant of adhesion; and when the latter is in excess must, so far as it goes, both absorb the power uselessly, and wear out the machinery unnecessarily.

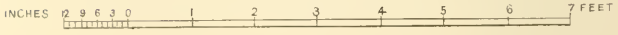
"I will not enter into a discussion with regard to the polishing of the rails by the breaks, and the consequent loss of adhesion. I believe that adhesion depends much more on the accidental condition of the rails, due to atmospheric causes, than on any permanent mechanical condition of their surface; but, at any rate, that quite sufficient adhesion will always be obtainable by the means I have endeavoured to describe, to what ever state of polish the rails may have attained."

PATENT CENTRE-RAIL ENGINE.



FRONT ELEVATION.

SCALE



gentleman. On the 18th of December, 1843, Baron Seguier addressed a communication to the Academy of Sciences in Paris, in which he proposed, as a means of avoiding getting off the rails, the employment of a centre rail upon all railways, the gradients of which were moderate and the speed upon which was high. On the 5th December, 1846, a patent was taken out by the Baron for this system, of which he described himself the inventor, and of which he was at all events the very active promoter.* On the 13th July, 1847, a patent bearing upon the subject was taken out in England by Mr. A. V. Newton."

"On the 20th of January, 1863, Mr. Fell took out his first patent, and on the 16th December, of the same year, his second, under the modest title of 'improvements in locomotive engines and railway carriages.' In neither of these patents did Mr. Fell attempt to appropriate to himself the invention of the centre rail, but simply the means, both ingenious and practical, by which he has succeeded in applying the principle of additional adhesion."

"Independent of the energy, perseverance, and straightforward practical sense, of which he has given proof, in his long train of trials and experiments, Mr. Fell's principal merit, in our opinion, is that he has understood, what theory entirely justifies, that locomotives with additional adhesion are only applicable to steep gradients and slow speed, because such engines are able to develop powerful means of traction, without heavy additions to their weight."

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* Baron Seguier evidently still considers himself the inventor of the centre rail system, for after the announcement in the newspapers of the successful crossing of the Mont Cenis Pass, on the 26th of August 1867, he published a letter in the *Moniteur*, making a statement to the above effect. He added, however, that he did not intend "to raise any question as to the pecuniary advantages that would be derived by others from the invention."

Early in 1863, Mr. Fell instituted experiments on a length of line of 800 yards, laid out on his plan, upon the Cromford and High Peak Railway, near Whaley-Bridge. The gauge was 3 feet 7½ inches, 180 yards of the line were straight with a gradient of 1 in 13 (406 feet in the mile); 150 yards with a gradient of 1 in 12 (440 feet in the mile); with curves of *two chains and a-half each*. The centre rail was raised seven and a-half inches above the surface of the two ordinary rails, so as to be acted upon by the two horizontal wheels of the engine. During the experiments, the first engine of the kind ever constructed, and necessarily, from want of experience, unsatisfactory in many of its details, working with a pressure of 120 lbs. to the square inch, was always able to convey a load of twenty-four tons up the incline. The maximum it succeeded in taking was thirty tons. Its dimensions were as follows: diameter of cylinder, 12 inches; length of stroke, 18 inches; four wheels coupled, diameter 2 feet 3 inches; axles, 5 feet 3 inches apart. The weight of the engine fully loaded with coke and water was sixteen tons. When the pressure was only brought to bear upon the vertical wheels, the engine could not take more than a weight of seven tons up the incline, but when the horizontal wheels acted combinedly with the perpendicular, she took up twenty-four tons on the same day, and under circumstances precisely similar in every respect, except as regards the action of the horizontal wheels upon the centre rail.

These experiments were considered so satisfactory, that it was decided, with the permission of the French Government, and for its information, that they should be repeated upon a more extended scale upon the Mont Cenis, with the condition made by Mr. Fell, that if the system were found to be practicable, the authorities should grant the concession of a por-

tion of the roadway for a line to be laid down across the French division of the mountain on the same terms as had already been agreed to by the Italian Government for the Italian portion.

The experimental line was laid down between Lanslebourg and the summit. It commenced at the height of 5,305 feet above sea level, and terminated at the elevation of 5,820 feet. Its length was two kilometres all but forty-four yards, or an English mile and a quarter. Gauge, 3 feet 7½ inches. Its mean gradient was 1 in 13, the maximum was 1 in 12; it had two curves of 44 yards each, and others, the most favourable of which was 125 yards. It will thus be seen that the line was constructed in a manner, both as regards gradients and curves, to subject the system to the severest tests. The experiments, which were conducted in the presence of commissioners from England, France, Italy, Austria and Russia, lasted from the end of February until the end of May 1865, and it is a remarkable fact that the adhesion was found during the period of snow better than could be expected in summer, for when snow was swept off the rails, it left them dry, and under favourable conditions; whereas, summer dust combined with moisture, would render them comparatively greasy and slippery. Captain Tyler, who was present at all the experiments on the part of the British Government, calls special attention to this curious fact in his report.

Two engines were employed in the trials, the first that which had been used on the High-Peak Railway experiments, and the second an engine built specially for the service of the Mont Cenis Railway. This latter was the engine principally employed, No. 1 being chiefly used to supply the place of No. 2, when any trifling derangement in its machinery required attention. It is intended that No. 2 shall be used on the completion of the line over the pass, and it is

the engine by which the trial trip was accomplished on the memorable 26th of August, 1867. When empty its weight is 13 tons, when loaded with coke and water 17 tons 2 cwt. The horizontal wheels and the machinery connected with them weigh $2\frac{3}{4}$ tons. The boiler is 8 feet 4 inches long, 3 feet 2 inches diameter, and contains 158 tubes of $1\frac{1}{2}$ inches exterior diameter. Heating surface 600 feet. The cylinders, two in number, 15 inches diameter, with 16 inches stroke, act at one and the same time upon the two systems of wheels, four horizontal and four perpendicular. Each system of wheels consists of four coupled, diameter of each 2 feet 3 inches. The space between the centres of each pair of perpendicular wheels is 6 feet 10 inches, that between the horizontal wheels 2 feet 4 inches; maximum pressure of steam in the boiler 120 lbs. per square inch; effective pressure upon the piston 75 lbs. This engine was a great improvement upon its predecessor. With engine No. 1, Captain Tyler, R.E., from whose Report to the Board of Trade the foregoing particulars are taken, says that during the space of two days he descended and remounted the experimental line six times. The train behind it consisted of three waggons, with a total gross weight of 16 tons. The average of his experiments was as follows:—The first ascent was made in 8 minutes 15 seconds, with a loss of 14 lbs. of steam, and of $5\frac{1}{2}$ inches in the gauge glass; the mean pressure of the steam varied from 92 to 125 lbs. per square inch. The speed in each of the experiments was greater, with the same load, than is proposed for the express trains. The mean speed resulting from the figures above stated, was at the rate of 13 kilometres, 300 metres per hour (8 English miles), instead of 12 kilometres ($7\frac{1}{2}$ English miles), the highest speed specified in the programme submitted to the French Government for this part of the line. The weather was fine and

calm, the external rails were in very good condition; but the centre rail, as well as the horizontal wheels were greasy, and consequently in a very unfavourable condition for adhesion.

The results of Captain Tyler's experiments with No. 2 engine were as follows:—Although at the time that they took place she was not in the best order, she was, nevertheless, able to ascend the incline, with the same load as had been attached to engine No. 1, in $6\frac{1}{4}$ minutes, or at the rate of $17\frac{1}{3}$ kilometres (nearly 11 miles) an hour. This engine besides possessing a greater amount of boiler-power, travelled more steadily than No. 1; its machinery is more easily attended to, and the pressure of the horizontal wheels upon the centre rail can be regulated by the engine driver at pleasure, from the foot plate. The pressure employed during the experiment was $2\frac{1}{2}$ tons on each horizontal wheel, or 10 tons altogether, but the pressure actually provided for, and which may, when necessary, be employed is 6 tons upon each, or 24 tons upon the four horizontal wheels. When this engine had ascended the experimental line in $6\frac{1}{4}$ minutes, or at the rate of $17\frac{1}{3}$ kilometres per hour, the steam pressure in the boiler had fallen from 112 to $102\frac{1}{2}$, and 3 inches of water in the gauge glass. The engine exerted, including the resistance from curves, 195 horses power—nearly 12 horses power to each ton of its own weight, or about 60 horses power in excess of what would be required to take up the load of 16 tons, over the same gradient and curves, at the rate of 12 kilometres per hour.

Captain Tyler finally reduced the pressure to 40 lbs. on the square inch, that is to one-third of the maximum pressure, and when he had done this, he found that the engine *alone* could move on a gradient of 1 in 12; the resistance of waggons and carriages being proportionally

much less than that of a locomotive, the latter could *a fortiori*, draw a train with a gross load three times its own weight, or 48 tons upon the same gradient, the pressure of course being raised to 120 lbs. to the square inch.

A very important, and we believe an unexpected feature of the Fell system was immediately developed in the experiments; M. Desbriere calls special attention to it. The centre rail not only aids the train in going round curves, but also adds largely to its safety. Each vehicle is provided with four horizontal pulleys, each of about eight inches diameter, playing around vertical axes fixed upon the frame of the vehicle, and placed two and two at each of its extremities, and on each side of the centre rail. By the tightening of these pulleys, the flanges of the wheels, instead of gliding along the outer rails, press strongly against them, and thus the train is able to overcome curves unaccomplishable by any other means. This arrangement of parts also renders it impossible for either engine or vehicles to get off the line; all the more important, seeing that by the terms of the concession, the portion of the roadway ceded to Mr. Fell is, for the most part, on the outside, that is, the side nearest to the precipice, the bottom of which is, in many places, eleven or twelve hundred feet deeper than the roadway.

Before proceeding to extract from the Reports of the French Commissioners to their government their opinions upon the Fell system, it is desirable to give some general deductions which Captain Tyler makes from what he witnessed, as bearing upon the important general question of railways over mountain passes.

Hitherto the immense cost of the construction of such railways, and the immense cost of working them, have proved all but an effective barrier to their adoption. The cost of construction divides itself into two portions, and we will

illustrate our meaning in the following manner:—Let us take A and B as the bases respectively on each side of a mountain. Were we to take these two points and to measure the interval between them, according to the every day application of the words "as the crow flies," we must first take our crow perpendicularly up from A, to the exact height of the highest point which a person would be obliged to ascend, in order to cross the mountain, and then having drawn our imaginary tape to the point perpendicularly above B, we have the distance between them "as the crow flies." But this distance in no way represents the actual distance that a person has to trudge up the mountain, and then to trudge down again in order that he may get, *materiellement et physiquement*, from one side of it to the other. The road which he has gone along can only be constructed with gradients that man and beast can accomplish. Exceed those gradients and the road might as well not be constructed. 1 in 12, or 440 feet in an English mile, is about as much as ought to, or, indeed, can be accomplished in this way. Yet, even to attain a mountain road with this gradient, it is necessary to make a great many turns and twists, to tunnel here, to raise an embankment there, to span a gorge sometimes several hundred feet deep with a bridge built between two projecting craigs at opposite sides of the ravine, whilst other bridges, of almost adamantine strength, and hundreds of feet in length, are often barely sufficient to resist the giant force of the torrents that dash along the gorge, and at times rise to within a few inches of a bridge's level. And when the road is finished, at the heavy cost which all such works involve, and traffic is brought upon it, its length is very different from what it would have been if it could simply have been climbed up the mountain by the shortest and straightest possible way, and then been brought down

again in the same manner. Still greater will be the difference between it and what our friend the crow accomplishes in the flight we have just referred to.

The experience acquired by our engineers tells us that the very maximum gradient an engine on the ordinary principle can climb up is 1 in 25, or 211 feet in a mile, but this can only be for a few yards, and with what is known, in locomotive language, as "a good run at it." On the Sœmmering, as has already been stated, the average gradient on the north side is 1 in 47, or 111 feet in a mile; on the south side 1 in 50, or 105 feet in the mile; yet these gradients, favourable as they are, compared with the gradient of an ordinary roadway over a high mountain pass, could only be obtained at a cost of £98,000 a mile. Equally costly was the Giovi incline, constructed to surmount the Apennines near to Genoa. The worst gradient on it for a short distance is 1 in 29, or 160 feet in a mile; its best 1 in 50, or 106 feet in a mile. The ruling gradient of the beautiful railway over the Apennines between Pistoja and Bologna is 1 in 40, or 132 feet to the mile. The distance from Pistoja at the foot of the mountain on the east to Poretta at the foot of the mountain on the west, by the old road, is 25 "*chiliometres*" (kilometres), a little more than 15½ English miles, but in order to obtain for the railway the average gradient of 1 in 40 we have just mentioned, it has been necessary to extend the distance from 25 chiliometres to 40, equal to 25 English miles. Each of these 40 chiliometres has cost 1,000,000 francs, or £40,000, making the total cost of the railway independent of the special rolling stock for working it, £1,600,000, or at the rate of £64,000 a mile. If at the time that Mr. Fell was engaged in connection with the construction of this very fine work, he had had his ideas matured respecting the centre-rail system, and that consent

had been given to the line being laid down in accordance with it, the distance to traverse would have only been 15½ English miles; many expensive works would have been avoided, and the total cost of the line would not have exceeded £400,000—probably it would have been considerably less. Another matter worthy of consideration is, that this Apennine Railway consumed eleven years in its construction. Not very protracted, considering that there are nearly 7 miles of tunnels (39 in number), of which 23 are on the ascent from Pistoja, and 16 on the descent to Poretta. The longest is 1⅓ mile, the second longest 1⅛ mile, the length of the others is pretty nearly equal. Nearly one-eighth of what is not tunnel is bridge or viaduct; some of the latter across ravines 300 to 400 feet long, and nearly 180 feet high. They are, in fact, double viaducts, one built on the top of the other, and reminding one of the two tiers of guns of an old-fashioned two-decker. According to the testimony of M. Desbriere, Mr. Fell would have accomplished an equally efficient railway on or through the pass in a couple of years. He would have had no tunnels, unless when, occasionally, he might want to get by a short cut through a projecting ledge of rock or mountain instead of round it, and, as to bridges and viaducts, a twentieth part of those now existing would have amply sufficed him. Before quitting this subject, we would observe that Captain Tyler sets down the difference between the length of a mountain road with gradients of 1 in from 12 to 15 as one-half that of a roadway with gradients of 1 in 40. In practice, however, it will probably be found that the difference will hardly be so great—but there can be no doubt of its not being less than as 3 to 5.

Taking the question of working expenses, we know that on the Sœmmering, on the Giovi, and on the Pistoja lines, the

weight of the engines is about fifty-five tons, and that on the Sœmmering and the Giovi the cost per train mile is 6s. 2d. *down* the pass as well as up it, while the average cost on the ordinary portions of the lines is under 3s. a mile; and so oppressive is the working cost of goods trains over the Sœmmering felt to be, and with such uncertainty are the trains, but especially the goods trains, worked over the pass, that before the end of the present year, a railway between Vienna and Trieste will be opened, with a detour of 110 miles, and it is by this roundabout line that the immense and continuously increasing goods traffic between the interior of Austria and its great naval and commercial sea port, will eventually be conveyed to it.

Captain Tyler, whilst instituting a comparison between the cost of the construction and working of the Mont Cenis Over-ground Railway with these costs upon the railway through the Great Tunnel of the Alps, calls especial attention to the fact that the former is only laid down on a road-bed already in existence, as a temporary (that is if we can accept temporary as an exact translation of *provisoire*) line, whilst that through the tunnel is permanant. But keeping this point in view, the report of Mr. James Brunlees, C.E., the distinguished engineer of the Mont Cenis Railway Company, shows its cost to be (including the necessary engines and other rolling stock) a little under £8,000 a mile, whilst he asserts that the Tunnel line will probably cost, including interest at 6 per cent. during construction, but *not* the cost of special engines and other rolling stock, £7,000,000, or £140,000 a mile. As the cost of the tunnel and its accessories is dealt with subsequently at full length, we need only here remark that Captain Tyler considers the cost of an over-ground *permanent* Fell line, laid down on an already existing Alpine roadway, with the ordinary 4 feet 8½-inch gauge, and with

curves of radii varying from 150 to 180 yards, should not exceed three times the cost of the present provisional road, or about £21,000 a mile. We are disposed to concur completely in this estimate, provided the additional width that it would be necessary to give to the roadway could be obtained by excavating from the *inner* side of the road, and not by widening it on its outer side—the side of the precipice—for this latter could only be effected by the construction of numerous solid and very expensive abutments in masonry, requiring great tact, nicety and judgment in their adjustment.

Captain Tyler concludes his report to the Board of Trade as follows :—

"As the results of my observations and experiments, I have to report, in conclusion, that this scheme for crossing the Mont Cenis is, in my opinion, practicable, both mechanically and commercially, and that the passage of the mountain may thus be effected, not only with greater speed, certainty, and convenience, but also with greater safety than under the present arrangements. Few would, in the first instance, either contemplate or witness experiments upon such steep gradients and round such sharp curves on the mountain side, without a feeling that much extra risk must be incurred and that the consequences of a fractured coupling or a broken tire, or a vehicle leaving the rails, would on such a line be considerably aggravated.

"But there is an element of safety in this system of locomotive working which no other railway possesses.

"The middle rail not only enables the engine to surmount, and to draw its train up these gradients, but also affords a means of applying any required amount of extra brake power for checking the speed, or for stopping any detached vehicles during the descent, and it further acts by the use of horizontal guiding wheels on the different vehicles as a most perfect safeguard, to prevent engines, carriages or waggons from leaving the rails, in consequence either of defects in the bearing rails or of failure in any part of the rolling stock. The safest portions of the proposed railway ought indeed, under proper management, to be those on which, the gradients being steeper than 1 in 25, the middle rail will be employed.

"There is no difficulty in so applying and securing that middle rail, and making it virtually one continuous bar, as to preclude the possibility of accident from its weakness or from the failure of its fastenings, and the only ques-

tion to my mind is whether it would not be desirable still further to extend its application to gradients less steep than 1 in 25. It would apparently be advantageous to do so, not only for the sake of obtaining increased adhesion with less proportional weight, and therefore economical traction, but also with a view to greater security, especially on curved portions of the line."

The French Imperial Commission ordered to be present at Mr. Fell's experiments, consisted of M. Conte, ingénieur en chef des Ponts et Chaussées de France, as President, with MM. Bochet, ingénieur en chef des mines, Guinard, ingénieur des Ponts et Chaussées, and Perrin, ingénieur des mines, as his colleagues. These gentlemen completed a voluminous and elaborate report of thirty-one pages of printed matter, accompanied by drawings, with the following "conclusions" :—

"From the experiments which have been described, and which the Commission has judged unnecessary to continue any furthur, and from the different verifications which it has made, the Commission has arrived at the conviction :

"First.—That the system of traction proposed by Mr. Fell is applicable for the passage of Mont Cenis, with the engines of the type which worked at the last trials.

"Second.—That this system presents no danger as regards the public security on steep inclines and on sharp curves, since, on the contrary, the existence of the centre-rail furnishes a guarantee against getting off the rails, and at the same time a powerful means of stopping the trains.

"Third.—That, with the exception of some points of detail, the study of which has not been made, but which present no serious difficulty, this system may from the present time be considered as applicable to the crossing of the mountain. That, with regard especially to the working of the line during the winter season, the covered ways proposed by Mr. Fell will be sufficient to secure the regularity of the service.

"Fourth.—That there is no absolute incompatibility, in consequence of the vicinity of the railway and the ordinary road, one to the other, provided that proper protective works be erected to effectually separate them."

We cannot conclude our notice of the part which was taken by France in the trials on the Mont Cenis without

referring to the fact, that the Emperor Napoleon took a warm interest in this subject, and it is owing to the intervention of His Majesty that, not only was the portion of the Mont Cenis roadway granted to Mr. Fell for his experiments, but subsequently the concession, under the terms of which the line across the mountain has been constructed. His Majesty expressed an opinion several years ago, that increased adhesion, and thereby increased power, would be obtained for engines, by the adoption of a third or centre rail, along the sides of which additional wheels would be run. An engine was actually constructed in France, at the instance of Baron Seguier, to illustrate the system; but the third rail was found useless at high speeds, and with flat gradients. When, however, Mr. Fell propounded the plan of centre rail for slow speed and steep gradients, the conviction of His Majesty was, that Mr. Fell was right. Hence, he afforded him his gracious patronage and support; without them, Mr. Fell would probably have had difficulties, even greater than he now has to contend with, in bringing his invention into practice.

On the 4th of November, 1865, "NAPOLEON, *par la Grace de Dieu et la Volonté Nationale*, EMPEREUR DES FRANÇAIS," authorised, by Imperial Decree, the construction and working of a locomotive line between St. Michel and the frontier of Italy (the summit of the pass) until "the opening of the tunnel of the Alps" for traffic. Of this very indefinite period and of the tunnel itself we shall have to speak presently. In the meantime, let it be stated that the Emperor's decree was accompanied by a *Cahier des Charges* (Table of Conditions), in which, in addition to the usual conditions as affecting railways in France, are contained several specially appropriate to this very special railway. Of these, the only ones that interest the general public set forth the

prices that are to be charged for the conveyance of goods and passengers. Each of the latter travelling in a *coupé* is to pay 27 francs, or about 5¼d. an English mile; other first-class passengers, 25 francs, or about 5d. a mile; second class, 22 francs, or about 4½d. a mile; third class, 18 francs, or 3¾d. a mile; children under three years of age, free; between three and seven, half-price; above seven, full fare. It will be seen from this tariff, how small is the difference between the charge for the highest and lowest classed passengers. The transit for goods by passenger trains is at the rate of £3. 1s. 6d. a ton, or 1s. 2½d. a ton a mile; by goods train £1. 12s., or about 7½d. a ton a mile.

The works of the railway were commenced on the 1st of May, 1866. It was expected that they would be finished in twelve months, but various circumstances have intervened to prevent the realisation of this intention; the chief, the floods of September 1866, on the French side of the mountain, when the waters rising higher than was ever known before, committed wholesale devastation, not only upon the works of the company executed up to that time, but upon the ten miles of the already opened railway between St. Jean de Maurrienne and St. Michel, as well. The devastation extended from Termingon within seven miles of Lanslebourg to St. Jean, a distance of twenty-eight miles. The Paris, Lyons and Mediterranean Company has repaired the ten miles of railway between St. Jean de Maurienne and St. Michel. The works of the roadway from St. Michel, eighteen miles, to Termingon have been repaired and their strength added to, by the French Government at an expense of about £80,000. The French Government has also recognised the claim of the Fell Railway Company to consideration, by agreeing to repay two-thirds of the cost of reinstating its works as they were previous to the floods, so that practically the company

has incurred through them a direct money loss of not more than from £3,000 to £4,000. It has, however, sustained a heavy loss from not being opened to carry the immense traffic which has crossed the pass during the spring, and summer of the present year.

The railway is laid, not altogether but principally, on the outer side of the roadway. The sleepers are transverse, three feet apart, to which the outer or ordinary rails are fixed by bolts or nails. The line is fenced off from the portion of the roadway to be used for ordinary horse traffic, (the greater portion of which will disappear on the opening of the railway) by means of substantial posts and rails. The railway, in passing from one side of the roadway to the other, crosses it thirty-three times, one more than half the number of these crossings (seventeen) are on the roadway, where it is practically on the level. The crossings are therefore of the ordinary character, such as are seen in England and on the Continent; but inasmuch as the top of the centre rail, which is laid upon and fastened to continuous balks of timber bolted on to the transverse sleepers, is 9 inches higher than the outer or ordinary rails, it has been found necessary to arrange that when the roadway is open as a crossing, at those parts at which the centre rail is in use, it shall be lowered, so that it shall not be higher than the two outer rails. This is effected by a *mechanique* extremely simple in its action, moved by means of a lever, just as a pointsman moves his points at an everyday railway station. One movement of the lever depresses the centre rail, into a hollow made expressly to receive it, to the level of its *confrères*, and when it is necessary to elevate it again so as to place it in apposition with the centre rails at each side of the crossing, one movement of the lever raises it, and then it forms continuous centre rail just as completely as if there had not been any lever beside it to elevate or to depress it.

There has scarcely been a portion of the roadway which has not been widened. In most places it has only been to the extent of a yard or a little more, but the heaviest works in connection with the road it has been found necessary to execute have been at its sharp turns or zig-zags, and in passing along the villages which are studded along the entire length of the pass; for it must not be supposed that it runs through a barren, uncultivated, and unfrequented district, inhabited only by the goatherds, or occasionally dwelt in by the chamois hunter. So far is this from being the case, that there is a well-to-do population of at least 25,000 along the pass, the well-made, robust, and hardy male portion of which has often been the means of saving human life during the snows and storms of winter, with a devotion and an indifference to personal risk or consequences, not exceeded in any other district, along the whole length of the Alpine ranges.

As regards deviations, the railway winds to the back of the villages of St. Michel, Modane, Bramans, Termingon and Lanslebourg, on the French side of the mountain, but, on the Italian side, there is only one inhabited place at which it is necessary to keep in the background, and that is at Susa. By means of this deviation the connection with the Alta-Italia Railway is effected. Both lines unite together at the existing Susa station at which there is the mixed gauge of 3 feet 7½ inches, the width of the Mont Cenis Railway, and 4 feet 8½ inches, the width of the Italian railway system, which is also the width of the French railways as well as of our own, with the exception of the Great Western. But even the Great Western, in order to come within the comity of the railway world as established in England, has had to succumb, and by means of a third railway, to become "narrow" as well as "broad" gauge. Owing to the difference of gauge, transhipment both of

passengers and their luggage, and of goods must take place at St. Michel as well as at Susa.

Of the deviations, or rather the prolongations or extensions of the railway, to avoid sharp turns or zig-zags, there are four between Lanslebourg and the summit. At all these zig-zags, as we know in our experience of turns in hilly or mountain roads, the gradient is always steeper than at other parts; but the deviations of the Cenis, by taking sweeps carried through eight little tunnels in the mountain, the longest of which is 105 metres, the shortest 40, and by increasing the actual distance three to four times what it is by the roadway, curves of larger radius and lighter gradient are obtained. The total length of these tunnels is 505 metres. On the Italian side there are ten deviations, and they would have been nearly double that number, had not the railway, instead of following the existing road at a part called *les Echelles*, about five miles from the summit, reverted to the old road which had been abandoned in consequence of the prevalence of avalanches along it in winter. Whilst the new road is undoubtedly superior for carriages to the old one, the latter is better suited for a railway, in consequence of their being no zig-zags upon it; but *en revanche* for this advantage, it has been necessary to cover the line over. 600 metres of this covering are massive and solid masonry, upon which avalanches will impinge, as they are hurled from the rocks above into the abyss beneath. In addition, there will be, hereabouts, 1,200 metres of covered way, of which we shall speak immediately. There are several other places on the Italian side of the mountain at which protection against avalanches must be afforded by means of similar galleries. Their total length will be 1,480 metres, or about 140 yards less than a mile, and with this amount all the Engineers seem to agree (notwithstanding the assertion of Mr. Crawford, M.P., to the contrary) that the

railway will be completely protected from the avalanche danger. But snow is the cause of inconvenience as well as of danger. If snow would be satisfied to remain quietly when it falls on *terra firma,* the snow-plough on the engines and the shovels of a few permanent-way men would speedily send it off the line without trouble or delay; but snow is invariably accompanied, especially in these elevated regions, with high winds, and these cause drifts. There is an almost undeviating rule as regards drifts, and it is that a drift of this year will find its way to, practically, the same spot that it was at last year, the previous year, and the year previous to that also, and it will be at the same spot next year, the following year, and so on *ad infinitum.* Hence it is necessary, on the Mont Cenis, to protect the railway by means of covered ways, in addition to protecting them from avalanches by galleries. The covered ways are constructed, combinedly, of wood and of timber. They require to be sufficiently strong to resist the effects of high winds or *tourmentes,* and the weight of snow that may fall or drift upon them. By means of them the line will be kept quite free from snow exactly at those points where, without them, its greatest accumulations would have taken place. They are obviously only required high up the pass—the first, on the French side, of 450 metres long, will be at a very exposed angle of the road, about 400 feet from the summit. At and about the apex of the pass the covered ways will be about 5,000 metres, or a little more than 3 miles in length, not exactly continuous, but very nearly so. Upon the greater part of the plateau which extends along the Cenis Lake and nearly to *les Echelles,* covering will be unnecessary, the effect of the wind being to sweep the plain comparatively clear of snow, which becomes deposited in the angles of the hills that form the somewhat distant background of the panorama. Proceeding downwards on the Italian side, there will be the

1,200 metres of covered way on the old road parallel to *les Echelles*, already mentioned, and about 1,200 metres more farther down, freedom from serious snow-drifts not being obtained on the Italian side of the mountain until at an elevation of about 4,000 feet above sea level. That point passed, the softness and glow of the Italian climate become perceptible, not only by one's own sensations, but because we witness the effects of the atmosphere from the crops and trees that surround us. The line of demarcation, beyond which cereals will not grow, is higher on the southern than on the northern aspect; suddenly we come upon the walnut and the sweet chesnut, and we have not proceeded more than a mile or so, when a turn of the road near to Mollaretta, 3,795 feet above the level of the sea, brings us upon the grape, growing in beautiful festoons, and yielding fruit that is said to make good and vigorous wine. But the highest point at which the vine can be cultivated on the French side of the pass—and that not always successfully, for in cold seasons the crops do not come to complete maturity—is St. Michel. Yet St. Michel is only 2,493 feet above the level of the sea, or 1,300 feet lower than Mollaretta.

The total length during which the trains of the Mont Cenis Railway will not be "*en plein air*," will be 11,113 metres, about $6\frac{3}{4}$ miles, scattered over 18 miles of distance, but in no case will the light of heaven be shut out, as both in the galleries and in the covered ways there will be openings for its admission, as well as for that of air, which openings can, however, be closed if the direction of drifting snow be towards them. As the average length of the eight tunnels is only 70 yards, it is obvious that the maximum of darkness in them, while the sun is above the horizon, will be twilight.

There will be four intermediate passenger stations—one only first class—at Lanslebourg, the half-way house, and as already mentioned, the place at which the ascent of the

mountain on the French side commences. The other French stations are at Modane, and Bramans—on the Italian side only one—a place which will be rather an engine-watering than a passenger station.

Having constructed our line, or rather we should say, having done our possible to make our readers understand how it is constructed, the next obvious proposition is how to work it.

Previous to the experiments of 1865, Mr. Fell gave a programme to both the French and Italian Governments of the manner in which he proposed to carry the traffic on the line when opened. Considering that three trains per day in each direction would be sufficient, at all events for the existing traffic, he divided his service into two for passengers, one of which should also carry goods, and one for goods only. The train conveying passengers without goods, should also be the mail train, and he proposed that its weight, exclusive of engine, should not exceed 16 tons. The speed of this train to be about 11½ miles an hour including stoppages; the mixed train to weigh 40 tons, but its speed not to exceed 7 to 8 miles an hour; the goods train to weigh 48 tons, and its speed to be 6 miles an hour. When Mr. Fell submitted these proposals, he estimated a certain weight for each of his engines, and each of his carriages and waggons, but unfortunately the weight of all three has been much exceeded in the construction of the rolling stock. The engines instead of weighing about 17 tons each, as expected, will weigh upwards of 21 tons, and there is a corresponding increase in the weight of the vehicles. The consequence is that although these additional weights do not affect the question as to the power of trains to cross the mountain, it very materially affects a most important point — that of proportion between dead, and paying and productive weight. It is obvious that the problem of adhesion being solved by

the addition of the centre rail, every pound added unnecessarily to the weight of the engine increases dead weight, without affording the corresponding benefit of carrying increased weight that brings profit and benefit to the shareholders. In this respect, the case between the Fell engine and the case of an ordinary engine for ascending a steep gradient is, that with the former additional weight is an incubus—an *impedimentum*—a break put upon the power of the engine without the slightest counterpoising or balancing advantage, whereas the ordinary engine, by increased weight, adds to its power, at all events to some extent, by the additional adhesion it obtains. It is therefore to be regretted that in laying down the plan for these engines, this most essential point was not more carefully—we might almost say more jealously—looked after. The same point bears, though in a less important degree, upon the weight of the carriages and waggons, for it is obvious that if a vehicle weighing, say, 3 tons (we take the figure at random) will carry safely, efficiently, and without strain upon any part of it, a given load, any weight beyond 3 tons is surplusage—not only unnecessary but most injurious. If anything tarnish the success of the Mont Cenis Railway, it is more likely to be from this cause than from any other that we are acquainted with, as the fact is undoubted that the weights are much in excess of what are required for the tractive power of the engines or for the safe conveyance of the loads that will be placed in the carriages and waggons behind them.*

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* It has recently come to light that, through some members of the Mont Cenis Board interfering in details connected with the construction of the engines—upon which they were not competent to pronounce an opinion, but which were, nevertheless, adopted in opposition to the recommendation of Mr. Fell—considerable alterations will have to be made in the rolling stock before the line can be opened for traffic. These alterations can hardly be completed before February of next year.

CHAPTER XII.

TUNNELS, ANCIENT AND MODERN.

It is hardly necessary to say that the great rival to the Mont Cenis or Summit Railway is the railway that is to be laid through the tunnel, which, in the official documents of both France and Italy is denominated "The Great Tunnel of the Alps." But before we enter upon the description of this tunnel, an account of subterraneous construction from the earliest period we have been able to trace tunnels, may not be uninteresting.

Tunnelling through hills and mountains is not exactly "as old as the hills," but the practice, nevertheless, is of great antiquity.* Yet, the oldest tunnel of which we have record was neither through hill nor mountain, but was carried beneath the course of the River Euphrates. This happened no less than 4,812 years ago, for it was at that time that Semiramis was appointed by her dying husband, Ninus, King of Assyria, Regent and guardian to their only child, the infant Ninias. The royal widow, according to

* Tunnels are not the only monuments of great antiquity that have come down to us. In the course of a very interesting article upon the Suez Canal, in the *Cornhill Magazine* for May 1865, the writer, speaking of the obelisk in front of the Temple of the Sun, at Heliopolis, says, "It is thirty-eight centuries old. It is the father of all obelisks that have arisen since. It was raised a century before the coming of Joseph; it has looked down upon his marriage with Asenath; it has seen the growth of Moses; it is mentioned by Herodotus; Plato sat under its shadow. Of all the obelisks which sprang up around it, it alone has kept its first position. One by one it has seen its sons and brethren depart to great destinies elsewhere. From these gardens came the obelisks of the Vatican and the Porta del Popolo, and their venerable pillar (for so it looks from the distance) is now almost the only landmark of the seat of the wisdom of Egypt."

Diodorus the Sicilian, the most trustworthy historian of antiquity, who has written of the peoples that existed earliest after the world's creation, commenced her reign 2,944 years before the birth of Christ, and immediately afterwards, the building of Babylon was begun, by two millions of men, who had been collected, by regal command, from all parts of the empire. The mighty city was erected on the two sides of the Euphrates, on each bank of which was raised a palace of colossal proportions. These the Queen Regent connected together by "a passage under the river,* in the nature of a vault, from one palace to another, whose arches were built of firm and strong brick, and plastered all over on both sides with bitumen, four cubits thick. The walls of this vault were twenty bricks in thickness, and twelve feet high, and the breadth was fifteen feet. This piece of work was finished in 220 days, and the river flowing over the vault. Semiramis could thus go from one palace to the other without passing over the river. She made likewise two brazen gates at either end of the vault, which continued to the time of the Persian empire." The passage was made, not by the process of tunnelling as we now understand it, but by first making enormous works for diverting the course of the Euphrates; then restoring it to its ancient channel as soon as the vaulted passage had been completed. The investigations of Mr. A. H. Layard, M.P., from 1846 to 1851, show that the process of making underground connections was fully understood from the earliest period of Assyrian history.

The ancient Egyptians were undoubtedly masters of the art of tunnelling. In a very interesting letter received from our much valued friend George Groves, Esq., the secretary

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* The extract in the text is taken from Book II, chapter 1, of the "Books of Diodorus Siculus, made English by G. B. Booth, of the City of Chester, Esqre.," published in London, *Anno* 1700.

of the Palestine Exploration Fund, enclosing the recent reports of Lieutenant Warren, R.E., the writer says, "you will see by Warren's papers that there is no lack of tunnels at Jerusalem; in fact, the whole of the rock upon which the city is built, appears to be honeycombed with them, but of what exact age they are, it is impossible for us as yet to tell."

The further reports of Lieutenant Warren cannot fail to be looked for and read with an all-absorbing interest by every lover of biblical literature and history. Already his researches and discoveries show that he is a man with whom his countrymen may well be satisfied. True type of the Englishman, he is earnest, indefatigable, and enduring; incapable of fatigue, he never knows what it is to be beaten. His ordinary work extends not only throughout the day with a temperature varying from 100 to 107, but also far on towards midnight. But at that period of the 24 hours, the Lieutenant says, "the temperature is much cooler." That is, the thermometer falls to about 80! Recently when having "an attack of incipient fever and not being able to shake it quite off," he with his faithful assistant and humble companion in all his labours and anxieties, Sergeant Birtles, "who was also very unwell," went for a three days' ride through Faghur, &c. "We returned on Saturday quite recovered!" Twelve or thirteen hours a day in the saddle for three successive days, is rather a rough remedy for the cure of fever.

We limit ourselves to two extracts from the reports; the first relates to a discovery made as recently as the 1st of September last, which may be truly described as one of very great importance.

"I have made what I consider to be a very important discovery, viz., an ancient aqueduct, south-east of the south-east corner of the Cœnaculum, and fifty feet above the present aqueduct—I have no doubt the original aqueduct from Solomon's Pools to the Haram Area. We dug out the earth from a cut stone shaft two feet square, and at sixteen feet was a channel running

from the west to the north-east, precisely similar in construction to the passages under the Triple Gate. It varies very much in size. Sometimes we could crawl on hands and knees; then we had to creep sideways; again we lay on our backs and wriggled along; but still it was always large enough for a man of ordinary dimensions. In parts built of masonry, in parts cut out of solid rock, it is generally of a semi-cylindrical shape; but in many parts it has the peculiar shoulders which I have only seen under the Triple Gateway, but which I told you in my last letter had been noticed by Mr. Eaton in the channel leading towards Tekoah. To north-east we traced the channel for 250 feet, until we were stopped by a shaft which was filled with earth; to the west we traced it for 200 feet, till it was stopped in the same manner. In part of this passage we could stand upright, it being ten or twelve feet high, with the remains of two sets of stones for covering, as shown in M. Piazzi Smyth's work on the Great Pyramid; the stones at the sides being of great size—12 feet by 6. This channel cannot be so late as the Romans. It is evidently of most ancient construction. It is built in little spaces, as if the work had been commenced at two or three points, and had not been directed properly. The plaster is still in good preservation. I shall have the passage cleared out, if possible, as far as the city walls. I presume it goes into the Haram, at a slightly higher level than the present aqueduct. If so, by following it we may arrive at some very interesting conclusions as to the original method of supplying the Temple with water.

"This channel must have been of great consequence in olden times, both from the distance it is driven under ground, and from the well-cut shafts which lead to it. I think the question is to be hazarded whether the supply of Jerusalem was not obtained by this aqueduct, which is quite concealed from an enemy."

At the date of the last report the tunnel had been traced about 300 feet to the north-east, where it appears to fall into the present aqueduct.

Our second and concluding extract will show the difficulties and dangers attending upon the labours of Lieutenant Warren and his party, as well as the necessity which exists for funds coming in liberally to meet the very heavy expenses of these marvellous explorations.

"Progress of Works to 11th October, 1867.—*Shaft near S.W. angle South Wall of Haram Area.*—Depth excavated, to Thursday, the 10th October, 76 feet.

"On Friday, having arrived at a depth of 79 feet, the men were breaking up

a stone at the bottom of the shaft. Suddenly the ground gave way, down went the stone and the hammer, the men barely saving themselves. They at once rushed up and told the sergeant they had found the bottomless pit. I went down to the spot and examined it, and, in order that you may have an idea of the extent of our work, I will give you a description of our descent.

"The shaft mouth is on the south side of the Haram Wall, near the south-west angle, among the prickly pears; beside it, to the east, lying against the Haram Wall, is a large mass of rubbish that has been brought up; while over the mouth itself is a triangular gin with iron wheel attached, with guy for running up the excavated soil. Looking down the shaft, one sees that it is lined for the first 20 feet with frames 4 feet 6 inches in the clear; farther down, the Haram Wall and soil cut through is seen, and a man standing at what appears to be the bottom. An order is given to this man, who repeats it, and then, faintly, is heard a sepulchral voice answering as it were from another world. Reaching down to the man who is visible is a 34 feet rope ladder, and, on descending by it, one finds he is standing on a ledge which the ladder does not touch by 4 feet. This ledge is the top of a wall running north and south and abutting on the Haram Wall; its east face just cuts the centre of the shaft, which has to be canted off about 2 feet towards the east, just where some large, loose stones jut out in the most disagreeable manner. Here five more frames have been fixed to keep these stones steady. On peering down from this ledge, one sees the Haram Wall with its projecting courses until they are lost in the darkness below, observing, also, at the same time, that two sides of the shaft are cut through the soil and are self-supporting. Now to descend this second drop the ladder is again required; accordingly, having told the man at bottom to get under cover, it is lowered to the ledge, from whence it is found that it does not reach to the bottom by several feet. It is, therefore, lowered the required distance, and one has to reach it by climbing down hand over hand for about 12 feet. On passing along, one notes the marvellous joints of the Haram Wall stones, and also, probably, gets a few blows on skull and knuckles from falling pebbles. Just on reaching the bottom, one recollects there is still a pit of unknown depth to be explored, and cautiously straddles across it. Then can be seen that one course in the Haram Wall, near the bottom, is quite smooth all over, the stone being finely dressed, all other courses being only well dressed round the drafts; one also sees two stout boards lying against the Haram Wall, under which the men retire whenever an accidental shower of stones renders their position dangerous. One is now at a depth of 79 feet from the surface, and from here we commence the exploring of the "bottomless pit." After dropping a rope down, we found that it was only six feet deep, though it looked black enough for anything. Climbing down, we found ourselves in a passage running south from the Haram Area, 4 feet high by 2 feet wide, and we explored this passage. It is of rough rubble

masonry, with flat stones at top similar to the aqueduct from Triple Gate, but not so carefully constructed. The floor and sides are very muddy, as if water gathers there during the rainy season.

"It at once struck me that it was one of the overflow aqueducts from the Temple of Solomon, and that there might be a water conduit underneath. We scrambled along for a long way on our feet, our skulls and spines coming in unhappy contact with the passage roof. After about 200 feet we found that the mud reached higher up, and we had to crawl by means of elbows and toes. Gradually the passage got more and more filled up, and our bodies could barely squeeze through, and there did not appear sufficient air to support us for any length of time; so that, having advanced 400 feet, we commenced a difficult retrogade movement, having to get back half way before we could turn our heads round. On arriving at the mouth of the passage underneath the shaft, we spent some time in examining the sides, but there is no appearance of its having come under the Haram Wall. It seems to start suddenly, and I can only suppose it to have been the examining passage over an aqueduct coming from the Temple, and I am having the floor taken up to settle the question. This passage is on a level with the foundations of the Haram Wall, which are rough-hewn stones—perhaps rock; I cannot tell yet. The bottom is the enormous distance of 85 feet below the surface of the ground, and, as far as I can see as yet, the wall at the south-west angle must be buried for 95 feet under ground, so that it must at one time have risen to the height of 180 feet above the Tyropœon Gully. I consider it very unsafe sinking these shafts without sheathing them; but I have been obliged to do so for want of wood. In this shaft in particular there is about 60 feet unsheathed, and a loose stone from any part might stave a man's head in before he is aware of it. I think it running needlessly into danger; and I hope that, with what you are sending from England, and what I am getting from Malta and Alexandria, I shall soon have enough to go on with in a business-like manner. The amount of wood wanted is very great. This shaft, when sheeted, would require 100 boards 18 feet long, and 9 inches by 1 inch. We are also very much in want of English dockyard rope and rope ladders; all the work here consisting of driving shafts of great depths, it is necessary to have many ladders. We have only two, and are often in great difficulties about it. It is all very well climbing hand over hand thirty-five feet up a rope, when hanging in the air; but when it is in an unsheathed shaft, with the dangling bringing down the loose stones on the head, it is unsafe. The anxiety of mind caused lately, by having to keep the workmen going without adequate means for their protection, is more than I can put up willingly with any longer. *We must have plenty of money for the excavations, or stop them altogether.*"

The oldest tunnel, of which we can find any record or

mention in Europe, is that constructed in connection with a great aqueduct built about 540 years B.C. in Boetia, to draw off the waters of the lake Copais, now called lake Topolias, to the sea then called the gulf of Opuntius, and now the Channel of Talanti. The tunnel, nearly a mile in length, became impeded and choked up, and, about 220 years afterwards, was ordered to be restored by Alexander the Great, who had previously "fleshed his maiden sword" in its neighbourhood at one of the few great and decisive battles of the world—that of Chœroncia. It was fought and won by Philip of Macedon, 338 years before the birth of Christ.

As to how the rock was penetrated in the absence of the modern appliance of gunpowder, we are now as ignorant as we are of the mechanical means by which the great pyramids of Egypt and other gigantic works there, were constructed; and we are in the like state as regards a tunnel in the Island of Samos, which we learn on the authority of Strabo was 4,200 Greek feet long—equal to 4,230 modern English feet—that is more than three-quarters of a mile. The height of the mountain through which it was driven was 900 Greek (907 English feet), and its purpose was to supply with water the principal city of the island, the inhabitants of which, 2,600 years ago, were among the most active and enterprising merchants and shipowners of the world. Ancient Samos, now called by the Turks *Susam Adasi*, is the nearest to the coast of Turkey in Asia of the numerous islands which dot the Eastern Archipelago.

Albano is the first halting station of the day express train from Rome to Naples; close to it is the Alba lake seven miles round, at an elevation of 700 feet above the level of the sea. 2,000 years ago the Romans constructed a duct to carry off its superfluous water into the Tiber; part of the duct is through a tunnel, which, in consequence of modern repairs, is still in a state of perfect preservation. It is a

little more than a mile long, and its dimensions are 6 feet high and 4 feet wide; it was completed in a year.

But the grandest tunnel of ancient Italy is the underground canal constructed by the orders of the Emperor Claudius to draw off the waters of the lake then called Fucinus, now Celano, into the River Siris. This stupendous work, three miles long, and nowhere less than twenty feet high, required the labour of 30,000 men for eleven years to accomplish. It has several shafts as in modern tunnels; it is now in a sound state, having been solidly repaired only a few years ago.

In the second volume of *La Vie de Cæsar*, by the Emperor Napoleon III., pages 412, *et seq.*, (English edition) will be found the account of the siege of Uxellodum (*Puy d'Issolu*, near Vayrac), the capture of which by Julius Cæsar, U.C., 703, put him in complete possession of Gaul. The town, surrounded on all sides by steep rocks, was, even without being defended, difficult of access to armed men. It was also well provisioned, but, as its water supply was derived from an abundant spring which arose at the foot of the wall of the town, 300 feet from the channel of the River Tourmente, "Cæsar resolved," says his Imperial historian, "to drain this spring, and for this purpose he did not hesitate to attempt a laborious undertaking. Opposite to the point where the spring rose, he ordered covered galleries to be pushed forward against the mountain, and, under protection of them, a terrace to be raised. Although these works were attended with great danger and fatigue, they were vigorously persevered in. At the same time, a subterranean excavation on a lower plane than the fountain, and running from the galleries, was made. This work, carried on, free from all danger, was executed without being perceived by the Gauls; the terrace attained a height of sixty feet, and was sur-

mounted by a tower of ten stories, which, without equalling the elevation of the wall of the town, a result it was impossible to attain, still commanded the fountain. Its approaches, battered by engines from the top of the tower, became inaccessible; in consequence of this, many men and animals in the place died of thirst. Nevertheless, the Gauls did not yield. At last, the subterranean gallery having reached the veins of the spring, they were taken and turned aside. The besieged seeing the fountain all at once dried up, believed, in their despair, that it was an intervention of the gods: they submitted to necessity, and surrendered." Researches made for the purposes of the *Vie de Cæsar*, by M. J. B. Cessac, assisted subsequently by the Permanent Commission of the Department du Lot, have brought this tunnel fully into view. It was carried through the marl; and the proof that the Roman soldiers had not boring tools suited for penetrating rock is afforded by the fact that, when they came upon it, they deviated in the expectation that they would come upon the tufas which, formed by the waters, would necessarily lead towards the spring. The Roman soldiers were right in their expectations.

The galleries and tunnel, as well as the siege-works, are illustrated by two plates, No. 31 and 32 of the Appendix. The tunnel was about 550 yards long. During M. Cessac's investigation the timber which supported part of it still existed.

The earliest mention that we have of tunnelling in connection with the Alps dates back more than 400 years. Anne,* Duchess of Savoy, conceived the grand project of

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* Of Anne, we learn that she was the daughter of James, King of Cyprus and Jerusalem; that she was married in 1433 to Louis, second Duke of Savoy, and second son of Amadeus VIII., who abdicated in 1434, and, although not

piercing the Col di Tenda, then, and for nearly two centuries and a-half afterwards, the best and easiest pass available between France and north-western Italy, with a tunnel at about one-third of its height from the summit. It appears, beyond doubt, that the works were begun, but at the death of Anne they were abandoned; after a lapse of three centuries they were resumed in 1782 by order of Victor Amadeus III., King of Savoy. The excavation of the mountain was continued, although not vigorously, until 1794, when it was abandoned, in consequence of the invasion of Savoy by the French. The total length of the tunnel would have been about 3,000 yards, and by means of it a precipitous sugar-loaf ascent of 1,300 feet to the top of the pass would have been avoided. At the present time the idea of the tunnel is revived, it being proposed to construct to it a railway on the Fell system,* from Cuneo at the foot of the

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an ordained priest, was nominated Pope in January 1440, and was the last of the Anti-Popes; his abdication of the Papacy took place in 1444, and his death in 1451. Anne, considered the most lovely woman of the period in which she lived, gained by the beauty of her person and her intellectual capacity such ascendency over her husband, from the time of his coming to the throne, that she not only disposed of all the honours and appointments of the duchy, but founded several useful industrial establishments. She gave the best proof of her own industry and attention to domestic duties by being the mother of sixteen children, most of whom grew up to man's and woman's estate. Anne's death took place at Geneva in 1463; her husband survived her two years.

* The language in the text is confirmed by the following paragraph in the *Times* of the 13th September, 1867. The Genoa *Movimento* has the following from Nice:—"The news of the success of the Fell system for passing mountains has been received here with pleasure, and two distinguished Nizzards intend visiting Mont Cenis to see how far that system can be applied to the Col di Tenda. The people of Nice well know that the only thing that can give life to their trade is a rapid communication with Cuneo, because by that town they would be in direct intercourse with Piedmont, Lombardy, and Venetia. When the necessary studies shall have been made of the development of the line

pass, which place is now connected with Turin and the whole system of Italian railways by a line fifty-four miles long. The Cuneo district is one of the most productive of the fertile plains that fringe the southern slopes of the Alps, and extend for a width of from fifty to sixty miles beyond them.

We did not begin either to make canals or to tunnel in Great Britain until a little more than a century ago. Now we have 2,200 miles of inland navigation, of which 213 are in Scotland and 297 in Ireland. Brindley, the engineer of the Duke of Bridgewater, commenced the Harecastle Tunnel on the Trent and Mersey Canal in 1765, but it took him eleven years to finish it. It was not until 1776 that the first boat was able to go through it. The tunnel is 2,880 yards long, 12 feet wide and 9 feet high. Although Brindley was much troubled with quicksands, the work was completed for the marvellously small sum of £3. 10s. 8d. a yard forward. Some years afterwards, in consequence of the immense increase of the business of the canal, Telford constructed another Harecastle Canal alongside the first, the dimensions of which are—length, 2,936 yards; width, 14 feet; height, 16 feet.

The longest canal tunnel—indeed, the longest tunnel, whether railway or canal—in England is the Marsden, on the Huddersfield Canal, 5,450 yards (3 miles and 170 yards), thus exceeding the longest railway tunnel by 154 yards. The lengths in yards of some of the principal canal tunnels

in question, and of the outlay it would require, the company which would be formed to carry it out would probably ask the Alta Italia Railway Company to take charge of at least the construction of the section which would end at the short tunnel that must be made on the Col itself. The town of Nice would put itself at the head of the company for promoting the work, and would take a large number of shares." Negotiations are in progress for carrying this intention into effect.

of England are as follows :—Sapperton (Thames and Severn), 4,180; Lapal (Dudley), 3,776; Blisworth (Grand Junction), 3,080; Tipton Green, 2,926; Oxenhall, 2,192; Foulbridge (Leeds and Liverpool), 1,640; Asperton (Hereford and Gloucester), 1,320; Fenny Compton (Oxford), 1,188. From this list we exclude the Old Thames and Medway Canal Tunnel, near Rochester, because the South-Eastern Railway Company, when it purchased the canal, converted the tunnel into one suitable for a railway; its length is 3,740 yards.

The most recently constructed canal tunnel in England is the Netherton Tunnel, on a branch of the Birmingham Canal, having only been completed in 1858. It is 3,036 yards long, 27 feet wide, and 24 feet 4 inches high in the clear. Seventeen shafts altogether were sunk during its construction, of which ten were closed on being used for traffic. The greatest depth of any of the shafts is 344 feet 6 inches, the least 65 feet 9 inches. The time occupied for completing this tunnel was only two years. For full and minute description of this tunnel see proceedings of the "Institution of Civil Engineers," Vol. XIX.

The village of Highgate, situated on one of the two northern hills in the immediate vicinity of London, was to have had a tunnel 301 feet long, 24 feet wide, and 13 feet high, for the purpose of avoiding the steep and dangerous hill on the great road which led, and still leads from London, towards the North. An Act of Incorporation was obtained, and the undertaking was prosecuted for a time with great energy; but unfortunately, after 130 yards of the work had been accomplished, the whole fell in on the 13th of April, 1812. The accident created an intense sensation, and it was the subject of a drama: "The Highgate Tunnel, or the Secret Arch," which for a time was a source of attraction at one of the minor theatres at the East end of London. The

disaster put an end to the desire for a tunnel, and the present road was constructed through a deep cutting, by means of which much of the steepness of the hill was done away with. Hornsey Lane crosses this cutting, on a noble bridge, which is called the Highgate Arch.

The late Mr. Robert Stephenson, M.P., in his address to the Institution of Civil Engineers, on his election as President in January 1856, stated, that "tunnels for railways had traversed hills and penetrated mountains to the extent of nearly 70 miles," the miles of railways opened in the United Kingdom at that time being 8,054.

Mr. J. M. Fraser, in a paper which he read at the Institution of Civil Engineers, on the 24th of March, 1863, considered, that "it would not be inaccurate to assume 80 miles as representing the length of tunnels now daily traversed by railway trains in the United Kingdom." At that period there were 11,547 miles of railway in operation. As there were 13,882 miles opened for traffic on the 31st of December, 1866 (of which about one-third is single line), we may consider that we have about 90 miles of line "in tunnel" at the present date, and in these are included the Metropolitan (Underground) Railway and the tunnels * on the New Midland Line between Bedford and London, opened for goods traffic in August 1867. We knew as a fact that, during the early construction of railways in England, our engineers resorted to tunnels to avoid gradients and curves (especially the former) that would almost be considered favourable at the present day. As experience increased and the power of the locomotive was developed, so did the amount of tunnel

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* These are four in number of the respective lengths as follows:—Oakley, 800 yards; Belsize, 1,460; Elstree, 900; Ampthill, 640. Total 3,800 yards, or two miles and a sixth.

work diminish. Hence it is that if the three estimates just stated be correct, the proportion of tunnel to railway on the 1st of January, 1856, was one mile to every 115 ; on 1st of January, 1863, one to every 144 miles ; on 1st of January, 1867, one to every 154. Had Ireland been excluded from the reckoning,—as she might well be, seeing that there are only three there of the aggregate length of 2,980 yards (exactly 100 yards less than a mile and three-quarters) on the 1,948 miles of railway that are now open for traffic in that part of the United Kingdom,—the proportion of tunnel to railway in England, Scotland, and Wales would have been one mile of the former for every 132½ of the latter. The number of tunnels in Ireland is, however, it is alleged, about to be added to, as, since a very serious accident at "Bray Head," on the Dublin, Wicklow and Wexford Railway, a feeling of uneasiness prevails in the public mind as regards the safety of the line at this point. It is, therefore, contemplated to run four tunnels through the mountain at its side nearest to the sea, at an estimated cost of about £23,000. Bray Head, it may be mentioned, forms the southern boundary of the Bay of Dublin, the Hill of Howth being its boundary to the north.

The longest railway tunnel in England* is the Woodhead or Summit Tunnel of the Manchester, Sheffield and Lincolnshire Railway. Its length is 5,296 yards, or 3 miles and 16 yards, with a gradient of 1 in 200, or 26⅜ feet to the

* In 1865 the London and North-Western Railway Company promoted in Parliament the Buxton Chapel-en-le-Frith and Sheffield Railway, the length of which was to have been twenty-four miles. When the Bill had passed the House of Commons, it was withdrawn under arrangements made with its opponent, the Manchester, Sheffield and Lincolnshire Company. If the line had been constructed, it would have had upon it the two longest tunnels in Great Britain. One would have been three and one-eighth miles, and the other four miles long.

mile, the rise being in the direction from Dunford to Woodhead. The ordinary passenger trains require ten minutes from Dunford to Woodhead, but trains travelling from Woodhead to Dunford take a minute less. Therefore, with the gradient favourable, the speed is only at the rate of 20 miles an hour; against the gradient, 18. It is a single line tunnel.

The Stanedge Tunnel on the Huddersfield Branch of the London and North-Western Railway is exactly 3 miles long, and it is also a single line tunnel; the gradient is nearly a level. The time for passenger trains through it is six minutes, or at the rate of 30 miles an hour; the time for goods trains is nine minutes, or at the rate of 20 miles an hour. The deepest portion of the tunnel is 600 feet below the upper surface of the mountain.

On the 3rd September, 1867, we came through the Shepherd's Well Tunnel of the London, Chatham and Dover Railway, 2,376 yards long, against the gradient, which is 1 in 100, or 53 feet in the mile for two-thirds of its length, and the remainder nearly level, in two minutes fifteen seconds; on the same day we came through the tunnel in the opposite direction, when the time occupied was one minute forty-two seconds: on the other hand, Mr. Allport, the General Manager of the Midland Railway, to whom we gladly acknowledge ourselves indebted for much valuable information most obligingly afforded, says that the passenger trains are timed to run *in each direction* through the Dove's Hole Tunnel 2,420 feet long at the same rate of speed, and actually do run at that speed—nearly 46 miles an hour,—yet the gradient is 1 in 90, or 58⅔ feet per mile. The same for goods trains, their speed is 23 miles an hour in each direction, and Mr. Allport assures us they maintain it in both directions.

The following are the lengths of some of the principal railway tunnels in Great Britain and of the two longest in Ireland :—

Name.	Company.	Yards.
Medway	South-Eastern	3,740
Sevenoaks.....	,, ...	3,600
Box	Great Western	3,227
Littleborough	Lancashire and Yorkshire....	2,869
Sapperton	Great Western	2,800
Pohhill..	South Eastern	2,750
Kilsby	London and North-Western..	2,423
Dove's Hole	Midland	2,420
Shepherd's Well .	Chatham and Dover	2,376
Wapping (L'pool)..	London and North-Western..	2,250
Lime Street ,, ..	,, ..	2,230
Clayton	London and Brighton	2,200
Sydenham.....	Chatham and Dover	2,190
Abbot's Cliff.....	South-Eastern	2,000
Watford	London and North-Western..	1,793
Merstham.....	South-Eastern	1,780
Clay Cross.....	Midland.....	1,780
Sapperton*	,, ...	1,760
Corah Wood.....	Newry and Armagh	1,510
White Ball	Bristol and Exeter.....	1,470
Belsize	Midland.....	1,460
Grenfield	Midland.....	1,400
	North-Eastern	1,364
Thackley	Midland.....	1,360
Honiton	London and South-Western..	1,350

* Followed by an open cutting of 100 yards; then a tunnel of 440 yards. The gradient in these tunnels is 1 in 70. For full details respecting them, see Paper read by Mr. Charles Nixon at the Institution of Civil Engineers. *Proceedings*, volume for 1842.

Name.	Company.	Yards.
Bletchingly	South-Eastern	1,324
Lydgate	Lancashire and Yorkshire	1,322
Wichwar	Midland	1,320
Shanklin	Isle of Wight	1,320
Shakspeare	South-Eastern	1,320
Almonsbury	Bristol and South Wales	1,320
Kilbarry	Great Southern and Western	1,290
Primrose Hill	London and North-Western.	1,250
Glasgow	Edinburgh and Glasgow	1,250
Potter's Bar	Great Northern	1,210
Balcombe	London and Brighton	1,122
Brislington (No. 1)	Great Western	2,200
Brislington (No. 2)	,,	1,100
Brislington (No. 3)	,,	330
North Welwyn	Great Northern	1,046
Penscliff	,,	968
Guildford	London and South-Western.	965
Saltwood	South-Eastern	954
Bangor	Chester and Holyhead	910
Chislehurst	South Eastern	900
Elstree	Midland	900
Gillingham	Chatham and Dover	895
Stoke	Great Northern	880
Milford	Midland	836
Calandar	Edinburgh and Glasgow	830
Whitstable	South-Eastern	822
Haddon	Midland	800
Oakley	,,	800
Bishopton	Glasgow and South-Western.	760
Coates Park	Midland	740
Buckhorn Weston.	Salisbury and Yeovil	739
Belmont	Chester and Holyhead	737

Name.	Company.	Yards.
Penmaen Bach	Chester and Holyhead	721
Tottenham.....	Great Northern	714
Leeds.....	North-Eastern	700
Copenhagen	Great Northern	694
Dover.....	Chatham and Dover	682
Manton.....	Midland	660
Ampthill	„	640
Chivet	„	620
Martello	South-Eastern	616
Barnet	Great Northern	605
Chelsfield	South Eastern	600

Some of our tunnels have been extremely costly, the Kilsby, for instance, £125 per yard forward, total £302,000. The face of the Primrose Hill Tunnel at its London end cost £7,000, thereby adding to its total cost at the rate of £5. 15s. a yard. Up to 1857, the average cost of all tunnels was £102 per yard, or for 70 miles £12,320,000. Tunnels have certainly been constructed more cheaply since then.* Mr.

* "While upon tunnels, the construction of that upon the West End and Crystal Palace Railway may be referred to, in consequence of the anxiety that was felt on account of its passing very close to the south-west angle of the Crystal Palace, between that point and the Water Tower, the foundations of which were being laid just as the tunnelling was proceeding at that spot. It will be remembered that the present Water Tower replaced one of which the foundation was deemed insufficient. Considering the enormous weight and height of the Water Tower, with its huge tank at the top, capable of containing several hundred tons of water, it became necessary to take every precaution, the matter being of great importance both as regards the safety of the tunnel, with its huge superincumbent weight, and the Water Tower, which, from its great height, and also from being placed at some little distance laterally from the tunnel, might easily have been thrown out of the perpendicular, had any settlement taken place after its erection.

"The precautions taken with the tunnelling were: never to leave the earth resting upon the bars longer than absolutely necessary; to build the crown

J. G. Fraser assumes them to have cost at the average rate of £45 per lineal yard, but this must be considerably below the mark, notwithstanding that many of the more recently constructed tunnels have only been for "single line." The dimensions of these tunnels on the 4 feet 8½-inch gauge, are usually as follows :—12 feet wide at rail level, 17 feet from rail level to soffit, whilst for a double line of the same gauge tunnels are usually about 25 feet wide at rail level, and about 22 feet from rail level to soffit. On the exceptional Great Western gauge, they would be respectively about a fourth higher and a third wider.

We must only touch the Thames Tunnel at a tangent. Its length is 1,200 feet with two arches each 13 feet 9 inches at the springing of the arch; 16 feet 4 inches high from the invert. It cost £1,000 a yard, or for 400 yards £400,000, two and a-half times as much per yard forward as the most expensive estimate for the Mont Cenis Tunnel, more than three times as much as its cost per yard forward up to the present time. In addition, the approaches of the Thames Tunnel (for foot passengers only) cost £54,714, total £454,714. It is now about to be utilised as a railway tunnel, having been purchased by the East London Rail-

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bars into the work, instead of withdrawing them, as is usually done in less important places; to select the hardest and best bricks, and to have them set in Portland cement, under careful and independent inspection on the part of the Engineers, the Contractors, and the Crystal Palace Company. The average thickness of the brickwork at this part, consisting of nine rings in the arch, five in the invert and side walls, was 3 feet 9 inches. The general shape of the tunnel was a semi-ellipse, 24 feet wide by 16 high.

"No settlement took place, nor was the Water Tower at all affected, although at other portions of the tunnel a small motion of the side walls took place, by their slightly approaching each other, with some crushing of the brickwork."—*Extract from Letter of G. H. Phipps, Esq., to the Author, dated the 16th of October*, 1867.

way Company for the purpose of bringing together the lines at the north-eastern and south-eastern ends of London.

As a rule, the tunnel mileage (except in one country only, Spain) is much less in proportion to total mileage on the various continental railways than it is in England. This is especially the case in almost all the more recently constructed lines, but more particularly so in Germany. Here, the ingenuity of the engineer has been exercised to avoid tunnels wherever possible, and not to seek them. We might cite many instances in proof, but limit ourselves to one, which must be familiar to many—the line along the left bank of the Elbe, between Dresden and the Austrian frontier at Bodenbach, through the beautiful Saxon Switzerland. There are, however, tunnels in Germany, the longest of which is that which has already been mentioned, the summit Tunnel of the Sœmmering Pass, 1,565 yards, just 195 yards less than an English mile.

There are long tunnels in France, both canal* and railway, and as regards the first-named class, our readers will hardly be prepared to learn that there has existed for forty-five years in France, an underground passage at Cunhardy called a tunnel, which is in length only 314 yards less than the Great Tunnel of the Alps; yet such is the fact,—the Norieu underground passage which forms a portion of the *Canal de St. Quentin,* is 13,128 yards long, or 7½ miles all but 72 yards. Its maximum depth below the surface is 86 yards. It is only 4 feet 11 inches wide and is without towing path. It was opened in 1822 at a cost of only £2. 12s. per yard. Seven years were occupied in its construction. But the most important canal tunnel in France, in respect of its width and elevation, is that of Rigueval, which is also on the

* There are about 3,000 miles of canals and navigable rivers in France.

Canal de St. Quentin. It is 6,237 yards long, 26 feet 2 inches wide, of which 5 feet 3 inches are for the towing path along which horse traction is used. The Tunnel of Manvages, 5,320 yards long, is on the *Canal du Marn au Rhin.* Of the two other long canal tunnels (both on the *Canal de Bourgogne*), that of Sousey is 3,873 yards long, 7 feet 3 wide. It has not a towing path. That of Pouilly is 3,630 yards long and 20 feet 2 inches wide, including a towing path of the width of 5 feet 3 inches. The cost of the Sousey was £9. 4s. a yard; of Pouilly £80 a yard.

The longest railway tunnel in France is that of La Nerthe on the Paris, Lyons and Mediterranean Railway, between Avignon and Marseilles. It is 4,638 metres (5,101 yards). It cost £90. 10s. per metre. Its shafts vary in depth from 65 to 623 feet.* There are twenty-four of these shafts, which are not over the centre of the tunnel, but about 30 feet on one side. They communicate with it by lateral galleries 10 feet wide, and as high as the tunnel itself. The shafts are all circular, about 10 feet wide, and have all been left open. The gradient from one end to the centre is 1 in 500 —10½ feet in the mile. It then falls to the other entrance at the rate of 1 in 1,000. The tunnel of Blaisy on the same line, near Dijon, is 4,100 metres (4,510 yards). It cost £77 per metre. It had twenty shafts during construction, of which ten are now closed. Nine of the shafts are from 515 to 643 feet below the surface. They are not

* In constructing shafts, French engineers prefer to place them on one side, and not over the centre of the tunnel, partly because they consider it more convenient for purposes of construction, and partly because they think it safer for the line, which is thus less exposed to accident or ill-will, or to the annoyances experienced from wet or dripping shafts.

French engineers construct tunnels on curves more than has been the practice of English engineers. One tunnel, that of Vierzon, 208 metres long, is on a reversed curve, one radius being 1,093 yards, and the other 1,366 yards.

over the tunnel, but about 32 feet on one side, and connected to it by lateral galleries. The Credo Tunnel on the Geneva Branch of the same line 3,949 metres (4,344 yards), £65. 12s. per metre. There are several other long railway tunnels in France. That of Rilly near Rheims, is 3,500 metres long. There were nine shafts during construction, of which four were closed when the railway was opened. Although lined with masonry throughout, the thickness being 20 inches in compact chalk, and 32 inches in that which was seamy, the cost was only £28. 15s. per yard. Hommarting Tunnel (*Chemin de Fer de l'Est*), is 2,780 metres long, Pissy Poville, 2,400 metres; Tarare is a very long one but we are not sure of its exact extent. The Tunnel of Arschwiller, on the *Chemin de Fer de l'Est*, is 2,678 metres, and is close to the tunnel of the canal from the Marne to the Rhine, named on the previous page the Tunnel of Manvages. In fact, where they enter the mountain they are at the same level, and a double arched entrance—the intervening pier being only 22 feet thick, and the arches precisely similar—receives them both. The canal tunnel was completed before that for the railway, which latter diverges from the line of the former at the rate of 26 feet in 1,000, so that at the end of the railway tunnel it is 60 feet from that of the canal. The canal then makes a bend and presently crosses *over* the railway tunnel, as it has a descending gradient of 1 in 200, and at what may be called its diverged entrance, it is 44 feet below the level of the canal. The railway tunnel took nearly eight years to construct at a cost of £38. 10s. per metre forward.

There is also a large number of tunnels from 500 to 1,500 metres long. The price per metre forward varies nearly as much as in England, its maximum being £95, that of Batignolles, near Paris, on the *Chemin de Fer de l'Ouest*, a short one, only 333 metres (366 yards); minimum £30, that

of Terre Noire 1,641 metres, on the Paris, Lyons and Mediterranean.

The longest railway tunnel in Belgium is that of Braine le Compte, 641 metres (705 yards). It cost £46 a metre. There are altogether eighteen tunnels along the 15½ miles of picturesque line of railway between Liege and Verviers; they are all short, none exceeding 400 metres in length; their cost was exactly £50 a metre forward. There is only one long tunnel in Switzerland, that of Hauenstein near Olten, on the railway between Basle and Berne, its length is 2,731 yards, and, notwithstanding the numerous difficulties which attended its construction, its cost was only £80 per yard. It might be expected that in an undulating country like Switzerland there would be a great many tunnels on its railways; such, however, is not the case, the larger proportion of the railways are constructed in the comparatively level valleys, and when engineers come upon rough ground, as a rule, they prefer stiff gradients to very expensive works. This, however is not always the case; witness the passage of the Jura from Pontarlieu towards Neufchatel; here there is the combination of expensive works with a steep ascending and then a steep falling gradient. These might have been greatly alleviated, if not altogether avoided, by a tunnel of comparatively short length; the engineer, it is said, wished to erect for himself, in this work, a monument *perennius ære*. He has succeeded.

The longest tunnel upon a railway in Italy, now open for traffic, is on the Giovi incline, near Genoa, 3,225 yards, or five yards over two miles. The longest of the two on the Brachia pass of the Apennines, between Pistoja and Poretta, is (as already stated) 3,300 yards; the length of the next longest, on the same pass, is 2,860 yards. A tunnel longer by a few yards than that on the Giovi incline, is in

process of construction on the branch which is to connect Naples by a direct line with the Adriatic. The tunnel Maggioni, between Florence and Rome, is 1,170 metres (1,287 yards) long.

The natural undulatory, in many places almost mountainous, character of Spain, has rendered necessary the construction of numerous tunnels on Spanish Railways. The following is an abridgment of much interesting information on this subject, published by the Spanish Government last summer, and translated into French a few weeks ago.

On the line from Madrid to Saragossa, the length of which is 213 miles, there are twenty-six tunnels; the most important of them is Horna, 1,010 metres. The total length of these twenty-six tunnels is 4,791 metres, or 3⅔ miles. On the Manzanares to Cordova Line, the length of which is 243½ kilometres, there are thirteen tunnels, the longest of which is 1,025 metres; their total length 3,092 metres. The Albaceta to Carthagena Line, is 154 miles long; the chief tunnel is that of Almadenes, along the gorge of the same name, its length is 1,056 metres. There are four short tunnels on this line, all in the vicinity of the gorge; their combined length is only 393 metres, making, with the tunnel of Almadenes, 1,449 metres.

The Northern of Spain—Madrid to Irun—is 399 miles long. Although it is not the longest, it is probably the most important railway in Spain, traversing nearly throughout its entire extent, a difficult, and, at places, an extremely hilly country, and finally terminating at the Pyrenees, where it meets the Bayonne and Irun Railway. Thus, on the section from L'Escurial to Avila, 44 miles long, there are sixteen tunnels, the total length of which is 4,408 metres, all of which are associated with numerous extremely difficult works of art in their immediate vicinity, some of the viaducts

varying from 95 to 135 feet in height, with other proportional dimensions. It is in this section that the Guaddarama Mountains are traversed, and, until the locomotive crossed the Mont Cenis the summit of this railway was the highest in Europe, 4,505 feet above sea level. On the section between Otzaurte and Beasain, 33 miles long, there are twenty-three tunnels, the total length of which is 10,351 metres. Some of the works of art on this section are magnificent in their character and construction. The tunnels on the other sections of the line are not so numerous; nevertheless, they are altogether fifty-eight in number, with an aggregate length of 22,160 metres, exactly 14 miles.

Turning from the most difficult Spanish railway in point of construction, to the easiest for the greater part of its extent, the Seville, Xeres and Cadiz Line, the length of which is 103 miles, we find that there are no tunnels upon it, although on the section between Xeres and Cadiz there are several extremely difficult works of art.

The Alar del Rey to Santander Railway is 87 miles long. It has twenty-one short tunnels upon it, the total length of which is 4,808 metres.

The length of the Palencia and Astorya Line is 110 miles. It runs from Palencia to Gigon, on the Bay of Biscay. This railway is only in course of construction. There are several tunnels upon it, of which the particulars have not yet been published.

The Saragossa and Barcelona Line is 230 miles in length. In the section between Cervara and Tarrassa, 59 miles long, there are sixteen tunnels. As their aggregate length is only 3,591 metres, it will be observed that they are all very short ones. The other portions of the line are of comparatively easy construction.

The Cuidad Real to Badajoz Railway, 213 miles long, is

a line presenting scarcely any difficulties of construction, and it has no tunnel upon it from one end to the other.

The principal difficulty connected with the Tudela and Bilbao Line is that at its terminus at Bilbao, it is barely above the level of the sea; but it has to ascend 2,060 feet in 29½ miles. There are no heavier works in all Spain than those upon this section. For more than half a mile the principal branch of the Ebro has been deviated, and the railway has been constructed upon the old bed of the river.

On the Barcelona to Santa Coloma Railway there are seven tunnels, very short in length; the longest is 443 metres long.

The Tarragona to Barcelona Line is 64 miles long; though passing through a level country for the greater part of its extent, it has one section—that between Villa-franca and Marterello, in which the rise is 540 feet in 15 miles. There are five tunnels upon this length, all short ones; but they were very difficult as regards construction, and they are very troublesome in maintenance.

The Lerida Reus and Tarragona Line is 63 miles. It has only one tunnel upon it, that of Terres, 700 metres long.

The Cordova to Malaga Railway, 121 miles, is extremely easy in point of construction, except for 6¼ miles at the passage of the Guitanas, where there are no less than twelve tunnels and six great bridges. In one of the tunnels a singular circumstance was discovered during construction. The miners suddenly came upon a *crevasse* or split in the mountain which extended from its lofty and precipitous summit to a great depth beneath the part bored through. The space is traversed by a bridge, the only one in the records of tunnels that we remember to have met with.

There is one very long canal tunnel in Spain—the Canal of Urgel—between the Ebro and one of its affluents, the

Segro. This canal is 90 miles long and the tunnel is of the length of 5,230 metres.

The grandest canal in Spain for water supply is the "Canal of Isabel II." It furnishes the supply for Madrid. It is built after the system of the ancient Romans—that is, aqueducts constructed in masonry arched over. Its total length is 45 miles. It has besides, thirty-one tunnels, partly cut straight through rocks which the canal traverses, and partly side-cut tunnels (one is five-eighths of a mile long) for obtaining water. At the present time, when the question of supplying London and other important cities with water is much agitated, it may be well to mention that by means of this canal 200,000 cubic metres of water, or 600 litres (a litre is about a quart) per inhabitant are brought to Madrid daily. Of these 600 litres 100 per head is for domestic use, and 500 for irrigating the districts adjoining Madrid. The quality of the water is said to be excellent; indeed it is alleged that if the air which it contains were abstracted it might be considered as distilled water. The pressure of the water in the conduits is almost without exception sufficient to raise it to the upper stories of the highest houses in Madrid. In some quarters of the city it could rise 75 yards above them. There are two road tunnels in Spain, one on the road between Grenada and Motril, 300 metres long, and one on the Pyrennean road between Barbastro and Benasquez, the length of which is 90 metres.

Spain, for a country with a population under 16,000,000, cannot be said to be badly off for means of communication. The total length of roads in the kingdom on the 1st of January, 1867, was 4,137,640 miles of the first class, 3,265,700 of the second, and 1,908,112 of the third. About 2,800,000 are in course of construction. It is intended eventually to extend the road system of Spain to a total of

about 22,500,000 miles. As already mentioned, the total length of Spanish railways on the 1st of January, 1867, was 3,182 miles.

There are few tunnels of any length in the United States. The Cincinnati Tunnel is 3,337 yards long; the Kingwood 1,366. The Alleghany mountains are perforated by one, the property of the Pennsylvania Railroad Company, which is 1,204 yards long, 24 feet wide, and 22 feet high. There are four through the Blue Ridge Mountains, Virginia, the longest of which is 1,955 yards, the next 1,418 yards, with an uniform gradient of 1 in 70. The Long Duck Tunnel, New Jersey, is 1,437 yards in length. But the Hoosac Tunnel, Massachusetts, will, when completed, be the longest railway tunnel in existence—except the tunnel of the Alps—8,166 yards; it was commenced in 1855, but it has only been vigorously proceeded with since 1864; its total estimated cost is to be £1,100,000, of which about £420,000 have been expended upon the 2,350 yards already constructed; its width is 26 feet, height 24 feet; the rock through which it is pierced is mica slate mixed with a little quartz.*

General Haupt, of the United States Army, the engineer-in-chief of this tunnel, is said, by the *Times*, to have invented one of the most compact, effective, and economical drilling machines, applicable for boring tunnels, driving adits of mines, and indeed for every description of work in which the hardest kinds of rocks have to be pierced. It is stated that it can drive holes in granite, or even quartz, at the rate of nearly four inches in a minute, and that as soon as about twenty-eight inches have been drilled, the blasts take place, when the

* For full particulars of this tunnel see reports of Mr. Storrow, and of Messrs. Laurie & Latrobe, embodied in the report of the Commissioners of the State of Massachusetts on the Troy and Grenfield Railroad, and the Hoosac Tunnel, dated the 12th March 1863.

machine can, in consequence of its great lightness and portability, be immediately carried over the *debris* caused by the explosion, and be at work upon the new face of the tunnel in the course of a few minutes.

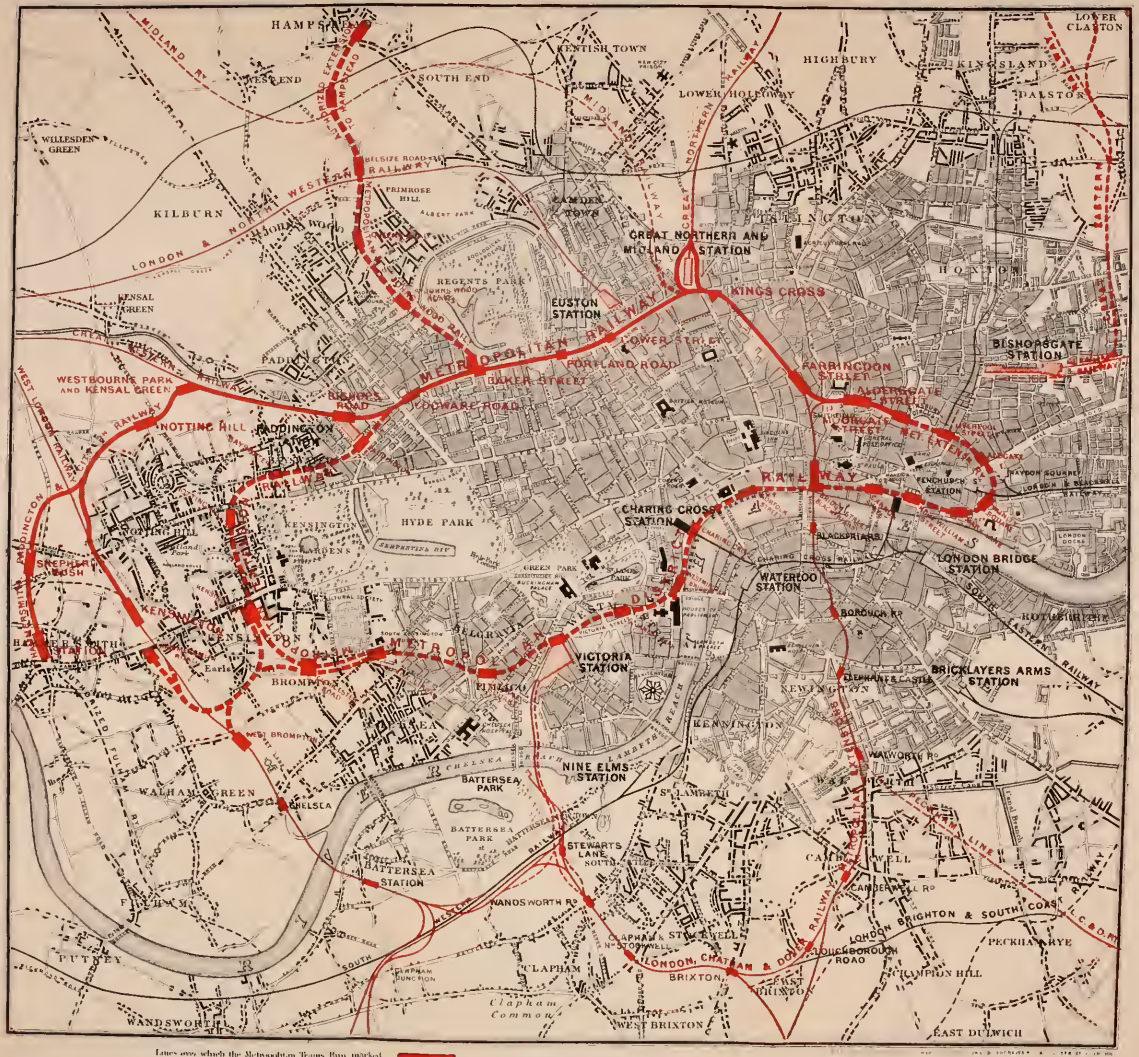
We extract the "latest novelty" in tunnels from a New Zealand newspaper received in England August 1867,—

"A Tunnel through an Extinct Volcano.—The Moorhouse Tunnel, opening up the fertile plains of the Canterbury settlement, is 2,838 yards long, and cost £195,000. It affords, we believe, the first instance where a complete section of an extinct volcano has been opened out. The elaborate drawings prepared by Dr. Haas for exhibition in Paris, will draw the attention of geologists to the fact, and doubtless afford the greatest satisfaction to the scientific world. The rock in the tunnel may be described as a series of lava streams and beds of tufa, intersected by vertical dykes of phonolite. The lava streams consist generally of scoria, overlaying a coarse pink trachyte, which passes gradually through shades of grey, purple, and blue into a black finely grained dolorite intensely hard and tough; the lightest and softest rock being at the top, and the densest and blackest at the bottom. Regarded from an engineering point of view, the work is considered eminently successful."

The New Zealanders are naturally very much elated at the completion of this, to them, great and important work, of which the *New Zealand Examiner*, a monthly journal published in London, and devoted exclusively to the interests of the New Zealand settlements, thus speaks in its August number:—

"That perseverance which has commanded success for England in so many fields has achieved another triumph in New Zealand. For six years has a quiet, but none the less remarkable, work been going on in the range of hills that divides Christchurch from Lyttelton. Possessed of a splendid harbour, the Province of Canterbury has had to suffer ever since its foundation from the difficulty of communication between its capital and port. At first sight the range of hills appear impassable, and are sufficient to frighten new arrivals. For the first years of the settlement's existence there was nothing in the shape of a road until the track over the hills was widened into a bridle path. All goods destined for Christchurch had to be sent round in boats up the river. Then came the cutting of a cart road winding round the hills, and eventually

METROPOLITAN RAILWAY.



reaching Heathcote (which may be properly called the Christchurch side of the range). The latter road was opened in 1859, and ever since the traffic on it has continued increasing. In 1856 an attempt was made to introduce steam navigation on the river, for the quicker and cheaper conveyance of goods, this unfortunately terminated disastrously in the wreck of the steamship Alma. The course of the river having been staked out in 1858, the Planet commenced running, and from that time the number of coasting steamers has steadily increased, while the sailing vessels from being confined to craft of 15 to 20 tons have risen to 100 tons. Still the great desideratum of a *direct* and *rapid* communication remained, and various schemes were propounded, but none carried into effect till May 1861, when the Provincial Government accepted a tender from Messrs. Holmes & Co., to complete a line of railway from Lyttelton to Christchurch (a distance of six miles) in five years, for £240,500. In this contract the tunnel, 2,838 yards long (the cost of which was estimated at £195,000), was included. The first sod of the line was cut on the 17th July, 1861, and for six long years, night and day, has the process of boring through the mountain gone on. During that time the contractors have met with all sorts of difficulties, not the least of which have been the attractions offered to their men by the successive outbreaks of the Otago and Canterbury diggings, but, lending their whole energies to the task, the works have not been stopped for a single day. The completion of this work must be productive of the highest benefits to Canterbury.

It will thus be seen that this tunnel cost at the rate of £69 per yard forward, and it required six years to complete it at a cost both of money and time very onerous to a young settlement. With Mr. Fell's system the tunnel would have been altogether avoided, and it is probable that the line would have been completed in about two years, at a price not exceeding £60,000, instead of the £240,500 it has cost the colony to construct it.

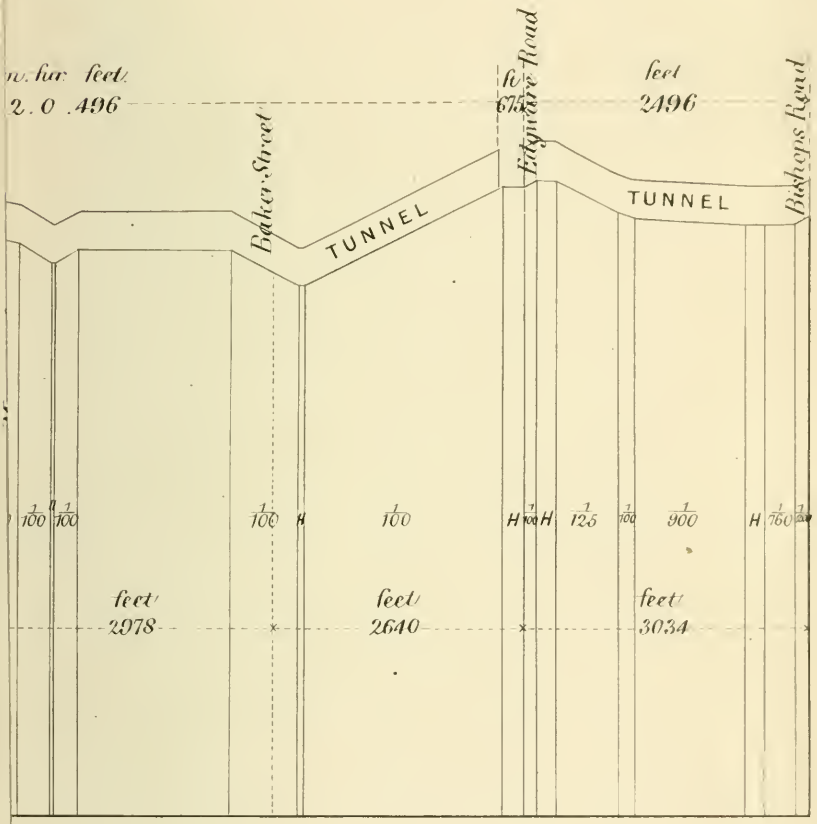
The total length of London's greatest tunnel, the Metropolitan Railway, from Bishop's Road to Moorgate Street, is 23,616 feet, or 4½ miles, less 144 feet. Starting from Bishop's Road, the measurements are as follows:—For 3,024 feet, or 96 feet less than five-eighths of a mile, there is tunnel, then an open space of 675 feet around the Edgware Road station. From there to King's Cross, 2 miles and 496

feet, is tunnel; but in this distance there are three most effective means of ventilation: the first is at Baker Street Station, 2,640 feet, or exactly half a mile from the Edgware Road Station. The second is at Portland Road Station, 2,978 feet, or 338 feet more than half a mile, from Baker Street. Portland Road Station is the most open of all the four intermediate stations. The third is at Gower Street Station, 1,920 feet, or 60 feet more than three-eighths of a mile. From Gower Street to King's Cross Station is the longest interval between two stations, 3,900 feet, or 60 feet less than three-quarters of a mile. The distance between the King's Cross and the Farringdon Street Stations is 5,192 feet, or 88 feet less than a mile. In this distance there are two tunnels—if one of them may be so called, for it is only 220 feet long; the other is 2,170 feet, or 190 feet more than three-eighths of a mile. In the remaining 3,836 feet, or 124 feet less than three-quarters of a mile, there are two little tunnels, one 523 and one 91 feet. During the hours the sun is above the horizon, complete light is never absent in the 91 feet tunnel—the train is no sooner in it than it is out again; and in the longer one there is for a moment or so "a dim religious light," and then it is actual daylight. The amount of this, however, must depend upon the season of the year at which the passenger goes through it. In certain dark days of November it is hard to say which is the darker of the two—the tunnel or the daylight.

The foregoing measurements will be readily understood by reference to the diagram herewith appended. It is a section of the Metropolitan Railway from end to end.

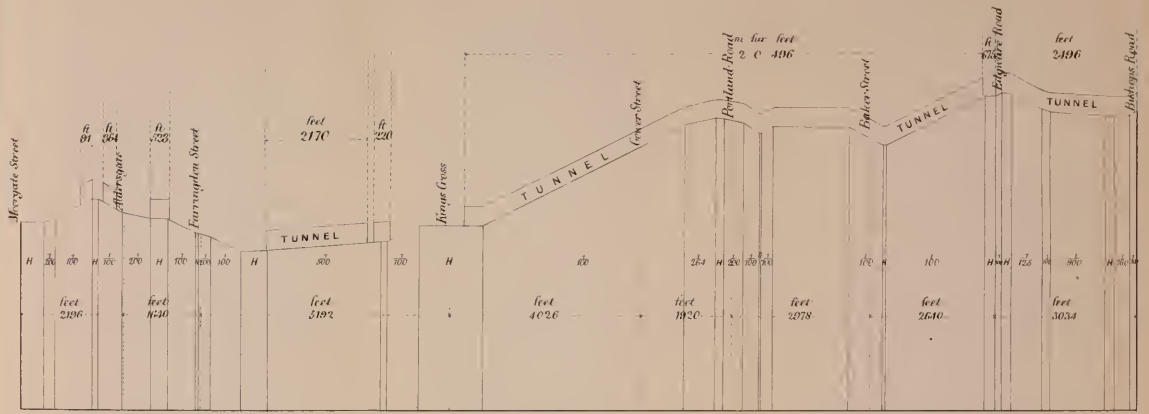
As regards its ventilation we shall speak presently.

There are two railways in connection with the Metropolitan Railway, which are also to be carried underneath portions of London. The Metropolitan District Railway,



Engineer, John Fowler Esq.
General Manager, Myles Fenton, Esq.

SECTION OF THE METROPOLITAN RAILWAY. LONDON.



Horizontal Scale 2000 ft — 1 inch
Vertical Scale 40 ft — 1 inch

Engineer. John Fowler Esq
General Manager. Myles Fenton Esq

when finished, will form the southern side of the inner railway circle that is to encompass London. It connects at Kensington, with the "Metropolitan Extension Railway" (a continuation from Paddington of the Metropolitan Railway). This extension is to run through Brompton to Pimlico, where it will be in closest proximity to the Victoria Stations of the London, Chatham and Dover, and of the London, Brighton and South Coast Companies; from there to Westminster Bridge, whence it is carried along, and, in fact, forms part of, the Thames Embankment, to Blackfriars Bridge. Here it is again in close contact, although at a different level, with the line of the London, Chatham and Dover Company, near its Ludgate Hill station. Proceeding eastward, it is carried as far as Trinity Square, Tower Hill, where it is to meet the eastern "Metropolitan Extension" of the Metropolitan Railway. These two sections finished, the whole inner Metropolitan circle will be completed. The distance from Kensington to Trinity Square is 33,150 lineal feet, or 6 miles and 1,470 feet, of which a little more than a third—that is, 10,974 feet—or 2 miles and 414 feet, are open cuttings or glass-covered stations, and a little less than two-thirds, or 4 miles and 1,056 feet, are in tunnel. The open cuttings and the tunnels are constantly alternating; the three longest of the latter are 665 feet; one is close to Gloucester Road Station, Brompton; one is at Tothill Street, Westminster; and the third is in the Thames Embankment. The gradients are favourable, there being only 2,352 feet (or less than half a mile) of 1 in 100, or 52 feet in the mile. These are all situated between Blackfriars Bridge and Trinity Square, Tower Hill. In addition to the foregoing main line of the Metropolitan District Line, there is to be a railway from Kensington High Street to join the West London Railway—

the line that connects the London and North-Western and the Great Western railway systems north of the Thames with the Clapham Junction Station on the south. From Clapham Junction there is unbroken connection with all parts of the London and South-Western, and the London, Brighton and South Coast Railways.

The length of the Kensington and West London Extension of the Metropolitan District Extension is to be 7,470 feet, or 450 feet less than a mile and a half, of which 5,565 are to be entirely open, 525 station roof and 1,380 covered way.

The St. John's Wood Railway, which starts from the Baker Street Station of the Metropolitan Railway, is in tunnel throughout, and is a series of stiff gradients, culminating with the stiffest of all at its St. John's Wood end. The line is 2¾ miles long, and its total rise in this length will be 255 feet, but the elevations are very unequally distributed. Starting from Baker Street Station, it proceeds for a short distance on a level, and then it rises 1 in 90 and 1 in 44 to the Regent's Canal. From the canal the line descends slightly, and then at three quarters of a mile from Baker Street will commence an ascent of 1 in 60, or at the rate of 88 feet in the mile, for 660 yards. Then follows an incline of the same length of 1 in 150 (35 feet in the mile), then for 440 yards nearly level, except, just for a few yards, 1 in 80. At one mile and 1,320 yards from Baker Street commences a gradient of 1 in 27, or 196 feet in the mile for a length of 1,320 yards. Half way up the gradient will be a station, but the steepness of the gradient will be diminished for about 200 feet to 1 in 250, or 21 feet in the mile. Mr. John Fowler, the President of the Institution of Civil Engineers, is engineer of the Metropolitan, the Metropolitan District, and the St. John's Wood Railway Com-

panies. The construction of an extension of this last-named line to Hampstead has been authorised.

The longest tunnel in Europe *over* land and over water is the Britannia Tubular Bridge built across the Menai Straits, parallel to and some mile and a-quarter from Telford's beautiful Suspension Bridge opened for road traffic in 1829. It is 1,834 feet 9 inches long, and in fact consists of two independent wrought iron tubes, each placed alongside of the other. There are four spans, two of 460 feet each, and two of 230—that is, the tubes rest upon two abutments and three towers of masonry—at an elevation of 100 feet above high water mark. The tower called the Britannia Tower is built upon a solid rock that projects above high water nearly in the centre of the Channel. The summit of this tower is 130 feet higher than the level of the railway in the tubes. The total weight of iron in the tubes is 9,360 tons, each tube of 460 feet weighs 1,587 tons, each of 230 feet weighs 753 tons, but these weights of iron are greatly in excess of what would be put in tubular bridges of like spans at the present time; and for a length but little exceeding a third of a mile, one tube, and not two, would be considered more than sufficient for all traffic, in both directions, that could be conveyed through it. The tubular bridge across the Conway River, forty-five miles from Chester, consists of two tubes placed alongside each other, each is 400 feet long and 1,180 tons. The combined cost of the two bridges, Britannia and Conway, is always set down at a million sterling. Now-a-days they would be constructed for about half that amount.

But Canada, or rather the Grand Trunk Railway of Canada, can put forward the boast that it possesses the longest over-land-and-water tunnel in the world. The Victoria Railway Bridge is constructed across the River

St. Lawrence just above the ancient city of Montreal. The entire length of this stupendous structure is 3,470 yards, or exactly 50 yards less than 2 miles. The tube is approached on each side by a solid abutment, that on the north side being 266 yards long, on the south 400 yards. Deducting these measurements from the total length of the bridge, the tunnel or tubular portion of it is 2,804 yards long, or 164 yards more than a mile and a-half. In addition to the abutments there are 24 piers of masonry which it is impossible to exceed in grandly massive strength and solidity. The current of the St. Lawrence runs where the bridge is constructed at a rate never less than six miles an hour, and in some parts of the stream its rate is ten. The real giant force, however, which the piers have to resist is the ice at its breaking up some time between the last ten days of each April and the first six or seven of each May. The late Mr. Robert Stephenson the engineer of this bridge, as well as those at the Menai Straits and at Conway, estimated the ice pressure on some of the central piers of the Victoria Bridge at six thousand tons each. It is therefore not to be wondered that there is no stone opposed to the current at each of these piers which weighs less than ten tons, and that all should be clamped together by massive bars of iron drilled into each block, and held fast for ever by molten lead poured into each interstice. The total amount of masonry in the bridge is 3,000,000 cubic feet, or about 22,000 tons. There are 25 tubes or spans of which 24 are 130 feet long each, and the centre, which is 60 feet above the surface of the water, is 242 feet long. The total amount of iron in the structure is 10,400 tons. The contractors for the bridge were Messrs. Peto & Betts, their resident engineer was Mr. James Hodges, and to him the chief merit in connec-

tion with the construction is due. Its cost was £1,350,000. It was opened for traffic at the period of the Prince of Wales' visit to Canada and the United States in 1860.

So far as regards tunnels actually constructed. We now come to speak of tunnels suggested. These may be divided into two classes—tunnels under rivers and tunnels under the ocean. Of the former, the first to be mentioned is that proposed to be constructed under the Mersey, to connect its Cheshire and Lancashire sides together. The scheme is propounded by Mr. John Hawkshaw, the eminent engineer, in a letter which he addressed to the Mersey Dock and Harbour Board, on the 31st of August last. Mr. Hawkshaw having stated that it is evident a bridge or viaduct over the river would interfere with the navigation, whilst the sandstone rock which underlies its bed affords facilities for the construction of a tunnel, proceeds to show that the river should be crossed between New Brighton and Bootle, that being the best point for connecting together the dock lines of railway on each side of the river Mersey.

The cost is set forth as follows :—

Total length of lines 9¼ miles ; length of tunneling, 4,800 lineal yards : estimated cost £785,000.

The lowness of the estimate is owing to it not being necessary to pass through valuable property, or important commercial buildings of any kind. Nevertheless Mr. Hawkshaw feels that the usual allowance for contingencies should be increased from 10 to 20 per cent. on the outlay. Still it brings the total amount considerably under a million. Mr. Hawkshaw does not ask the Mersey Docks and Harbour Board to be at the total cost of these works, however important it is that the two several portions of the board's establishment should be closely united in the manner which this tunnel accomplishes, but that it should only contribute a

portion of the outlay—an outlay which he considers will not be more than a third of what will be required for accomplishing any other of the schemes that have been proposed for carrying a tunnel under the Mersey.

In 1864 the Dublin Trunk Connecting Railway obtained an Act for the construction of a railway in the immediate vicinity of Dublin. Part of the plan sanctioned by Parliament is a tunnel under the Liffey, less than half a mile from its mouth. The depth of the tunnel-top under the bed of the river will be 20 feet. The stratum of limestone rock is curiously placed where the tunnel is to be pierced. The bottom of it will rest upon the rock, but the tunnel itself will be constructed through the superjacent clay. It will be lined with brick in cement. Its length under the river is to be 324 yards, and the approaches to it, which are to be constructed in the manner known as "cut and cover," are to be 430 yards each. The gradients on both sides will be 1 in 70, or 75½ feet in the mile. The cost is estimated by Mr. John Burke, the engineer for its construction, at £200 per yard forward.

A proposal has recently been made to construct a tunnel under the Humber from Barton to Hessle, close to Hull. A bridge over the river has often been spoken of; but its estimated cost, £700,000, render its construction hopeless. It is considered that the tunnel, which would be about 2,000 yards long, could be constructed for £150 a yard, and, with an allowance of £50,000 for approaches, the total cost would not exceed £350,000. It is not probable, however, that the railway companies concentrating on both sides of the river would find it to their interests, at all events at present, to carry this project into execution. The company that would most benefit by it would be the Manchester, Sheffield and Lincolnshire.

Mr. Peter W. Barlow, civil engineer, has recently obtained permission from the City Commissioners of Sewers to construct a subway beneath the Thames, which is to be carried from Lower Thames Street to the opposite shore of the river. The dimensions of the subway are to be sufficient to allow a loaded omnibus to pass through it. If constructed economically, there is no reason why it should not answer commercially.

We perceive by recent accounts from America that it was originally intended to connect the railways concentrating on both banks of the Mississippi at St. Louis, by a tunnel under the bed of the river; but this plan has been abandoned, and instead of it a "subaqueous iron tubular bridge" is to be laid on the bed of the river, which is about half a mile wide in this vicinity.

The difficulties connected with crossing the upper Indus at Attock, a thousand miles from its mouth, and 940 feet above sea level, have long been felt. Colonel Robertson, of the Madras Staff Corps, therefore, proposed a scheme for going under instead of over it. In his report on the subject submitted to Government in 1859, he stated that, as the geological formation at Attock, is a compact slate rock, it is easily worked; and under the bed of the river it is apparently not broken by any great fissures which might possibly endanger the tunnel. Colonel Robertson fixed the upper level of the excavation for the tunnel at 60 feet under low water cold weather mark, or, at the water's deepest point, 20 feet below the bed of the river; the lining of the tunnel to be 2 feet thick, and as its height is 20 feet, the foundation level would be 82 feet below the low water level. To guard against all risk of inundation through floods, which raise the level of the river from 50 to 92 feet (it was at the latter height in 1841), the two entrances of the tunnel are to be

100 feet above low water level. The width of the river at the point selected is 1,215 feet. This portion of the tunnel is to be nearly on the level; but the gradient of the approaches to it on each side, each 3,720 long, is to be 1 in 40, or at the rate of 132 feet in the mile; the total length of actual tunnel to be 7,215 feet, as some portion of each approach is to be in open cutting. There are ten shafts, each 600 feet apart, except at the actual river, where they are 1,580 feet apart. In 1860 the works were commenced, and a drift gallery had been nearly carried through, when all operations were suspended; but it is intended that they be resumed in prospect of the railway between Lahore and Pesshawer being constructed. The revived estimate makes the cost of the tunnel £105,000, if the gradient on each side be 1 in 20; but if it be flattened to 1 in 30, the estimate is £143,300.*

The greatest tunnels that we know of connected with mining (irrespective of galleries for working in mines) are the great drainage galleries at the mines of Clausthal, in the Hartz, 11,377 yards, or 6½ miles long, and in many parts 900 feet below the surface of the superjacent mountain. The second is the *Great Adit*, which drains several of the important mines in the parish of Gwennap, Cornwall. It is from 30 to 60 feet below the surface, and is 30 miles long. There is an adit level of 10,000 yards to the celebrated silver-mines of Norway.

There are two modes by which it is proposed to carry a subway between France and England,† the first is by means

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* Drawings of the tunnel entrances, and a section of it, are given in *Engineering* for September 27, 1867.

† Under water between France and England is not going to have it all its own way. In 1864 there was a scheme for very large ferry-boats between Dover and Calais, the boats to come, at each harbour, into a groove or

of iron tubes laid on the bed of the ocean, the other is by actual tunnel. At the present time no less than three competitors present themselves for the honour of constructing the former, and there is only one whose scheme is before the

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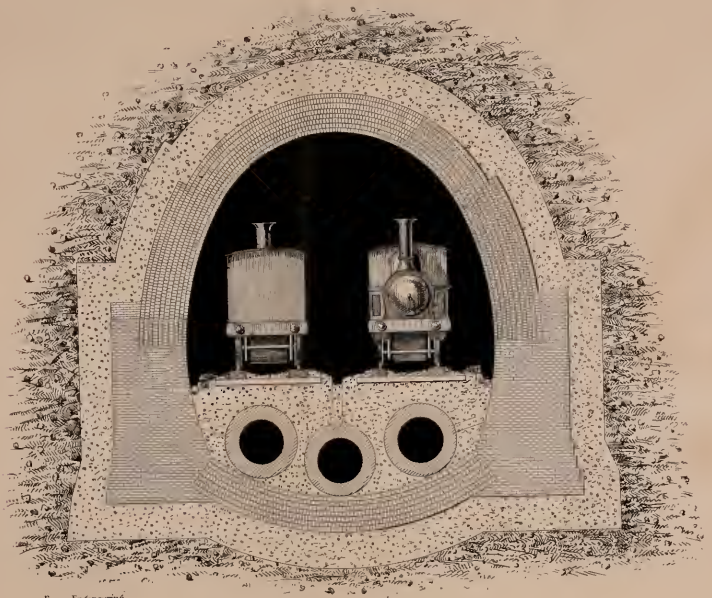
dock specially to be made for them. The plan, however, was abandoned at an early stage, mainly, it is believed, because the French Government declined incurring the very great outlay that would have been unavoidable at Calais. In fact, the plan would have rendered necessary the construction of a new and much enlarged harbour there, involving an expenditure of three or four millions sterling. The present year has brought out several ferry schemes, one of which only we purpose referring to—that of Mr. T. B. Daft, C. E. This gentleman proposes to run his vessels between Dieppe and Newhaven. He has not, however, quite decided whether each ship is to consist of one hull or of two. If the hull be single, his deck is to be 500 feet long and 150 wide. If double, each is to be 50 feet wide, the pair to be placed 30 feet apart, and to be connected together by iron beams covered over by a broad deckway, so that passengers might go from one ship to another at their convenience. But no vessels so united could hold together in a heavy cross sea. The beams would be smashed to atoms by its violent and irregular action, and the difference of elevation of waves only a few feet distant from one another.

Mr. Daft proposes four pairs of engines of the collective power of 2,400 horses for his boats, to receive which there are to be special floating harbours at Dieppe and at Newhaven, so arranged that the trains can at once be put on the deck of the vessels at the departure harbour, and landed at that of arrival without disturbing passengers or luggage. Mr. Daft makes up his figures as follows:—Expenditure on capital account £1,000,000; 600,000 passengers during the year at 5s. each, £150,000; 300,000 tons of merchandise at 8s. each, £120,000; gross probable receipts £270,000. *Per contra*, wages of crew, £4,680; coals, 15,200 tons for twelve voyages per week, £11,250; stores, light dues and pilotage, £920; interest at 5 per cent. on capital £50,000; insurance, repairs, and depreciation, £100,000, making a gross annual expenditure of £166,850, thus showing a divisible profit (besides the 5 per cent. interest on the million of capital) of £103,150. We sincerely hope that the shareholders may find it, if ever these vessels and harbours be constructed. The only objection we shall dare to offer to the plan is the possible inconvenience to which a gallant male passenger may be subjected when a lady, whom he had perhaps found a most charming conversational *compagnionne de voyage* on *terra firma*, may all of a sudden, in a rough sea, ask him to be so good as to hand her the basin!

public for the latter. The three advocates for the tubular system are Mr. James Chalmers, Mr. B. Hilmer, and M. Thome de Gammond, of Paris. Each has his mode of laying down and connecting the tubes together, but the great and distinguishing feature of the plan of M. De Gammon, is that he proposes to construct a great oceanic station, which is to be a kind of half-way halting house between the two shores. Here also is to be a harbour and three ship's basins, so that any one returning from a long voyage and being in a hurry to get either to London or to Paris, or to any other place—it signifies not where—in England or the Continent, might land and at once proceed upon the *terra firma* portion of his journey. In the centre of the harbour there is to be a huge shaft 330 yards in diameter, which would serve the double purpose of ventilating the tunnel, and of providing means of ingress and egress between the *Islet de Varne* station and the upper and outer world. All these great advantages—tunnel, shaft, and railway—are to obtained at the cost, as estimated by M. De Gammond, of £7,200,000 !

The advocates for the tubes insist that theirs is the right system, in consequence of its having been publicly stated that Mr. Hawkshaw has satisfied himself by many borings that the bottom of the English channel between Dover and Cape Grinez, has too many and too deep "faults" to permit of tunnelling. Mr. George Remington, C.E., however, considers he gets over the difficulty by avoiding the line originally selected for the Anglo-French tunnel. He therefore proposes Dungenness as his English starting point. The depths of the tunnel is, says Mr. Remington, to be from 90 to 130 feet below the bed of the channel, and there are to be three main shafts, the first at the point of Dungenness, the second on the shoal in mid-channel, where there are only eleven feet at low water spring tide, and the third

SECTION OF
CHANNEL RAILWAY TUNNEL
AS PROPOSED BY Mr GEO. REMINGTON C.E.



From Engineering

at Cape Grinez. These shafts are to be 100 feet diameter, and being carried up considerably above the sea are to act as lighthouses. It would be inconsistent with the character of this work to enter into an account of the technical details which Mr. Remington proposes to adopt. We shall, therefore, limit ourselves to saying that in addition to the three intended permanent shafts, it is likewise proposed to put down ten temporary shafts, the cost of each of which is not to exceed £20,000. With these thirteen shafts, says the editor of *Engineering*, "the tunnel may be carried on in twenty-six sections, and the distance from shore to shore being twenty-six miles, gives only one mile for each section, or two miles for a shaft, and assuming an advance of only one yard a day for each headway, the whole distance may be accomplished in about five and a-half years," exclusive of the couple of years required for sinking the shafts.

The following is Mr. Remington's estimate :—

56,320 yards run of tunnelling of £100 ..	£5,632,000
Three main shafts, at £50,000	150,000
Ten temporary shafts, at £19,800	198,000
Six miles of approaches, at £20,000	120,000
36 miles of permanent way, at £4,500. . ..	162,000
Stations	100,000
	£6,362,000
Contingencies	636,200
Total	£6,998,200

Is it practicable? An excellent authority, although, no doubt, a little of the "go-a-head" class, says, "Yes," and informs the world that there is judicious "provision for gas lighting, water pipes, electric telegraph and proper drainage,

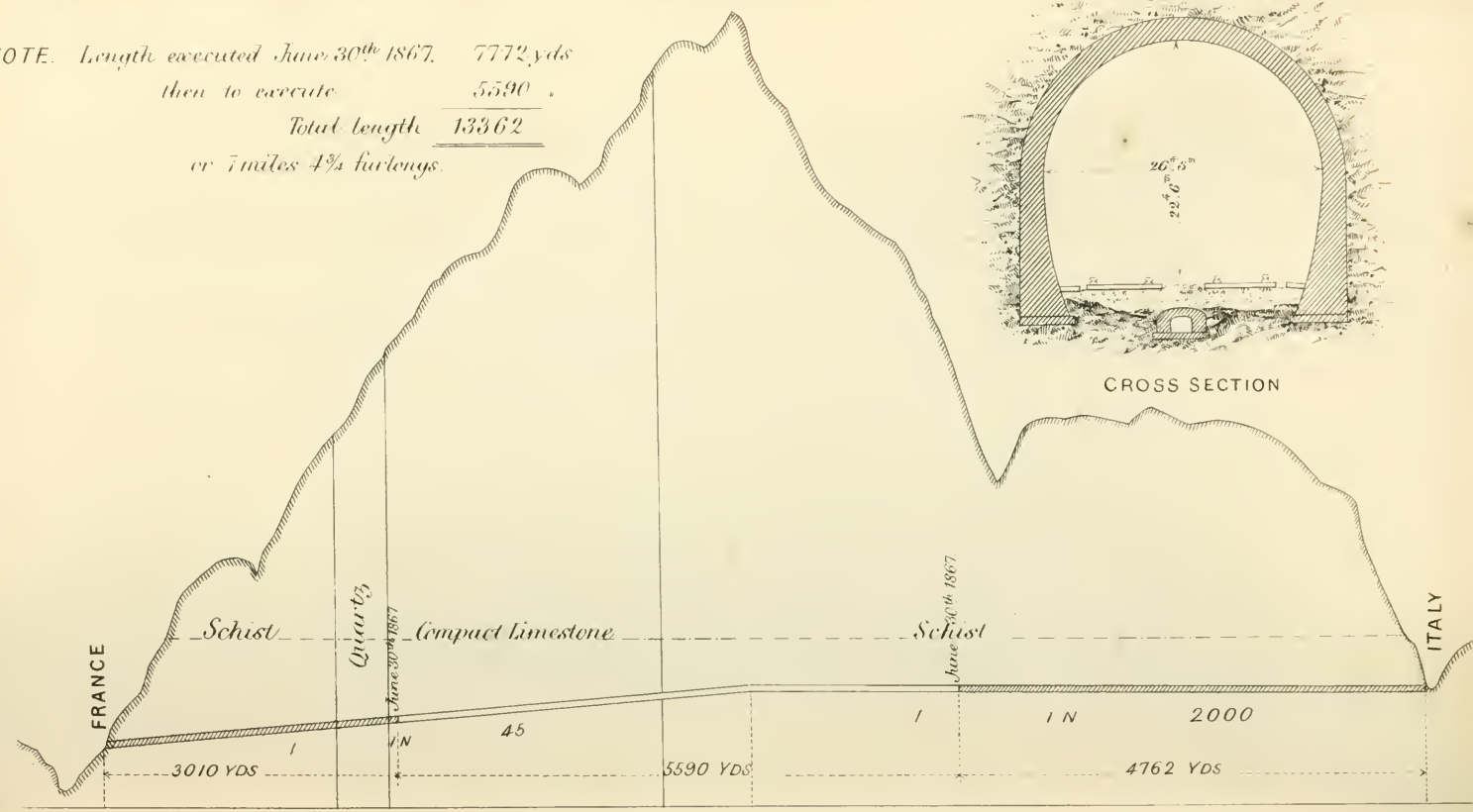
and indeed all that can be desired to make the passage through the tunnel as safe and comfortable as transit on the Metropolitan Railway." On the other hand, there is the opinion of Mr. Hawkshaw, whose borings we have just referred to. Have they been extended as far to the westward as the diagonal line, or course, proposed by Mr. Remington, and do the "faults" extend to a depth of from 80 to 130 feet below the bed of the ocean? At all events, thinking it would interest our readers, we have had engraved the section of the tunnel from the drawing of it, which was recently published in *Engineering*, and it is herewith inserted.

There is no incident or occurrence in life, no matter how solemn or serious it may be, that cannot, in some way or another, contribute to travestie and amusement. We shall therefore, conclude our notice of "Tunnels suggested," with the following piece of pleasantry extracted from a recent number of the *Scientific American*:—"A gigantic engineering project is now the sensation out West—a tunnel under the Atlantic for a railway! The plans are already supposed to be drawn up, complete in detail. Even to lighting the cars with the magnesium and electric lights. The undertaking is to employ one hundred thousand men for thirty years, and when completed it will take the trains but five days to do the journey from Newfoundland to Ireland, *viâ* the telegraph route. The amount of capital required is estimated at two billions five hundred million dollars." Well may the Editor of *Engineering* lift up his hands and exclaim, Good Gracious!

THE MONT CENIS TUNNEL RAILWAY

NOTE. Length executed June 30th 1867. 7772 yds
then to execute 5590 "
Total length 13362
or 7 miles 4¾ furlongs.

CROSS SECTION

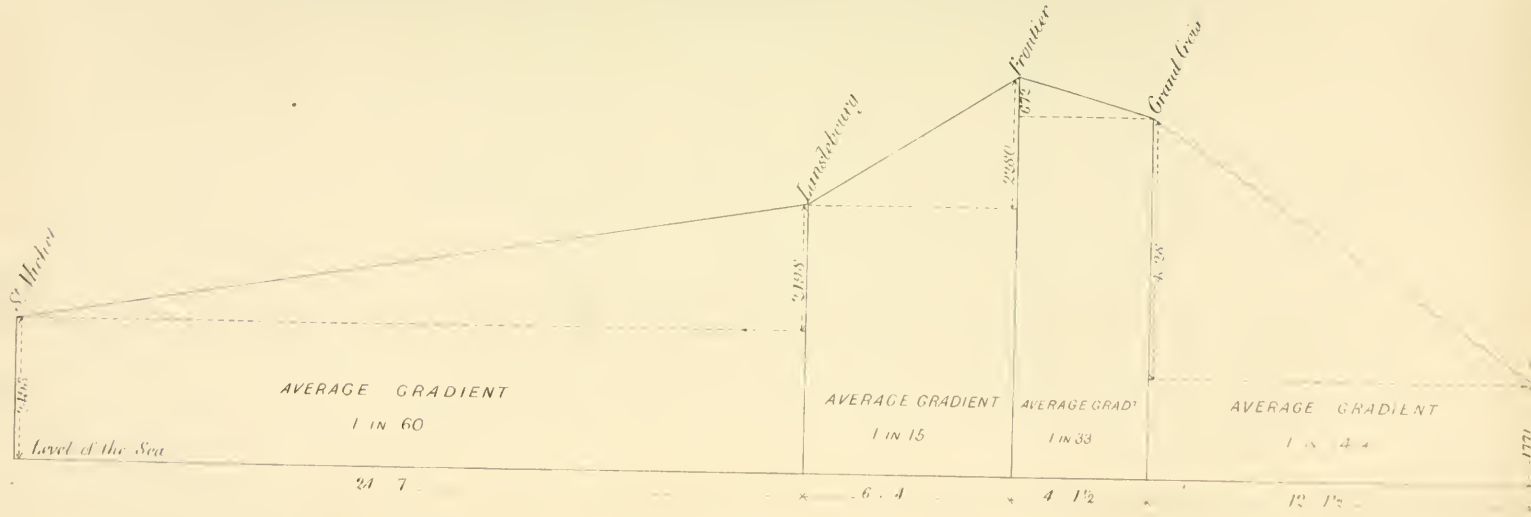


LONGITUDINAL SECTION

SECTION OF THE

MONT CENIS RAILWAY

JAMES BRUNLEES ESQ^R ENGINEER.



Heights marked in feet

Lengths marked in miles and furlongs

CHAPTER XIII.

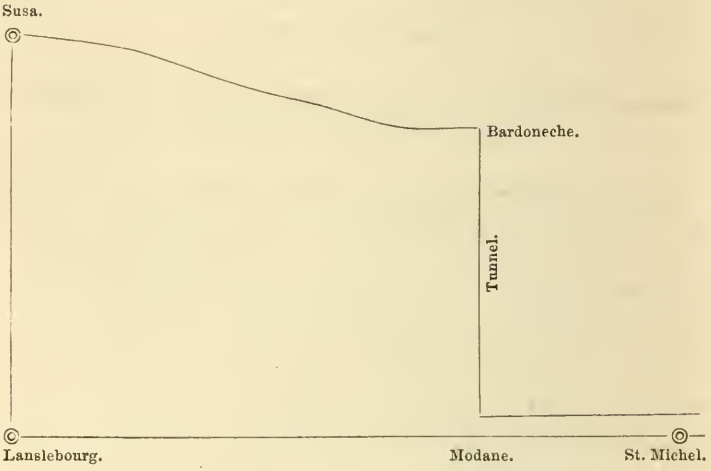
THE GREAT TUNNEL OF THE ALPS—TUNNEL VENTILATION—VENTILATION IN THE METROPOLITAN RAILWAY.

By some authorities, the great tunnel of the Alps is called the "Mont Cenis Tunnel." But this appellation is a misnomer, as the tunnel is as far as 15 miles distant from the Cenis Mountain. It is in reality carried through the Great Vallon Mountain, the narrowest of the Alpine range which separates France from Italy. Nevertheless, between the spot where the tunnel enters the mountain at Modane, on the French side, and makes its exit at Bardoneche on the Italian, there is an intervening distance of more than $7\frac{1}{2}$ miles. It is opposite to Fourneaux, a village $1\frac{1}{2}$ mile from the village of Modane, that the Modane entrance of the tunnel commences. It is 3,709 feet above the level of the sea, and it is at an elevation of about 150 feet over the roadway of the Mont Cenis Pass, between St. Michel and Lanslebourg. It is visible on the right hand side as a traveller is going from France towards Italy.

The Bardoneche entrance is not visible, as it is in the midst of the mountains, far away from any roadway, and 426 feet higher above the level of the sea than the Modane entrance.

At Lanslebourg, the road which has, for all the distance from St. Michel, run nearly due east, makes a sudden turn to south-west and continues in this direction to Susa. The course of the tunnel is south-west throughout its entire length. It is consequently parallel or nearly parallel to the Mont Cenis Road, between Lanslebourg and Susa; although, as just stated, they are about 15 miles apart.

The following little outline will convey to the reader an idea of the relative positions of tunnel and railway.



We have drawn a straight line between Lanslebourg and Susa, solely for representing the general direction of the road; but in reality the road is a cork-screw with fully as constant deviation from the straight line as is exhibited by that useful article of domestic economy, and perhaps we could not find a better manner of illustrating the difference between an ordinary road on the level, and one on or through a mountain passway. If the iron of a cork-screw went straight from where it is fastened to the handle, to its point or extremity, it would measure about three inches, but its convolutions extend it to ten. It is precisely the same with the road between Lanslebourg and Susa. If it were on the plain it would measure about seven miles; but its convolutions, its twists and its turns, its zig-zags, and its *lacets* convert seven into twenty-five. The length of the tunnel when completed will be 12,220 metres, or 7½ English miles and 242 yards. It consequently exceeds by about 4½ miles, the next longest railway tunnel on the continent of Europe,

that of Lanerthe, on the Paris, Lyons and Mediterranean Railway already referred to.

The Tunnel of the Alps has a double nationality, it is half, exactly half, French, and exactly half Italian. By the convention of 1856, between the Governments of Sardinia and France, 6,110 metres of perforation and of lining were to be made at the expense of each country, but the whole of the works were to be done by Italy exclusively. They were commenced on each side of the mountain in 1857. For the first $3\frac{1}{2}$ years, that is, until the end of 1860, the process of perforation was performed by manual labour only; in 1861 and 1862 in was partly by manual labour and partly by machinery; since 1862, machinery has been exclusively adopted.

The following Table sets forth the progress made on each side since the commencement of the work.

THE TUNNEL OF THE ALPS.

	Year.	Northern Entrance. Progress.		Northern Entrance. Total.		Southern Entrance. Progress.		Southern Entrance. Total.		General Total.		General Total.	
		M.*	c.+	M.	c.	M.	c.	M.	c.	M.	c.	M.	c.
By Hand Labour.	1857	10	80			27	28			38	8		
	1858	201	25			257	57			459	82		
	1859	132	75			236	35			369	10		
	1860	139	50			203	80			343	30		
	1861	193	00			00	00			193	0		
	1862	243	00			....				243	0		
				921	0			725	0			1646	0
By Machinery.	1861	....				170	0			170	0		
	1862	....				380	0			380	0		
	1863	376	00			426	0			802	0		
	1864	466	65			621	20			1087	85		
	1865	458	40			765	30			1223	70		
	1866	212	29			812	70			1024	99		
	1867‡	317	98			456	60			774	58		
				1831	32			3631	80			5463	12
				2752	32			4356	80			7109	12

* M. Metres. + c. Centimetres. ‡ For the first Half of 1867 only.

The rate of progress given in the foregoing Table is very different from what was expected previous to the commencement of the works. It was then anticipated that the tunnel would be excavated from end to end before the close of 1864, but it was not until the 15th of October, 1866, or $9\frac{1}{4}$ years after operations had been begun, that exactly one-half was perforated. On the 1st November, 1867, the half had been exceeded by 1,958 metres, still leaving 4,152 metres to be excavated. The amount of perforation accomplished on the two sides of the mountain has always been unequal, for of the 4,152 metres yet to be excavated, 2,905, equal to about $1\frac{7}{8}$ mile, have to be accomplished on the French side, whilst on the Italian there are two-thirds of a mile. This will be understood by an explanation of the strata through which the tunnel is to be carried. Commencing at Modane, there are 2,140 metres of schist, then 363 of quartz, followed by 2,706 of compact limestone, and finally 901 of schist. This completes one half; the other, or Italian half, is all schist. The only rock comparatively easy in working is the schist, but from the commencement the schist on the French side was of a more resisting character than that on the Italian. The miners came upon the quartz exactly where they expected to find it, but instead of its being a stratum 400 metres thick, as was anticipated, it turned out to be only 363 metres; nevertheless, it required two years, less two months, to bring it into subjection, that is, from the 15th of June, 1865, until the 20th of April, 1867,—the progress forward during all that time, not much exceeding half a metre (about 20 inches) a-day. The compact limestone nearest to the quartz having been partly decomposed by the action of this latter, was very workable. Hence, during May and part of June 1867, the advance was very considerable, but since June the compact limestone has proved to be harder but not so difficult to work upon as the quartz. For six

weeks the engineers were hopeful that they could go on at the rate of three metres a-day. If such progress could have been unflinchingly maintained, the excavation on the French side could have been accomplished by August 1870. With two metres a-day it will require until March 1872; but if, the advance do not exceed a metre and a-half a-day for two-thirds of the whole distance, the tunnel cannot be perforated under six years, which brings the date to July, 1873.

But the perforation of the rock is not the only serious impediment to progress. All things that live and breathe, miners among the number, require air for their sustenance; and, in order to supply it in sufficient quantities for the support of the human moles within the interior of the tunnel, it has been necessary to resort to special appliances for this purpose. Immense machinery, moved by water-power of an aggregate force for each end of about 400 horses, erected at both entrances of the tunnel, works not only the boring machines, but, at the same time, furnishes the miners with the necessary ventilation. The air is compressed to five atmospheres by means of the water-power just referred to; and the double application of the air is the ingenious contrivance of Messrs. Someiller, Grandis and Grattoni, the distinguished Italian engineers, under whom the works are conducted. Until recently the ventilation, although indifferent except at the site of the boring machines, was excellent in their vicinity; but with each metre that the works progress farther into the mountain, the difficulties of ventilation are added to; especially so on the French side, and for a reason that will at once, on a moment's explanation, be evident to the reader. When the boring machines have made the usual holes in the rock about three feet deep, they are filled with gunpowder, and exploded. Now, if the excavation of the mountain had been

made partly by adit and partly by shaft, as soon as one of the latter had been made, the smoke from each explosion beyond it would have found vent through it to the outer air, and in a few minutes the forward face of the tunnel would be ready for the fresh action of the boring machines. But as there is no shaft in the Cenis Tunnel, the whole of the smoke created by each explosion has only one means of exit—that is, through the tunnel's mouth. Smoke, in its escape, wants to ascend (as we know by our every-day experience), but it cannot do so for the want of a shaft; it cannot get out even on the level, for the gradient in the tunnel on the French side is, on an average, 1 in 45, or 117 feet 4 inches per mile. As the perforation had, on the 1st November last, been accomplished to the extent of 3,205 metres, the face of the tunnel was about 226 feet higher than the entrance,—consequently, the smoke of each explosion at the present time is not only not able to come out on the level, but it has actually to descend the number of feet just stated before it can commingle with the outer air; and the number of these feet of elevation will continually increase, until, at the end of the French perforation, there will be 429. We believe it is a matter of fact, that the ventilation is every day becoming worse, and the means of supplying the requisite air are becoming more difficult with each metre of advance made, and so it must continue until the final perforation has been (for no doubt it will be) accomplished.* On the Italian half, the rock is through-

* On the other hand, Captain Tyler, in his report to the Board of Trade of his inspection of the Mont Cenis Railway, dated the 4th September, 1867, states, that, by the favour of the Italian Government, he visited the tunnel works on the 24th of August, when "on going with Signor Copello, the chief engineer of the French side, into the Grand Tunnel on that side of the Alps, I found that a great improvement had been effected in its ventilation since my

out, schist, and the gradient, being only one in 2,000, or $2\frac{8}{25}$ per mile, all the elements for progress will continue to be, comparatively, as favourable as they have hitherto been; and even with a much less rapid rate of advance than on the French side, it requires no great gift of prophesy to "forecaste" that the boring machines from Italy will be ready to embrace those from France long before the latter shall have arrived at the midway point. But let it be understood that the works from the Italian side cannot go on a yard beyond midway,—first, on account of the gradient, which would dam up all the water percolating into the tunnel; second, because it would be impossible to keep the line of the tunnel, owing to the absence of all the external landmarks required for ensuring its correct direction. The embrace we have just referred to will take place 4,138 feet above the level of the sea, 1,645 above the level of St. Michel, 429 above the Modane entrance of the tunnel, but only $2\frac{8}{25}$ above that at Bardonecche, 2,360 above the level of Susa, about 5,360 feet *below* the highest point of the Great Vallon Mountain, and 2,520 feet below the summit of the Mont Cenis Railway.

What might have proved a source of great trouble and expense—water—has fortunately not as yet on any one occasion presented itself in a manner to cause alarm or even uneasiness. We need not therefore refer to this subject in

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visit of last year. A wooden partition had been completed under the roof for a distance of 1,500 metres. Four cylinders had been constructed, each four metres in diameter, and with a stroke of two metres, for drawing out the foul air at a maximum rate of ten strokes per minute. The head of water for working these cylinders was 70 metres.

"The one cylinder which alone was at work during my visit produced a strong current through the heading, and a perceptible current almost up to the face of the excavation. I learnt that a fan ventilator was employed to produce similar effects on the Italian side."

any detail, but before proceeding to as important an element as any with which the tunnel is encompassed—cost—we had better state that the arch of the tunnel is a semicircle 25 feet 3½ inches at its base, 26 feet 3 at its broadest part, and 24 feet 7 inches high. (See diagram.)

Captain Tyler in his report of 1866, sets down the total cost of the tunnel and its 34½ miles of approaches at £5,400,000, or £128,500 per mile. Now we know that up to the present time each metre of tunnel excavated and lined (for it is to be lined throughout from stone quarried near to each entrance, with an occasional introduction of brickwork) costs 7,000 francs, or £280. This would bring its total cost exclusive of permanent way, which would be, say £30,000, to £3,421,600, but we believe that the farther the tunnel is penetrated, the expenses will increase rather in geometrical than arithmetical proportion, and that the average cost of the tunnel will not be 7,000 francs or £280 "*per metre courant,*" but 10,000 francs or £400. If this be so, the cost of the tunnel, without permanent way, would be £5,188,000. To this sum has to be added the cost of the 34½ miles of approaches. The nature and the probable cost of the works can be appreciated from the fact that they are now about to be let, and the contract time for their completion is to be four years and a-half from the date of their commencement. These 34½ miles of double railway cannot be estimated at less than £60,000 a mile or £2,070,000, making the total cost of the tunnel and of the railways which connect it with the railways of France to the north, and with those of Italy to the south, £7,258,000, or at the rate of £172,800 per mile. Possibly, if the construction were in the hands of a railway company instead of those of two governments, a saving of a million or so might be effected, but in any case the cost would be upwards of £6,000,000, or nearly £142,850 a mile.

In connection with the subject of cost, a calculation of Captain Tyler's gives the following results. The difference, says the Captain, of elevation between the outer summit of the Mont Cenis Pass and the summit of the railway through the tunnel is 2,520 feet. The excess of working expenses in consequence of this difference of height, estimated on a traffic ten times as great as that which passed over the Mont Cenis in 1865, and the cost of traction per horse power and per hour being taken at 2¼d. (the cost on the Sœmmering and the Giovi), an additional capital of £650,000, or £13,000 a mile, with interest taken at 6 per cent., is represented. If then £13,000 a mile be added to the £21,000 actual cost per mile of a permanent Alpine railway, the total cost of a railway *on* the mountain becomes, for the purposes of comparison, £34,000 a mile, as against whatever may be the cost per mile for the Tunnel Railway and its approaches. If they cost £142,850 a mile, the comparison will be as 31 to 142 ; but, if, as we believe, the cost will be £172,800, then the proportion will be at 31 to 172.

A few years ago people could think or speak of nothing else for the Alps but tunnels ; there was to be a tunnel railway through the Simplon, one through the St. Gothard, and as immediately to the eastward of the Great St. Gothard range, there is a rapid diminution of elevation of the Alpine mountain, no less than three passes were named as suitable for tunnels, the special advantage of each being that they could be constructed by means both of shaft and of adit. These three passes commencing near Dissentis, run from north to south, and each, as it were, starting from one root, branches off and follows its own course through its own system of valleys, but the three unite in a common pass about two miles to the south of Olivione. They are called respectively the Cristillina (the easternmost), the Greina (the centre), and the Lukmanier

(the westernmost). The length of tunnel suggested for the Cristillina was the most modest of all, only seven miles; for the Greina it was to be twelve and a-half miles, whilst that for the Luckmanier was proposed to be fifteen miles, nearly but not quite double that now constructing under the Great Vallon Mountain. But if the tunnel of the Lukmanier was to be the longest, its advocates were able to assert in its favour, that not only could the shafts be numerous, but that not one of them need be at a greater depth from the surface than two hundred yards. Well, notwithstanding these supposed advantages, these long tunnel railways have ever since remained a dead letter, and have long ago been consigned to rest in the wide laying burial ground of Utopia. We shall one of these days (*probably*, in four or five years) have *one* tunnel through the Alps; we are not likely in this or the succeeding generation to have a second.

At a very early period in the history of English Railways, the ventilation of tunnels came to be considered a very important question, and as usual on such occasions, ignorance furnished an immense number of facts and realities which experience showed to be nothing but fictions. It was in deference to the highly wrought popular feeling on the subject, when every manner of evil was prognosticated for travellers going through tunnels, that the late Mr. R. Stephenson was induced to construct the large ventilating shafts on both the Kilsby and the Watford tunnels of the London and North-Western Railway. There are two shafts in each of these tunnels, the diameter of each of the four being sixty feet. They may be said to divide the tunnels into three distinct parts, the periods of going along each space of sixty feet being perfectly appreciable by the traveller. The ventilation is no doubt better in consequence of the execution of these gigantic shafts; but experience has long since shown

that shafts nine to twelve feet in the clear, are quite sufficient for all ventilating purposes, no matter how much the tunnel may be below the earth's surface.

We are indebted to Mr. Charles S. Storrow, an American engineer of reputation, for a great deal of very interesting information upon the subject of the ventilation of tunnels, and the state of the atmosphere in them during and subsequent to the passage of trains. Mr. Storrow was sent to Europe in 1862, by the commissioners of the State of Massachusetts, which had been appointed by legislative action, in relation to the construction of the Great Hoosac tunnel already referred to. The tunnel first visited by Mr. Storrow, in England, was the Box Tunnel, of which in his report he furnishes a section. Its length is 3,227 yards; its gradient throughout is 1 in 100. It has five shafts, each being twenty-five feet in internal diameter. But this diameter is, as just stated, now considered to be unnecessary. The deepest shaft is 300 feet.* Mr. Storrow experi-

* There are no such shafts upon railways as there are in mining. The shafts of the Consolidated and United Mines, Cornwall, are 1,488 and 1,650 feet. The shaft of the Nesvain Copper Mine is 2,180 feet; of the Veta Grande Mines, Mexico, 1,092 feet; of the Valenciana Mine, Mexico, 1,860; of the mines of Himmelsfurst, Saxony, 1,080 feet; of the salt mines near Cracow, 1,783 feet. Several mines in the Harz Mountains, in Bohemia, and in Cornwall, have also been worked to a depth exceeding 2,000 feet. The deepest in Bohemia is Keettenburg, said to be 3,000 feet below the surface of the soil. The deepest in Cornwall is that of Fowey Consols. The shaft of the Fahlam Copper Mine of Sweden is 1,300 feet deep. The shaft of Mr. Astley's colliery at Ashton-under-Lyne, Lancashire, is 2,100 feet deep. The deep workings are 1,500 feet below the bottom of the shaft. The shaft of Wearmouth Colliery is 1,600 feet deep; that of Dukenfield, Cheshire, 2,004 feet; and the lowest working in the colliery is 2,504 feet. At Pendleton, coal is worked from a depth of 2,505 feet. One of the collieries at Wigan is 1,775 below the surface. Many of the Durham collieries are equally deep. For further particulars see Dr. Ure's *Dictionary of Arts Manufactures and Mines*, edition of 1861.

enced no inconvenience as regards ventilation when going through the tunnel in passenger trains. On one occasion he proceeded through the tunnel in a hand car—"a passenger train passed us" says Mr. Storrow, "on the other track to that which we were on. It filled the tunnel with smoke and produced perfect darkness, so that the other ends of the tunnel (which had been seen most distinctly previous to the passage of the train) could not any longer be seen, and on removing the lights we were carrying, the person who sat at my side talking with me and touching me, was absolutely invisible. With all this, however, there was nothing troublesome to respiration. As we proceeded and successively passed the large shafts, a ray of light appeared directly under them, which, a moment afterwards was lost in intense darkness, and this continued until we reached the other end of the tunnel, after an interval of fifteen or twenty minutes from the passage of the express train." Mr. Storrow was informed that "the ventilation of the tunnel depends a good deal on the weather. Whenever a strong clear wind blows, the smoke disappears very readily, but in fogs it is quite troublesome to the workmen. I could not find, however, that it seriously interfered with their work. Indeed there never was a time when it could not be done, if required. No artificial means had ever been used to ventilate the tunnel, but the passage of quick trains going through it in the ordinary course of the operations of the road, is a powerful agent for this purpose. With the steep grade of 1 in 100, the steam, on the descent of the tunnel, is nearly or quite shut off, and the train passes quickly through. The first engine which passed us, moving down the grade, produced no sensible effect upon the air, but in ascending the tunnel there is a very great expenditure of steam; the trains moving slowly, and heavy trains are assisted by a second engine. All

this of course vitiates the air. The quick passage of a train always produces a current in the direction of its motion, and if made by a train running downward, and therefore using but little steam, its effect in clearing the tunnel is very marked. This effect is said, however, to be rather impeded than assisted by the presence of the shafts, and I found that the persons in charge of the tunnel, taking this circumstance, and the water admitted into the tunnel by the shafts, into consideration, would be pleased to have them closed altogether, and to depend for ventilation upon a natural current from end to end being caused by difference of temperature, or prevailing winds, and by the artificial current produced by the passage of quick trains."

"Its most dangerous enemy is frost In winter enormous icicles are sometimes formed by the gradual accretion, and if not removed would be very dangerous."

Of the Sapperton tunnel on the Birmingham and Gloucester section of the Midland railway, 1,760 yards long,* Mr. Storrow says, "the grade is very steep, 1 in 70, or 75½ feet to the mile. Hence, in running up the tunnel a great deal of power is required, and an assistant locomotive is kept constantly in use. This, of course, creates a large additional development of smoke and steam, so that after the passage of a single heavy freight train up, the smoke would fill the tunnel for hours, and be quite offensive. Formerly coke was used on English railways, but latterly coal (which, as we know, produces a much greater volume of smoke) is now universally used. All agree that this change has been very injurious in tunnels. At the Sapperton tunnel the assistant engine is usually run down the tunnel immediately after the train has passed up,

* See note, page 373.

and thus assists in clearing away the smoke, but a quick passenger train running down the steep incline at great speed is found to be far more effectual, and is indeed the only effectual ventilation." *

"The inspector of the road, who accompanied me, thought the opening in the shaft of some use, and said the men wanted it. The superintendent thought it of no use whatever, and that it was something of a nuisance from the water which dripped from it. He was of opinion that after a tunnel was constructed, it would be better to close all shafts, and to trust to quick trains for ventilation. As the tunnel now is, the men continue in it all day, whenever necessary, though they do not like it, but if two freight trains should follow each other without the smoke being cleared away, it would be very difficult for them to work, and if four trains followed each other, it would be impossible."

In confirmation of the view that tunnels are better for ventilation without shafts, than with them, Mr. Storrow gives the particulars of interesting conversations he had with Mr. Brotherhood and Mr. Brassey upon the subject. Both say that numerous shafts are unnecessary for ventilation. They make eddies and currents, and interfere with each other. Mr. Brassey particularly says, that the passage of a train at quick speed is the best ventilator.

On the whole, although opinions are divided in England, as to the use of shafts for ventilation after a tunnel is completed, it leans rather to the side, that unless in very long ones, shafts are of no use and had better be closed, as they are rather an interference with the natural current which difference of temperature, or prevailing winds, generally

* This is a suggestion that may prove of great value in the working of the railway through the Great Tunnel of the Alps.

occasion; they also interfere with the great ventilating agency of quick trains. A tunnel is compared by many engineers to an *inclined* chimney; and, as in the upright chimney, the draft would be impaired if there were several openings in its side, interfering with the direct currency of air for ventilation.

The Hauenstein Tunnel (already mentioned in our list of tunnels) is 2,731 yards long; it is straight throughout, and has a uniform gradient of 1 in 139. Three shafts were commenced in the construction of the tunnel—two only were completed, of which one, by a fearful accident through fire, that caused the death of between fifty and sixty persons, became irremediably choked up. The third shaft was used until the completion of the works, but it was closed immediately afterwards, and has not since been opened; the tunnel, therefore, is without ventilating shaft. We have, in the last three years, passed through this tunnel eight or nine times, and, notwithstanding the slowness of the pace, never experienced any inconvenience from want of effective ventilation. Mr. Storrow, who rode on the outside platform of the carriages (they are on the American plan), expresses the same opinion. The conductors of both the trains informed him that there is usually a current of air through the tunnels, and that the smoke disappeared in from fifteen to twenty minutes. Both complained of its being very wet from the dripping of water—a fact that we can fully confirm from personal experience.-

Even with goods trains, drawn by two heavy locomotives, which burned coals, although the tunnel was filled with smoke, Mr. Storrow did not find respiration so difficult as what he had often experienced when sitting in a room with a smoky chimney; and he remarked on several subsequent trips the same day, how quickly the tunnel became free of smoke.

The greatest danger to travelling in the Hauenstein, is the falling down, either of portions of the rock, through which the tunnel is pierced, or the giving way of portions of its lining, owing to the water, which is constantly falling, forming into ice. To exclude the cold, as far as posssible, a wooden screen, during winter, covers the upper part of the arch at each entrance, descending as far as possible, but allowing sufficient room for the funnel of the locomotive; there are also canvas curtains which may be drawn across the entrance at pleasure, and they are invariably so drawn in winter, except at the very moment of the passage of trains.

The chief engineer of the line is doubtful as to whether there ought not to be a shaft. At times the current of cold air through the tunnel is so strong, that it would be an inconvenience to the trains if not checked by the curtains. They also have the effect of keeping up a temperature in the tunnel sufficient to prevent the water that drips on to the rails becoming frozen in winter. Great trouble and inconvenience were experienced from this cause in the first instance. The freezing of water, lodged on the rails, has scarcely ever happened during the last few years.

The time that a train will take to pass through the tunnel of the Alps must now be considered. If it had been constructed throughout on the level, or with every favourable gradients, and that a train would be permitted to run throughout at express speed, it might be conveyed from entrance to exit in about twelve minutes. This gives a speed of say thirty-eight miles an hour. But with a gradient, the average of which is 1 in 45, anything approaching this rate of speed would be simply impossible.

Length, however, is not the only element that has to be taken into account.

M. Auguste Perdonnet, in his "*Traité Elementaire des*

Chemins de Fer" (Paris 1858-60), says with great truth: "Les fortes pentes sont plus nuisibles dans les soauterrains que dans toute autre partie, d'un chemin de fer. L'humidité empechant la boue, qui impregne les rails, de secher, l'ascension de fortes rampes y devient tres penible. Il faut, done, s'appliquer a les eviter plus encore dans les tunnels qu'a ciel ouvert." No matter how stoutly the tunnel of the Alps may be lined, and no matter how impenetrably the tunnel may act as a barrier against infiltration of water, it never can be free from moisture; not the moisture of a downfall of rain, which washes the rails and "makes things pleasant," but it will be one in which will be conbined, unchemically and therefore loosely, the steam of the engines condensed into water, minute particles of grease, and smoke; all three will, *inter alios locos*, find a resting place upon the rails, and they will thus create on them a thick, clammy, *pasty* moisture, which will sensibly diminish the engine's adhesion, and act as a most serious impediment to its progress. It will therefore be impossible with the foregoing elements, and with a gradient of 1 in 45, to calculate on a higher rate of speed from the Modane entrance to the centre than ten miles an hour, or six minutes to the mile—twenty-two minutes; and our belief is that to maintain even this rate of speed it will be necessary to have a fiercely burning fire in the fire-box and tubes, together with a plentiful fall of sand from the sand boxes on to the rails. As soon as the train has arrived at the centre, which is also the summit of the tunnel, the engine will get relieved, and with the gradient almost level the second half of the tunnel can, as a simple question of speed, be run at the highest possible rate. But although it may be safe, it certainly will not be expedient to do so. At twenty-four miles an hour the time required would be nine minutes; total, with twenty-two minutes for the ascent, thirty-

one minutes. As regards the journey from Italy to France, Can a higher rate of speed be permitted for the descent of the 429 feet in $3\frac{3}{4}$ miles than was allowed for the ascent? There appears to us to be but one answer—Certainly not. As regards danger, we believe that with efficient and powerful engines and proper brakes, in the hands of steady and competent men, the transit will not be attended with a particle of danger; but the question arises, Will travellers generally be of this opinion? Many of both sexes will undoubtedly consider that they are as safe in the tunnel as during any other part of their journey; but it is to be feared that the majority of persons who go through it will not only have vividly present in their minds a sense of actual danger from material causes, but also a belief that if they escape any damage from these causes, suffocation must be a natural result of going through seven and a-half miles of foul, fetid, and polluted atmosphere, in a long hole never less than three thousand, and for a tolerable distance five thousand six hundred feet, below the upper and outer surface of the mountain. Death, if it do occur, will be caused, not by actual suffocation, but from some action upon the nervous system, that will produce all the fatal symptoms of suffocation.

We have had no less than three very recent illustrations of death from such a cause, no later in fact than in August 1867; for during that month three inquests were held on three persons who had been taken out in a dying state from the London Metropolitan Railway. In each case the suspension of animation took place between Lisson Grove and King's Cross Stations, yet the distance (all in tunnel) between them only slightly exceeds two miles, and there are abundant means of ventilation at the three intermediate points, Baker Street, Portland Road, and Gower Street Stations. The verdict in the first case was "accidental death

from natural causes, accelerated by the suffocating atmosphere of the Underground Railway." "Death from effusion of serum on the brain" was the verdict in the second case—in other words, apoplexy; but as the medical gentleman who made the *post-mortem* examination, could not state at the inquest that the atmosphere of the railway had accelerated death, no reference to it was made in the wording of the verdict.

The third case, happening almost immediately afterwards, excited a good deal of alarm in the public mind; and the alarm was not lessened in consequence of the publication of several sensational articles in two or three London newspapers. Therefore, at the opening of the inquest held upon Elizabeth Stainsley, on the 28th of August, Mr. Myles Fenton, the General Manager of the company, requested an adjournment until time had been afforded to obtain analyses of the atmosphere of the tunnels. Professor Julian Rodgers, of the London Medical School, was engaged by the Coroner; Drs. Bachhoffner, Letheby and Whitmore by the company. At the adjourned inquest, held on the 30th of October, Professor Rodgers submitted his report, in which he stated that he had analysed and tested the air contained in the tunnels of the railway between Bishop's Road and King's Cross Stations, and he had made comparative experiments in other tunnels. "The atmosphere in a pure condition," continued Professor Rodgers, "consisted of a volume of 79·19 measures of nitrogen, and 20·81 of oxygen; and every 10,000 measures of air contained from 3·7 to 6·2 measures of carbonic acid. On the 4th of September he found that, in 17 cubic inches of air taken from each of the tunnels between the hours of 3 and 5 p.m., tested for carbonic acid, with the exception of the air from the Gower Street and King's Cross tunnel (which contained a more notable quantity), only a

slight trace of the acid was indicated. On the 10th of September, between 10 and 11 p.m., he determined the quantity of carbonic and sulphurous acids contained in 17 cubic inches; and during his transit backwards and forwards from King's Cross to Bishop's Road he found 13 meaures of carbonic acid in 10,000 of air, and one measure of sulphurous acid in 40,789. Carbonic acid was evident in 17 cubic inches of the air taken from the Gower Street and King's Cross tunnel. On October 2, in the same tunnel, he found 18·7 measures of carbonic in 10,000, and one measure of sulphurous acid in 23,913. On October 28, between 8 and 9, p.m., he found traces of carbonic evident, in 17 cubic inches in all the tunnels. On the 4th of September he found that the following were the per centages of oxygen in the tunnels :—Bishop's Road, 20·48; Edgware Road, 20·60; Baker Street, 20·30; Portland Road, 20·10; Gower Street, 18·7. In the Blackheath tunnel, on September 28, it was 20·0. The air of Pimlico on September 21 contained 20·9. On October 24 the per centage was as follows :—Box Tunnel, 20·3; Birkenhead Tunnel, 20·1; Wolverhampton Tunnel, 20·5; at Wellington Barracks, 22·42, at 2 feet 6 inches from the floor."

Replying to the Coroner, Professor Rodgers said he did not think the deficiency of oxygen would act injuriously upon a delicate person passing through the tunnels; and he considered that the amount of carbonic and sulphurous gases in the tunnels could not have been injurious to the woman. There was not a sufficient accumulation of these gases to be of injury to the public health. The woman had eaten heartily, was laced tightly, and had a diseased heart; he, therefore, did not think the deficiency of oxygen could have hastened her death.

The joint report of Drs. Bachhoffner, Letheby, and Whit-

more was then read and put in evidence. It stated that the analysers collected samples of the air on three separate occasions:—First, immediately after the trains had ceased running at night; second, just before they commenced running in the morning; and third, in the afternoon, between four and five o'clock, a period of the day when there was generally the largest amount of traffic. The samples, twenty-eight in number, were analysed for sulphurous acid, carbonic acid, carbonic oxide, coal gas, and oxygen. The presence of sulphurous acid having been sought by the most delicate chemical test—namely, its action upon iodic acid and starch, which was capable of showing the presence of one part by volume of sulphurous acid in 100,000 parts of air, but by such test the presence of that acid could not be detected; and from this the analysers concluded that its volume was less than the above in the tunnels. The mean proportion of carbonic acid was about 6 in each volume of 10,000. The amounts of coal-gas and of carbonic oxide were so small as to be barely discoverable. The amount of oxygen in the tunnels and stations was not in any case deficient. These results proved that in no instance was the air found to be vitiated to any material extent, although the air taken in the afternoon was less pure than that taken at night. The presence of sulphurous acid gas in the tunnels and stations, which at times was appreciable to both taste and smell, must not be taken as an indication that this gas existed in dangerous quantities, for as little as one part of this gas in 100,000 parts of atmospheric air was strongly perceptible both to taste and smell. The partial combustion of the wood forming the breaks, when acting upon the tires of the wheels, also produces a pungent smell. The analysers were of opinion that, having regard to the cubical volume of the trains,

the short time occupied by them in passing through the tunnels and stations, the large volume of air they displaced, and the increased impetus given to the horizontal movements of the air by the rapidity of their transit, the vitiation of the atmosphere could not be of a serious character, and this accorded with the results of their analysis. The tunnels were dry and free from infiltration of liquid or other matters prejudicial to health. The general health of the *employés* of the company was such as to afford unquestionable proof of the sanitary condition of the air in the tunnels. The report ends thus :—"From the foregoing facts, we are enabled confidently to state that the atmosphere of the Metropolitan Railway is not unwholesome or injurious to health."

Mr. Fenton, general manager, and Mr. Driscoll, an inspector of the company, having been examined as to the improvements made in the ventilation of the tunnels, and the absence of complaint from *employés* of the company, or from passengers with respect to the atmosphere, the jury, almost without hesitation, returned a verdict of "Death from natural causes."

The singular fact was elicited at the inquest that the peculiarly "pungent smell" of the tunnel is due rather to the friction of the brakes, than to any other cause. The partial combustion of the wood produces a pyroligneous carbo-hydrogen, as Dr. Letheby styled it, together with a small amount of sulphurous acid gas. These the nose and lungs will detect sooner than the most delicate chemical tests, and they are the real producers of the coughing and unpleasant feeling experienced by some passengers. Such vapours, however, only affect delicate people. This will account for the fact that people, travelling through ordinary tunnels, are free from irritation and coughing. The Metro-

politan Railway is the only tunnel in which, owing to stoppages at intermediate stations, it is necessary to put the brakes on.

The efforts made by the company to ensure the best ventilation and purest atmosphere possible, are unremitting. Before the opening of the line an extended series of experiments was made with various specimens of coke supplied by all the leading coke manufacturers in the kingdom. That which best bore the crucial tests, to which the specimens were submitted, is the coke supplied by Messrs. Straker and Lowe from their Brancepeth Collieries near Durham. Coke for locomotives, and other purposes, is usually burned seventy-two hours. When coke of a very superior quality is required (so that all sulphurous and noxious vapours may, as far as possible, be consumed) it is burned ninety-six hours, but all coke used on the Metropolitan Railway is burned twenty-four hours more—that is 120 hours. Special ovens have been built for burning it, and when the process of combustion is completed, the coke is, what is well known in railway locomotive phraseology, "hand picked." Thus, only the bright coke of each burning is allowed to be sent to London; any outside or dirty coke, however good it may be in reality, being kept back. It is, therefore, impossible to procure, in the whole range of fuel, any more free from ingredients likely to produce unpleasant smell, or to affect respiration.

A few words must be said with respect to the peculiar construction of the engines. In the first place the parts are so arranged that no steam whatever escapes into the tunnel. This is accomplished by having a large tank on each side of the engine. These tanks together contain about 1,000 gallons of water. The exhaust steam is turned into them, instead of through the funnel in the ordinary way. The

second peculiarity of the engines is that they are constructed with large heating surface. The steam is raised to a pressure of about 130 lbs. at starting, and by the time the journey through each tunnel, between station and station, is performed, it has been reduced to about 80. The damper is kept on during the entire journey. It will thus be seen that the combustion of fuel in each tunnel must be very small indeed, the fire being simply kept in, without any draft through the fire box.

Recently, the directors of the company, with the view to satisfying public feeling in every possible way, forwarded to the Vestries of St. Marylebone and St. Pancras, applications for permission to effect openings to the external air at several points of the Marylebone and Euston Roads—where important roads cross this thoroughfare—by means of handsome and ornamental hollow columns, which should be connected with the railway, and would support street lamps similar to those now placed at frequented crossings in various parts of the town.

It is a fact beyond all question that, unvaryingly, there are fewer persons belonging to the staff of the Metropolitan Railway, in proportion to their numbers, absent from duty on account of illness, than on other railways. We have seen returns, fully confirming the statement to this effect. We believe they were published by Mr. Myles Fenton, in the newspapers a few months ago.

During the year ending the 30th of June, 1867, the enormous number of 22,458,067 passengers* were conveyed by the Metropolitan Railway Company without acci-

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* The largest number of passengers ever conveyed in one day was on the 10th June, 1867 (Whit Monday), 113,075. The total carried that week was 542,833.

dent, injury, or (as far as the world knows) ill effects to any one of them.

There is a source of danger in connection with travelling through a long tunnel with a bad gradient, that a recent occurrence in the Dove Hole tunnel of the Midland Railway (a tunnel to which special reference is made at page 372), suggests. The accident is so extraordinary in its character that a brief account of it at present will not be out of place. It appears that on the 9th of September last, a ballast train had gone into the tunnel with the intention of the permanent way men supplying it with ballast. Whilst it was at a standstill and the men were at work, a cattle train, consisting of twenty-seven trucks, and drawn by two powerful goods' engines, was permitted to enter the tunnel. This cattle train came into collision with the ballast train, when, among other results, one was that the coupling chain which connected the cattle trucks to the engines broke. The trucks thus freed began to descend the incline, which, as already stated, is 1 in 90; their *impetus* increased each moment, and by the time they emerged from the tunnel, *on the wrong line*, they were travelling at express speed. Notwithstanding a slight change in the gradient, they went on at that rate for eight miles, continuing always, of course, on the wrong line. At that point the trucks came in collision with the engine of an express train from Manchester, which had been standing on its own proper line waiting for the signal it should receive before proceeding onwards. The driver of the express train engine perceiving in a moment what was occurring, reversed his engine, put on full steam, and then jumped off, very unfortunately for himself. But the engine had not sufficient speed upon her to prevent a collision with the cattle trucks. The greater part of these latter were literally crushed to atoms; and, perhaps, fortunately, the cylinders of the

express train engine were burst by the collision. This allowed a great escape of steam, and it was ultimately, combined with the presence of mind of a pointsman, the means of the engine not doing more mischief than shaking some and frightening all the passengers travelling in the train belonging to it. Not so five drovers who were in the brake-van of the cattle train: they were killed, and, apparently, their deaths were instantaneous. Such an accident as this is not likely to happen in the tunnel of the Alps; but, suppose a coupling iron broke, and with it the coupling chains, on the French or ascending side, would the brake power attached to the carriages be enough to check their downward speed? At all events, it must not be forgotten that the average gradient on the French side of the tunnel is 1 in 45 (117 feet in the mile), or exactly double as steep as that of the Dove Hole Tunnel, and that the Modane entrance of the tunnel of the Alps is 1,216 feet above St. Michel, consequently there is an average fall per mile during the whole twelve miles of 1 in 101, or at the rate of 50 feet in the mile, and as there will be no intermediate station, carriages if they came to be detached, and had not sufficient brake power to arrest their progress, might continue to run the whole of this distance at high speed, and *on the wrong line.*

[For minute details relating to the construction of the Tunnel of the Alps, up to 1862, and to the means of supplying ventilation during its progress, the reader is referred to the interesting report of Mr. Storrow, embodied in that of the Commissioners of the State of Massachusetts on the Troy and Grenfield Railroad, and of the Hoosac Tunnel, dated the 12th of March, 1863; also, to an article on the Tunnel, in the *Edinburgh Review* for July 1865, No. 249.]

CHAPTER XIV.

ITALY—THE EASTERN MAILS—SICILY.

Arrived in Italy, either by the Mont Cenis Railway, or by that through the Tunnel of the Alps, we have in front of us a Peninsula which juts for an extent (taking Susa as the extreme northern point and Otranto as the extreme southern) of 765 miles into the ocean. On the east, the ocean is called the Adriatic; on the south as well as on the west, the Mediterranean, a sea that contains within its limits a surface of 579,000 square miles.

We have already described the mighty railway company, *Alta Italia*, 2,565 miles in length, of which, since the close of the war of 1866, 1,349 belong to the South Austrian Division, and 1,216 to that of *Alta Italia* proper. If we are on our road to Brindisi, we arrive at the end of *Alta Italia* at Bologna, and, at that station come upon *Ferrovia Meridionale*. From Bologna, the line, proceeding southwards but also verging towards the eastward, gets to the Adriatic at Rimini, and thence, hugging the shore, it touches at Ancona, distant 127 miles from Bologna. From Ancona it still follows the shore of the Adriatic, except that at the Spur of the Boot it passes inwards through Foggia, 331 miles from Bologna. It is at this point that the line which is to unite Naples by the shortest possible railway connection, with the Adriatic, branches off. Its total length will be 124 miles; 43 are now open for traffic, 68 will be finished in the summer of 1868, leaving only a blank of 12 miles to be continued. Unfortunately, however, on these 12 miles, situated in the very heart of the Apennines, are concentrated the greatest works of the railway—three tunnels, one of which will be 2 miles and 17

yards long, and when completed will be the longest railway tunnel in Italy; the two others will be of the united length of 2 miles and 890 yards.

Reverting to Foggia, the main line, proceeding southerly and easterly for 145 miles, reaches Brindisi, 470 miles from Bologna, 711 from Susa, 1,180 from Paris, and 1,477 from London.

Captain Tyler, in his interesting Report of 1866, reviews the relative capabilities of the several harbours of Italy for the receipt and despatch of our Eastern mails, and without hesitation, names Brindisi as the one that should be selected. The harbour is composed of an outer port of about $1\frac{1}{4}$ mile long by about half that distance at its greatest width. It is connected by a channel 290 yards, or the sixth of a mile, with two inner harbours or arms, the western of which is to be the Packet Harbour. The Italian Government have important works going on at Brindisi, and their objects are the security of the outer port, the deepening of the channel, and the facing of the channel that connects the outer and inner ports, as well as the sides of the latter, with solid masonry. During 1865 and 1866, 1,800,000 cubic feet of excavation were accomplished and very considerable progress has been made with the masonry, but at the present moment the works rather flag. It is stated, however, by the Government authorities, that as soon as it is decided that the British Contract Steamers carrying the Eastern mails to and from Alexandria, shall make Brindisi their port, the works will be resumed with great vigour. The present depth of the channel is $19\frac{1}{2}$ feet, but this depth is to be increased to 26 feet at low water, not only at the channel, but at the passenger jetty (to which the railway will be extended), and alongside the coal depôt. This depth would be sufficient for the largest steamers of the Peninsular and Oriental, or of any

other company, and with the view to affording suitable accommodation for large ships in case of need, it has been decided to construct immediately a dry dock, 380 feet long, at an estimated cost of £100,000. At the entrance of the outer port, and for a quarter of a mile within it, the depth of water will be from 28 to 37 feet. The rise and fall of tide at Brindisi is not more than 1½ foot. A plan of the harbour is appended.

Whilst at Brindisi, it is impossible to omit reference to its future with respect to the conveyance of our Eastern mails to and from Alexandria. This subject is divisible into two portions—conveyance of the fast and conveyance of the heavy mails. These mails go at present respectively *viâ* Marseilles and *viâ* Southampton. A contract now in course of completion between the Post Office and the Peninsular and Oriental Steam Navigation Company is about to bind the nation to the Southampton route for *twelve years*. It admits, however, of the transfer of the fast mails *viâ* Marseilles being likely to take place at a period more or less proximate. If the reader will be so good as to refer to Appendix No. 3 in this volume, he will see a memorandum in which the course of the Eastern mails, both fast and heavy, is indicated, and the vast difference between the time that letters take in their conveyance by the two routes—that is, *viâ* Southampton and *viâ* Marseilles. This difference will continue until all mails, both fast and heavy, are carried (as eventually they will be) by Brindisi.

The following table exhibits the relative distances between London and Alexandria by the three routes. The computation is in English miles.

Viâ.	Land.	Water.	Total.
Southampton	78	3,353	3,431
Marseilles.....	833	1,701	2,534
Brindisi.....	1,477	954	2,431

There is therefore a less distance *viâ* Brindisi than *viâ* Marseilles of 103 miles; than *viâ* Southampton of 1,000 miles; but, as Captain Tyler says—"Apart from contingencies, which must be always greater by sea than by land conveyance, the speed on a railway is usually double that at sea," hence the captain strongly recommends the Brindisi route, not only on account of its being the shortest between London and Alexandria, but likewise because the land portion exceeds that *viâ* Marseilles by 644 miles, and that *viâ* Southampton by 1,399 miles. As a question of time, the computation made is as follows:—Southampton fifteen days, Marseilles eight days one hour, Brindisi six days seven hours.*

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* It will be seen by the subjoined extract from the *London and China Telegraph* of the 15th November, 1867, that a contract for the conveyance of our Eastern mails (referred to *ante*, page 241), has been entered into between the Government and the Peninsular and Oriental Steam Navigation Company. Henceforth, the service to and from Egypt and India will be weekly, instead of four times a month; to and from China, fortnightly, instead of twice a month; to and from the Australian Colonies, once every four weeks, or thirteen times a year, instead of twelve times, or once each calendar month, as at present. It will be perceived that, as usual, St. Martin's-le-Grand is opposed to a more complete postal system, because the outlay involved "is more than the Post Office will sanction." The service is undoubtedly an improvement on the existing one, but it falls far short of what will have to be conceded, probably even within another twelvemonth.

"At length the terms of a new contract for the conveyance of the India and China mails have been arranged with the Peninsular and Oriental Company, and the new service, which will come into operation in February next, will be organised on a basis which in most respects must be considered very satisfactory. The contract is for a longer period than the previous one, and its terms are much higher. The Marseilles route will still be adhered to, and between that port and Alexandria there will be a weekly direct line of steamers in conjunction with a weekly line between Suez and Bombay. The Bombay mails will be made up in London each Friday evening, and the service abroad will be arranged with a view to insure the delivery of the homeward mails in London on Monday morning. There will be a fortnightly service between Suez and Calcutta and China, connecting at Galle, as at present; and the mails for these

The contrast between the weight of the Eastern mails carried in 1850 and at the present time is marvellous. Then the annual number of boxes despatched, the average weight of each of which was about 60 lbs., was under 2,500; in

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places will be despatched with every alternate Bombay mail. In like manner the homeward China and Calcutta mail will be timed to reach Suez simultaneously with every alternate Bombay steamer. In short, the China mail in future will be a fortnightly one, instead of twice in the calendar month; it will be despatched every alternate Friday, and delivered here, all circumstances being favourable, every alternate Monday. On this side of the Isthmus the whole system will consist of a weekly vessel between Marseilles and Alexandria direct, with another to and from Southampton, touching at Malta as at present. It will be observed that no contract has been made for a line between Brindisi and Alexandria; as the port of Brindisi could not be substituted entirely for Marseilles, an extra service has been decided against, on the score of outlay. The Australian mail will be once in every four weeks, joining the China steamer at Galle, as at present. The advantages of the scheme are obvious. The uncertain intervals between the making up of the mails, owing to the difference in the lengths of the months and the intervention of Sundays, disappear in favour of a system of regularity and fixed days. The partial amalgamation of the two services cannot fail to have a favourable effect in promoting increased punctuality in the delivery of the inward mails. The days selected for despatch and arrival are beyond doubt the most suitable ones. And it is satisfactory to know that the new era we are about to enter upon is a permanent and not an experimental one. It will be observed that the existing system of one line between Suez and Calcutta, and another between Bombay and China, with transhipment at Galle, is still to be retained, instead of giving place to the direct trunk line from Suez to Hongkong that we have always advocated. We must, however, rest content with this arrangement for the present, as the outlay involved by the direct line is more than the Post Office will sanction. We are assured, however, that the boat from Calcutta will always be despatched in time to avoid the possibility of detention to the China mail. It will be seen that the new service, however satisfactory in itself, will not harmonise with the French line at all; indeed, if the Messageries steamers continue to be despatched on the 19th of the month, probably in most cases the facilities at present offered by the French mail will be absolutely nullified. We imagine, however, that the French company will find it expedient to make a corresponding alteration by despatching their vessels on a given day in every fourth week, so as to bring their departure midway

1867 it is at the rate of 25,152. It is true that since 1858 the Australian mails are conveyed by the overland route—they are only despatched once a month, both *viâ* Southampton and *viâ* Marseilles, but then they form nearly two-thirds of the total weight of the mails; they swell the number of boxes from the average of 524 to 1,347.

But we must ask our reader to continue his land journey a little further south than Brindisi, just for a moment, so that he may get to Lecce, twenty-five miles. This is as far as he can go by railway towards Otranto, twenty-nine miles farther at the very extremity of the heel of the boot of Italy, the Castle of which used, in the days of our boyhood, thanks to Horace Walpole, to enchain, enchant, delight and to terrify us. We feel bound to acknowledge the fact that we are exactly forty-five years older than we were forty-five years ago. We fear we must also confess to a sense of terror about Otranto that can only cease with our own cessation. We are therefore not surprised that even Captain Tyler, stout, resolute and brave as he is, did not wish to go to Otranto. "I did not," says Captain Tyler in his report of 1866, "even

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between two of the Peninsular and Oriental mails. We trust some such arrangement as this will be urged by our own Government on that of France. We may add that Saturday is the day fixed for both arrival and departure of the Southampton steamers, and that the duration of stay at Singapore, and the question of calling at Penang, are still undecided."

By the now existing contract the company have a subsidy of £230,000 per annum, equal to about 4s. 6d. per nautical mile. By the new contract the subsidy will be £400,000 per annum, or at the rate of 6s. 1d. per mile. There are two new and special conditions attached to the contract. It is to be for twelve years instead of six, as heretofore; and when the net profits of the company exceed 8 per cent., a fourth of the surplus is to go to the Post Office, it being understood, on the other hand, that when the dividend sinks, from unavoidable causes, below 6 per cent., the subsidy is to be raised to an amount that will cover the deficiency, but it is not, in any case, to exceed £500,000 a year.

consider it worth while to visit Otranto, although I made a personal inspection of all the other Italian Ports to which I have referred, as well as those of Naples and Genoa." In other words, Captain Tyler visited every Italian Port except one, and that one was Hob-gob-lin!

The connection of the *Ferovia Meridionale* with the network of the *Calabro-Sicula* is effected by means of a branch given off at Bari, half way between Foggia and Brindisi, and running for seventy-two miles south to Tarento, situated at the very top of the front of Italy's heel. Whilst Brindisi is intended to be the commercial port of Italy towards its southern extremity, Tarento is to be its great southern port for military purposes. The extent and depth of the outer harbour, its great natural advantage in a military as well as in a naval point of view, and the extent of the *"seno interno"* or inner expanse of deep water, render it admirably applicable for a naval arsenal. It will therefore eventually fulfil for Italy the purposes which Plymouth fulfils for England, while Spezzia on the Mediterranean, half way between Genoa and Leghorn, may be considered as Italy's Portsmouth.

The main-land as well as the Sicilian portions of the *Calabro-Sicula* are at the present time very much longer on paper than on *terra firma*. The longest of the Calabrian sections is, when completed, to extend from Tarento all along the undersole of Italy as well as to the ball of the foot, and thence to its very tip-toe at Reggio, a distance of 300 miles; but although ten years have elapsed since the railway works were taken in hand, only the ten miles nearest to Reggio have as yet been completed. As, however, the Italian Government has recently made a loan of £720,000 to the company, the works are carried on actively, and it is probable that half-way in 1868 (portions perhaps earlier) 127 miles, in two sections, of which one from Tarento

westward will be 90 miles, and the other will extend the line from Reggio 47 miles, will be ready for traffic. Of the remaining 163 miles to complete the continuous railway tie along the sole of Italy, some slight progress has been made on 56 miles, none on 107.

In reply to a question put by us to a gentleman of the administration of the company, to whom we are mainly indebted for the foregoing information, "Quando sarā terminata la Linea—Tarento—Reggio?" we were told, "Non è dato respondere a questa domanda senza conoscere di quali mezzi la societa potra disporre;" and we received precisely the same answer in respect of the Sicilian lines of the company.

The distance between Reggio and Messina is exactly $7\frac{1}{2}$ miles. As we are here on the dominions of Scylla and Charybdis, it is no wonder that the steamers of the company, which ply backwards and forwards in connection with its trains, are often impeded by the numerous currents and the heavy gusts of wind that prevail in the Straits of Messina. Nevertheless, the passage from port to port is usually made in less than an hour, although at times the navigation is so difficult and dangerous, that, in winter, the Royal Postal Steamers of the Italian Government are occasionally unable to land their mails at Reggio, and are compelled to carry them on to their next port of call.

We live in an age of wonders. M. Oudry, one of the engineers of the *Ponts et Chaussées* of France, proposes to cross over the Straits of Messina with a suspension bridge of four spans, each 1,000 metres, or 3,281 feet long. The bridge (which is to be made available for railways) would thus be 4,200 metres, or two miles and five-eighths long, exclusive of the great sustaining piers at each edge of the water. M. Oudry selects this width in preference to the

narrowest part of the Straits, which is 3,200 metres, exactly two miles wide, because at the spot of his selection the depth of his two central piers, *under water*, would be only 110 metres; whereas, if he took the narrowest part of the Straits, his two piers must be of the under-water depth of 130.

The lower surface of the platforms should, in M. Oudry's opinion, be 50 metres above high water, and to that elevation he proposes they should be carried. The towers of the piers being, say, 40 metres higher, the total pier elevation to be constructed, exclusive of foundations, would be about 200 metres, exactly half as high again as the top of the cross of St. Paul's. Semiramis, after a repose of nearly 4,900 years, should be started into life again, together with her two millions of Assyrians. Her greatest elevation, however, was only 350 feet—the walls of Babylon—270 feet short of the piers of M. Oudry. To be sure the walls were said to be seventy miles long, and wide enough at top for five chariots.

Of the total length of railways contemplated and sanctioned for Sicily—347 miles, 82 are opened for traffic, of which 59½ are from Messina (passing in its course at the foot of Mount Etna) to Catania, in the direction of Syracuse; and 22½ from Palermo to Marsala. It is a striking illustration of the rapid development which takes place through the opening of railways in a fertile country, that the traffic receipts per mile on the Sicilian sections opened have, since the commencement of 1867, been at the rate of £640 per annum. The directors of the company consider (apparently with justice) this amount as indicating very satisfactory results for the future.

Whilst upon the railways in the extreme Southern Italy, we wish to mention a non-feasible theory that has been propounded to us during a visit we paid to Italy in July last. As England is to have her overland route to her Eastern

possessions through Brindisi, why should not France find her way to Algeria by Reggio, and thence to Marsala, from which latter port the city of Tunis is only separated by some 90 miles of water? From Tunis to Constantine, and thence to Algiers, the measurement is 400 miles. But while the distance from Paris to Algiers, *viâ* Marseilles, is 1,100 miles, that *viâ* Reggio is 2,297, in which are comprised 500 miles of intended railway, the construction of which is not likely to be accomplished for several years to come.

"The world," says the *Pall Mall Gazette* in its recent review of Alfred Von Reaumont's Work, *Geschichte der Stadt Rom*,* "may be divided into those who have been to Rome, and those who wish to go there, with more or less of looming hope that the wish may be gratified." For the wishful and the hopeful there are facilities that did not exist even twelve months ago. The "Roman Railways" Company is the second, both in length and importance on Italian soil, as it consists of 1,024 miles "*en exploitation*," and by it, not only Rome, but Naples may be approached from the north, either *viâ*

* The Government press of Rome has just published the census of the population of the city for 1867:—The city and the suburbs are divided into 59 parishes, containing a population of 215,573 souls, being an increase since 1866 of 4,872. Of these 30 are cardinals, 35 bishops, 1,469 priests and ecclesiastics, and 828 seminarists. The occupants of religious houses are 5,047, 2,832 being monks and 2,215 nuns. These belong to 61 different congregations or orders. There are also 49 seminaries or colleges, among which are the French Seminary, tenanted by 48 pupils; that of South America by 50; that of North America by 33; the German Seminary has 58 pupils; the English 21, and the "Pie Anglais" 14; the Scotch 12; and the Irish 52, &c. The number of males educated in colleges amounts to 258, and females in *pensionnats* to 1,642; 775 males and 1,088 females live in charitable institutions. The number of families is 42,313, composed of 98,176 males and 93,438 females—to whom must be added 7,360 following the military profession, 320 *detenus*, 4,650 Jews, and 457 other dissidents. There have been 1,615 marriages contracted during 1867.

Florence or *viâ* Ancona, and there is a net-work of lines running farther south than Naples, which will ultimately join at the Sole of the Boot, with the Calabro-Sicilian Railways. Summed up, the railway mileage of the whole Italian Peninsula now open for traffic is 3,040 miles. There will be further openings of them, to the extent of about 250 miles before the end of 1868; but as regards lines projected, or to which even the words "*en construction*" may be applied, we must wait for their realisation until the whole system of Italian finance and of Italian credit has been put upon a more solid basis than that upon which it is at present founded. But thanks to railways as they now exist towards and in Italy, the traveller, bent on tip-top speed, can leave London on any morning of the week, and even now, before the opening of the Mont Cenis Railway is accomplished, he can reach Turin before the chimes of the innumerable, and not always correctly-going public clocks in that city have struck twelve the following night. Of these clocks it is said that a person knowing them well, may start on a perambulation through the city as the first commences striking twelve and complete a circuit in which he shall never be out of public clock hearing, just as that from which he started is striking one. When the Mont Cenis Railway is opened, the traveller in search of haste can reach Turin in time to start that night for Florence, and arrive there at eight o'clock the following morning—forty-eight hours from London to Florence—What distance? 1,122 miles. Resting in the city for thirteen hours, he can proceed at 9.10 p.m. to Rome, the distance of which from Florence, 233 miles, he can accomplish in nine hours and twenty minutes, which includes Frontier Visa, both of luggage and of passport. If he be determined not to tarry at the Eternal City more than four hours, he can proceed on his way

for Naples, 163 miles farther, and be there 21 hours after he has left Florence, and (including his 13 hours pause there) 44 after he has left Turin, 70 after he has left Paris, 83 after he has left London; from which Naples is distant by railway measurement exactly 1,518 miles.

The railway distance from Florence to Rome will be lessened some thirty miles by the opening early next year of the line *viâ* Orvietto. It will also, of course, lessen to the same extent the journey between Florence and Naples, but in some years hence the railway between Southern and Northern Italy, avoiding Florence altogether, will be shortened by 93 miles, that is, when two unfinished portions of line along the west coast of Italy, one between Genoa and Spezzia 57 miles, and the other, the portion of the line between Civita Vecchia and Leghorn, nearest to the former, 36 miles, are completed. The works required upon these lines will be extremely heavy and extremely costly. How the money is to be found for them passes even conjecture, at the time of our present writing.

"*Vede Napoli e mori.*" We have seen her; we obey the injunction, and we depart in peace with but one word on dying lips,

FINIS.

APPENDIX, No. 1.

Report by Mr. Edward Page, Inspector-General of Mails, on some points connected with the relations between the Post Office Department and Railway Companies.

(See page 85.)

General Post Office,
29*th February*, 1856.

Sir,

In the First Annual Report of the Postmaster-General, presented to Parliament last year, it is stated by Lord Canning as one of the reasons for instituting such a report, that "many misapprehensions arise from an imperfect knowledge of matters which might, without any inconvenience, be placed before the public."

That such misapprehensions do exist as to several matters connected with the railway branch of the Post Office Service has lately been exemplified in an address by Mr. Robert Stephenson, M.P., on his election as President of the Institution of Civil Engineers.

In that address Mr. Stephenson (no doubt without any intention whatever to mislead) puts forward, in effect, the following statements, which I believe to be inaccurate :—

1st. That the scheme of penny postage, to the extent to which it has so far been developed, would have been impracticable, or, if practicable, unremunerative, but for the facilities afforded by railways for conveying bulk.

2nd. That railway companies, instead of being liberally treated by the Post Office, are called upon to perform the service of that department at a rate of remuneration which affords little or no profit.

3rd. That the Post Office has lately entered into a competition which is injurious to railway companies, by conveying books and other parcels at very reduced rates.

My object in this Report is to direct your attention to the facts on which, in my opinion, the Post Office is entitled to rely in opposition to the above allegations, the last of which has likewise been recently adopted in the Report of the Committee of Consultation of the London and North-Western Railway. It may perhaps be the desire of the Postmaster-General to furnish, in his Report for the current year, some corrections of these misconceptions, the more especially as Mr. Stephenson states, in the very outset of his address, that his chief object is to suggest topics for communications and discussion at future meetings over which he may have to preside. Such a correction is the more necessary, because there is reason to apprehend that these and other similar opinions which have been at various times promulgated have, by being made the ground for claiming special additional payment for the mail service, affected to a certain extent the arbitrations between the Post Office and railway companies, and have thus acquired practical importance.

On the first point (taking the subjects in the order in which they are named above), it is hardly to be wondered at that the public generally should be led to form erroneous impressions, seeing how imperfectly the details of the Post Office are usually understood. But it will not be difficult to prove that the conclusion arrived at by Mr. Stephenson cannot be supported, and to show that the increase which has taken place in the weight of the mails would have presented no difficulty to their conveyance by mail coaches, and that since the transfer of the mails from coaches to railways, the cost of transmission has increased in a *far greater degree* than it would probably have done had railways never been constructed.

I should premise that it has been ascertained from returns kept by the department, that while the whole number of chargeable letters delivered in the United Kingdom has increased about six-fold, the increase has been about nine-fold with respect to

letters to and from London; and the same remark applies, although the increase is in a somewhat different ratio, to newspaper and book parcels. If, therefore, it can be shown that the weight of mails at present despatched from London (which greatly exceeds that of mails brought to London) could have been carried by mail coaches, it follows that no difficulty would have arisen with the mails in other parts of the country, where the increase of weight has not been so large.

The actual increase in the weight of the mails has been much less than is generally believed. It is often supposed that, because the whole number of letters has, since the introduction of penny postage, increased six-fold, therefore the whole weight of the mails has also increased six-fold. But when it is recollected that by far the larger portion of the mails has always consisted of newspapers, which were not in any way affected by the scheme of penny postage, it will be obvious that it would require a very large increase in the weight of the small or letter portion of the mails before the total weight would exhibit more than a small per centage of increase.*

In 1838 the gross weight of the night mails despatched from London in a single evening was about 4 tons 6 cwt. 1 qr. At the present time the total weight of the night mails despatched in a single evening may be stated at about 12 tons 4 cwt. 3 qrs. It will be seen, therefore, that the total increase in the weight has been only 183 per cent., or less than three-fold.

Mr. Stephenson correctly states that in 1838 the number of mail coaches leaving London each evening was twenty-eight, giving an average load for each coach of 3 cwt. 9 lbs., supposing the weight to have been equally distributed, which I am far from assuming

* It appears, from the Third Report of the Select Committee on Postage, 1838, page 49, that in the mails despatched from London at that time, the chargeable letters formed only 7 per cent. of the whole weight. An increase in the number of those letters to nine-fold, or by 800 per cent., would therefore advance the total weight of the mails by only 56 per cent., or little more than one-half, even if the average weight of a letter had continued the same. That average has, however, been considerably reduced.

was the case. Taking the present weight of mails, and assuming that these twenty-eight mail coaches were still running, the average load for each coach would be 8 cwt. 3 qrs. Now a reference to the Third Report of the Select Committee on Postage in 1838, pages 48 and 50, will show that, according to the testimony of the Post Office witnesses* (the general tendency of whose views was certainly not at that time favourable to the practicability of penny postage), a weight of bags amounting to 18 cwt., or more than double what the present average load would have been, was sometimes carried on one mail coach, and that a load of 15 cwt., in addition to the usual limited number of passengers and luggage, was by no means too high a maximum to fix for mail coaches generally.

Admitting, however, that the weight was not equally distributed over all the mail coaches, and recollecting, at the same time, that this average load of 8 cwt. 3 qrs. would be above the average ordinary load on any other than weekly newspaper nights, when it would no doubt be higher, the inference is still a fair one that the greater part of the mail coaches would have borne the increase of weight without any difficulty, although there can be no doubt that, on some of the lines, additional coaches would have been required for a portion of the distance.

But the result which the above calculations justify is a great deal more favourable than is at all necessary for the purpose of disproving Mr. Stephenson's argument, that the expenses of carrying out penny postage would have been so large as to have entailed a certain loss.

Let us suppose that, partly to meet the increase of weight, either daily or on the heavy newspaper night only, and partly to provide for the establishment of additional day mails (they were already in existence on some of the lines), the number of mail coaches would have been doubled all over the kingdom, and that

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* The evidence more particularly referred to is that of Mr. Louis, the Surveyor and Superintendent of mail coaches, who had a thorough knowledge of the details of the service under his control.

their cost would also have been doubled (an improbable supposition, considering the increase in the number of passenger coaches which must, in the absence of railways, have necessarily taken place to meet the increase of traffic). The expenditure of the department for mail-coach service would in that case have been advanced from £155,000* to only £310,000 per annum, while the present expenditure for the railway and mail coach service of the department is £443,000, of which sum £400,000 is paid to railway companies alone. Not only, therefore, would penny postage without railways have been both practicable and remunerative, but it would have been even more profitable (assuming the existing increase of letters) than it now is.

In order to show the impracticability of carrying out the penny postage system without the use of railways, Mr. Stephenson states, while speaking of the mails now carried by the London and North-Western Railway, that "not one mail coach alone, but fourteen or fifteen mails would have been needed to carry on with regularity the Post Office traffic." It is probable that Mr. Stephenson is not very far wrong in this assumption, although he deduces from it the erroneous conclusion that penny postage must have entailed a certain loss. The facts of the case are, that in 1838 twelve or thirteen mail coaches from London were actually employed to carry the mails which now leave London by the London and North-Western Railway; so that, on Mr. Stephenson's own estimate, only two or three additional mail coaches would have been required for forwarding those mails, which, it may be observed, constitute about one-half of the whole of the night mail leaving London.

The mail coaches which formerly carried the mails now leaving London in a concentrated form by the London and North-Western night mail train, were as follows, viz.:—

London and Edinbro'	Night Mail.
London and Leeds	,,
London and Halifax	,,

* This amount includes the cost of the inconsiderable extent of railway mail service at that time in operation.

London and Holyhead	Night Mail.
London and Liverpool	,,
London and Manchester	,,
London and Glasgow	,,
London and Carlisle	,,
London and Derby	,,
London and Birmingham	,,
London and Birmingham (Dublin Express)	,,
London and Hull London and Worcester	* ,,

In alluding to the advantages which have been conferred by railways, Mr. Stephenson is unfortunate in putting forward as an illustration, the cheap transmission of the printed proceedings of Parliament. Under the old postal system, and during the existence of mail coaches, Parliamentary reports and proceedings *were conveyed by post free of all charges.* On the introduction of penny postage, a postal charge for their conveyance was imposed, and this charge has continued up to the present day.

Referring to the relations between the Post Office and railway companies as to the remuneration for mail service, I should observe, that under the old mail-coach system, the Post Office was protected from undue demands for the transmission of its mails along the public highways of the kingdom by means of *competition.* The principle of free trade in locomotion operated as a safeguard against extravagant charges. Coach proprietors, who had established themselves on any road, were prevented from taking advantage of their occupation of the line to levy unreasonable charges for either passengers or mails, by a wholesome fear of opposition. The result was, that by constantly offering its contracts to public competition, the Post Office insured the performance of its service on terms which afforded only a fair and moderate profit to the contracting parties.

The introduction of railways practically destroyed competition,

* Only a portion of the bags which these mails formerly carried is now sent by the London and North-Western Railway.

and placed large monopolies in the hands of a few private companies; but, to compensate for this, Parliament took the precaution of insuring moderate charges for passenger conveyance, by special provision in each Railway Act. Strange to say, a similar provision as regards the remuneration for Post Office service was omitted, and it was deemed sufficient to specify that the remuneration should be "reasonable;" a most indefinite term, and one which has given rise to infinite variety of opinion.

It is true that, failing an amicable settlement, provision is made for a reference to arbitration; but, in the absence of any general principles to guide the arbitrators or umpire in their judgment of what is or is not reasonable, the question resolves itself into one of individual opinion, and the consequence has been that the most conflicting decisions have been arrived at in cases which, if not identical, have been so nearly alike as to render it impossible to reconcile the strange variation in the rates awarded.

Without, however, dwelling upon the uncertainty of arbitration, which is by no means its least objectionable feature, it can readily be shown that this mode of determining payments has led to results very different from those implied by Mr. Stephenson, who states that for trains put on to suit the Post Office service, very little remuneration is allowed beyond the absolute outlay which the service entails, and that the Post Office insists on the right of travelling at the mere actual cost.

It can hardly be necessary to point out that the Post Office has no more power than a railway company has to fix any particular rate, or to insist upon any principle of its own in regard to payment. The department can do no more than give expression to the views which it believes to be fair and just, leaving the final decision to the umpire. But that those decisions have allowed to railway companies the mere actual outlay, with little or no profit, is a misapprehension which a brief examination of some recent awards will suffice to remove.

It fortunately happens that Mr. Stephenson furnishes in his address the data for checking his own accuracy on this particular point. He says that locomotive expenses on railways do not on an

average exceed 9½d. per mile, and that the cost of running a train may be assumed in most cases to be about 15d. per mile. Compare this with some of the rates actually paid by the Post Office to different companies at various periods within the last few years, amounting, it will be seen, in one instance to the enormous price of 4s. 6d. per single mile.

	s.	d.	
Chester to Birkenhead	2	0	per single mile.
Dublin to Drogheda	2	0	,,
Leeds to Selby	2	0	,,
London to Bristol & Gloucester .	2	0¼	,,
Ipswich to Colchester	2	0½	,,
Ely to Yarmouth	2	1	,,
Peterboro' to Grimsby	2	2	,,
London to Dover	2	3	,,
Londonderry to Strabane ..	2	4	,,
Arbroath to Aberdeen	2	6	,,
Lancaster to Carlisle	2	6	,,
Southampton to Dorchester ..	2	8¼	,,
Perth to Dundee	3	0	,,
Dublin to Galway	3	0	,,
York to Berwick	3	0	,,
Dundee to Arbroath	3	1	,,
Preston to Liverpool	3	1	,,
Dundalk to Castleblayney ..	3	2	,,
Parkside to Preston	3	6	,,
Exeter to Plymouth	3	7	,,
Grange Court (near Gloucester) to Haverfordwest	3	7	,,
Drogheda to Dublin	3	9	,,
Drogheda to Dundalk	4	0	,,
Dublin to Cork	4	6	,,
Limerick Junction to Limerick..	4	6	,,

In these cases it will be seen that the rates paid by the Post Office for the use of only a fraction of the train exceeded the whole

cost of running, as calculated by Mr. Stephenson himself, by from 60 to 260 per cent. But these rates, while they no doubt include in some cases special elements of expense not covered by the average of 15d. per mile, are independent of the receipts obtained from passengers, parcels, and in some cases from goods, earnings which, added to the Post Office allowance, have, in many instances, rendered the mail train one of the most profitable trains on the line.

It should be mentioned that the rates of payment quoted above applied, in some few of the cases, to trains which were running as passenger trains before the Post Office employed them for the mails, the times of departure and arrival, places of stopping, &c., being adopted by the Post Office almost exactly as the company had arranged them for their own convenience. In these instances the extravagance of the charge for the mails becomes of course the more remarkable.

I should imagine that the Post Office department would be well satisfied if those mails, the hours of which are absolutely fixed by notice, were conveyed at rates based on Mr. Stephenson's estimate of the actual running cost, making some allowance, on the one hand, for the benefit derived by the company from the train, and adding, on the other hand, compensation for any special extra expenses to which the company may be subjected by the requirements of the Post Office, together with a full allowance for profit. I believe that some basis such as this has long been considered a desideratum by this department, and it is to be hoped that Parliament may see fit ere long to place the question on a footing of this nature.

It may not be inappropriate to mention here, in further refutation of Mr. Stephenson's charge of illiberal treatment, that although the law officers of the Crown have given an opinion that Government can claim exemption from toll on railways, such claim has for many years been abandoned by the Post Office. The arbitrators acting for the department always considered the railway companies both as carriers and proprietors of the road, and from their calculations accordingly. It may also be observed that the

strongest desire is usually evinced by railway companies to obtain the conveyance of the mails, a desire which is certainly incompatible with the assumption that no profit is allowed for that service, and strangely at variance with Mr. Stephenson's theory that railway companies are indifferent to postal traffic.

Before dismissing this branch of the subject, I must refer to a description of postal service by railway which has now become very extensive throughout the kingdom. I allude to the cases in which the Post Office sends a certain weight of mail in charge of the companies' guards, by an ordinary train, over the working of which no control whatever is claimed by the department. For a service of this nature, the payment awarded under arbitration has, in a recent case, amounted to the exorbitant sum of 7d. per single mile, the weight of the mail averaging for the whole line not more than 1 cwt., or about half that of a second-class passenger and his luggage. For this trifling weight of mail the Post Office was thus made to bear very nearly half of the whole cost of running the train; while it has been ascertained that the average charge made by various railway companies for ordinary parcels carried beyond short distances very little exceeds one half-penny per cwt. per mile, the average charge for ordinary goods being of course even less.

I may add, that, although in a few cases, railway companies have been induced to accept moderate sums either for the use of one or two passenger trains, or for the general use of all their trains, it constantly happens that the department is prevented from increasing postal facilities by the refusal of companies to accept rates equal to, and often exceeding, the charges made to the public for the occasional transmission of a corresponding weight of such ordinary light goods as are frequently sent by passenger trains.

At page 7 of his address, Mr. Stephenson gives the total earnings of railways from passengers, for the year 1854, at £9,170,000. The sum paid to railway companies by the Post Office during the year was about £392,600, or about $\frac{1}{23}$ part of the gross earnings of all the passenger trains. He estimates the gross weight of passengers conveyed during the year at 8,000,000 of tons; while the gross weight of mails for the entire kingdom (including guards,

clerks, &c.) was considerably under 20.000 tons, a large portion of which was not conveyed by railways at all. Assuming, however, that the whole of it had gone by the railways, it would appear that the Post Office paid $\frac{2}{3}$ part of the total earnings for the conveyance of less than $\frac{1}{400}$ part of the total weight.

In connection with this branch of the subject, it may not be immaterial to mention, that in the finance accounts printed by order of Parliament last year, the gross amount of the passenger tax paid to the Government by railway companies in the preceding year is stated to have been £309,000. As the amount paid by the Post Office to railway companies for the postal service of the year 1854 was £392,600, it follows that the Government paid to railway companies for the carriage of the mails very nearly one-third more than it received from them in the shape of passenger tax.

The third allegation of Mr. Stephenson is that the Post Office has lately entered into a competition which is injurious to railway companies, by conveying books and other parcels at very reduced rates.

Without stopping to inquire whether railway companies (most of whose Acts of Incorporation are of a later date than the Penny Postage Act, and several of whose lines have been opened since the commencement of the book parcel regulations) have any legal or equitable right to the monopoly of parcel traffic, it may be sufficient to state, that with very trifling exceptions it is only to books and other printed matter (the general circulation of which is so intimately connected with the diffusion of knowledge and the promotion of education), that any reduction below the ordinary postal charges for letters has been applied. Now, even assuming for a moment, that every book parcel that the Post Office carries is abstracted from parcels which would otherwise be conveyed by railway, it is obvious that the companies would not sustain any loss by such parcels becoming part of the mail, if the Post Office paid to the companies for its mail rates only as high as the booksellers pay them for their parcels, in which, for the most part, such books would be conveyed, if they were sent at all. But it is a

matter of fact, that the general rates paid by the Post Office to railway companies are largely in excess of those paid by the booksellers for their parcels. It follows, therefore, that the companies, instead of being injured, would be benefited by any such abstraction, seeing that, besides receiving a higher rate of remuneration for the carriage of those book parcels, they are entirely relieved of the cost of collection and delivery, a cost which, as Mr. Stephenson shows, renders goods traffic less profitable to railway companies than passenger traffic.

But a more careful consideration of this question will establish good grounds for the opinion that by far the larger portion of the book parcels which the Post Office carries would not be sent at all, but for the peculiar facilities offered by the extensive organisation of the Post Office, contrasted with which the facilities which railway companies can of themselves afford sink into insignificance.

As bearing strongly upon this comparison of facilities, I may mention the somewhat remarkable fact, that copies of the very Report of the Committee of Consultation of the London and North-Western Railway, in which the Post Office is represented as unduly competing with railway companies for the carriage of books and parcels, were extensively circluated to that company's shareholders through the medium of the Book Post, not merely to towns and villages at a distance from their railway, but even to Liverpool to which the company's own trains might have carried them without any charge whatever. When it is recollected that there are about 10,500 Post Offices scattered throughout the United Kingdom, that there is scarcely a village without a Post Office, and scarcely even a hamlet without a regularly-established official means of communication with a Post Office, and that consequently persons even in the most secluded districts, can communicate by post with all parts of the kingdom with tolerable certainty, and with very little trouble or expense, it will readily be seen that such facilities as these must lead to the transmission of books and documents which otherwise would never be sent.

In fact, the book post service is one so different in its character and objects from that to which the parcel arrangements of the

railway companies are adapted, that it may fairly be assumed it would hardly exist at all, but for the extensive facilities for its development which the Post Office possesses. The evidence given before the Select Committee on Conveyance of Mails by Railways (1854), especially that of Mr. Charles Knight, the eminent publisher, is very decided on this point. He says (3872) that the cases in which books are sent by post may be nearly all considered as exceptional cases to the ordinary commercial operations of publishing; and again (3870 and 3892) that the book post may be looked upon as a mere auxiliary to the conveyance of parcels by other means; and (3860) that if the existing regulations were stopped, the public would not be able to derive the same advantages through any other channel. The Select Committee, in their Report, admitted their conviction that "a large proportion of the parcels would not be sent but for the facilities offered by the Post Office in their distribution."

Following, however, another line of argument, let us again assume for a moment that all the book packets conveyed by Post have been abstracted from the companies' vans. It can on the other hand, be shown, that the imposition of a postal charge on Parliamentary proceedings,—the limitation as to size of packets passing through the Post,—and lastly (the most important alteration of all), the abolition of the compulsory newspaper stamp,—are changes, the combined operation of which must have been to give to the companies a far greater weight of parcel traffic than the weight of the whole of the book packets passing through Post Office. It has been ascertained, with regard to the night mails from London, by which by far the largest proportion of books is conveyed, that the reduction in the number and total weight of newspapers conveyed by these mails since the alteration in the Newspaper Stamp Act is more than six times the total number and weight of all the book parcels. To show the extent to which weight has thus been abstracted from the mails, I may mention that the number of carriage-loads of bags sent from the General Post Office to the Euston Square Station on Friday nights, has, since the recent Newspaper Stamp Act took effect, been five less

than previously; and that the average nightly reduction of weight of newspapers despatched from London is upwards of two tons and a half. At the same time it is beyond doubt that the effect of the Act in question has been largely to increase the newspaper circulation of the kingdom, and consequently to add still further to the earnings of the railway companies.

If, as Mr. Stephenson states, uncertainty, irregularity, and delay are observable in the service at the Post Office, they result to a great extent from the irregularity which often occurs in the working of the mail trains by the companies, and not from any difficulties experienced at the Post Office in dealing with its vastly and rapidly increasing business.

Admitting, however, that slight detentions do occasionally occur from pressure of Post Office work, it is right to mention that the Post Office has long since urged upon the principal companies the adoption of a plan by which they and the Post Office shall be mutually bound to pay certain penalties for delay, from whatever cause; the Post Office further offering to pay in addition a premium to the companies in every instance in which the prescribed time is not exceeded. This proposal was, however, rejected at the time by every company to whom it was submitted, and since that date (1851) it has only been agreed to by one of the Scotch companies. It should be mentioned, that the Post Office offered in each case to reopen the award, and to readjust the payment by an arbitration, in which the proposed agreement for fines and premiums should be taken into consideration, the object being to render the arrangement as equitable as possible to the companies. I believe that the department is willing to renew this offer on the former basis, or, indeed, to adopt any equitable scheme for insuring greater punctuality.

Before concluding this report, it is but just to record a brief admission of the points in regard to which railways have, to a material extent, improved the postal communication of the kingdom.

The most important of those benefits is unquestionably the increased rapidity of communication, which has practically brought

Edinburgh and Dublin almost as near to London as Birmingham and Bristol were in the days of mail coaches. But the acceleration of speed, great as it has been, has not been the sole cause of the saving of time; for the use of railways has led to the avoidance of many of the stops which formerly took place at what were termed "forward offices," for sorting purposes, that duty being now performed in travelling sorting offices, during the progress of the train. For this boon the public are clearly indebted to railways, and the Post Office is equally indebted to them for the consequent simplification of its system. The chief of the other benefits which railways have given to the Post Office and the public is greater frequency of postal communication; for, although there would no doubt have been established more numerous day mails, as well as frequent postal communication between certain large towns, if coaches had remained the fastest means of transit, it is scarcely probable that we should ever have been able to concede the very extensive additions to the number of communications throughout the kingdom generally, of which the use of railways has admitted; and the effect of which has doubtless been to cause a greater increase in the number of letters than would otherwise have taken place.

The vast advantages comprised in those two improvements can scarcely be overrated; but, having briefly acknowledged them, it hardly devolves upon me, in the present Report, to dilate upon them at any greater length.

I am, Sir,

Your obedient faithful servant,

EDWARD J. PAGE,
Inspector-General of Mails.

To Rowland Hill, Esq.,
&c. &c. &c.

APPENDIX, No. 2.

Reply of Robert Stephenson, Esq., M.P., President of the Institution of Civil Engineers, to observations in the Second Report of the Postmaster-General. Delivered at the Meeting of May 20th, 1856.

Gentlemen,

You will no doubt remember, that on taking this chair for the first time after election to it, I addressed you, according to the custom of the President of the Institution, upon matters of interest connected with civil engineering. The special points to which I directed your attention, were connected with the rise and progress of the railway system in this country; and amongst other matters referred to, were the facilities afforded by railways to the Post Office, which were described "as of the highest public consequence." In enumerating those facilities, I observed that speed might, at first sight, appear to be the greatest item in the catalogue. But I said, "it may be doubted if it is the most important":—"What is really of the greatest value to the Post Office, is the facility afforded of carrying bulk." And then I went on to state that, "without railway facilities, it was not too much to say, that the excellent plans of Mr. Rowland Hill for the reduction of the rates of postage, could not have been carried out to their full extent," and to give a variety of reasons in support of that position.

I had hoped that throughout the section of the Paper in which this subject was considered, I had guarded myself very carefully against the slightest appearance of impugning the merit of Mr.

Hill's plan, or its influence for good upon the British people, as no one can appreciate more thoroughly than I do the value of the penny postage system, and the boon it confers upon the public. It has been, therefore, with regret that I have seen in the "Second Report of the Postmaster-General on the Post Office," dated the 30th January 1856, observations upon the Railway companies of England and upon my own statement, which appear to misconstrue the object of my remarks.

The tendency of the Post Office Report is to depreciate the advantages afforded to the Post Office by Railways. It is said that the railway working is "so irregular as to require from the Post Office serious and repeated remonstrances," and also that against the advantages afforded by railways "there is an important set-off in increased expenses," that "that change, which to the public at large has so much reduced the charge for the conveyance, whether of persons, or goods, has had precisely the reverse effect as regards the conveyance of mails." It is also alleged, that the claims of the companies are often exorbitant, and that the loss inflicted upon the companies by the Post Office, in undertaking the carriage of parcels by their book post, is not, as the railways allege, "an injury, but is, in reality, a benefit," and that even if it were otherewise, the companies "are compensated by the law relieving newspapers from the compulsory stamp, which has largely transferred the conveyance of newspapers from the mail bags to the luggage vans." Annexed to the Report, which contains these statements, is a letter from Mr. Page, the Inspector-General of Mails, who carries these allegations still further.

I shall endeavour in reply, not only to sustain my own argument, but to show, that the assertions contained in the Report are fallacious; and that on the contrary, railways, viewed in reference to postal facilities, are "the great public instructors and educators of the day."

The Post Office Report commences with certain admissions. It introduces the subject by the following sentence:—"Increased use has been made of several of the railways."

Now, if the railways are so irregular, if their claims are so exor-

bitant, and if, as the Report says, the same work could be done by the old mail coaches at much less expense, why is "increased use made of the railways?"

The next sentence states, that "By means of the establishment of an additional express mail train from London to Dover, ... a much later despatch from London of the day mail to France has been afforded, the time being now as late as 1·30 p.m. This change, besides affording to the merchants in London the opportunity of replying, the same morning, to letters from France, received by the night mail, admits of letters from Scotland, Ireland, and the north and south-west of England, which arrive in London by the day mail, being sent forward by the day mail to France, instead of being detained, as previously, for the night mail."

The Post Office claims the merit of this. Nothing is said of the facilities afforded by the railway. The mail, here referred to, leaves London at half-past one in the afternoon. It stops only at the four junction stations on the line;—Reigate, Tunbridge, Ashford, and Folkestone;—reaching Dover at four o'clock, and thus, in two hours and a-half, carrying all the correspondence with Europe to the confines of England. Twice a month this train carries the Indian Mail. It conveyed, last year, nearly two million letters. exclusive of newspapers, to and from the army and navy in the Crimea. It will thus be seen, that this train performs important services for the Post Office and the public, and that it travels with great speed. The Post Office complains that the South-Eastern Railway Company are exacting "enormous prices," because they pay for the service of this train at the rate of 2s. 3d. per mile! But when it is considered that this train was put on purely for Post Office purposes, and that the ordinary train, which previously left at the same hour, has not been superseded, but has been put back, in order to give facility to this train, the rate charged cannot be considered unreasonable:—in my opinion it is too low.

"Experience," says the Report, "has confirmed the advantages to be derived from the use of Travelling Post Offices, and several

additional offices of this kind have been provided. Much greater use has also been made of the apparatus for exchanging mail bags."

The Report argues, that Mr. Rowland Hill's plans would have been as well carried out, under the old mail coach system, as under the railway system. If so, what are "the advantages derived from the use of Travelling Post Offices"? There was no "Travelling Post Office" on the Holyhead road: why should there be a Travelling Post Office on a railway? The answer obviously is, that the immense increase of correspondence renders necessary new appliances; that if the letters all remained to be sorted when they arrived at what are called the "forward" offices, the delay would be so great that the public would have to wait much longer for their letters.

It is further said: "Against these great advantages, there is an important set-off in increased expense; for, strange as it may seem, the change which to the public at large has so much reduced the charge for the conveyance, whether of persons or of goods, has had precisely the reverse effect as respects the conveyance of mails."

Now, I am prepared to show that, notwithstanding the enormous increase in their bulk, there has been no real increase in the charge for conveying the mails.

The charge for conveyance of the mails by railway is stated at page 14 of the Report, to be as follows:—

MAILS CONVEYED BY RAILWAYS.

	Average charge per mile.	Maximum.	Minimum.
	s. *d.*	*s.* *d.*	*d.*
England	0 $9\frac{1}{4}$	4 10	$0\frac{1}{4}$
Ireland	1 $5\frac{1}{2}$	4 6	$0\frac{1}{4}$
Scotland	0 $8\frac{3}{4}$	3 2	$0\frac{3}{4}$
United Kingdom ..	0 10	4 10	$0\frac{1}{4}$

The rates, therefore, for conveying the mails on railways are very unequal: varying from ¼d. a mile to 4s. 10d., according to the services performed. The rates paid to the old mail coach proprietors were also very unequal: varying from nothing to 1s. per mile. But the fact is, that whilst the payments by the Post Office to the railways, represent all they get for conveying the mails, the payments by the Post Office to the mail coach proprietors only represented, in a very minor degree, the cost to the public of conveying the mails, and the advantages to the coach proprietors consequent on carrying them.

All mail coaches in England were entirely free from tolls for the maintenance of turnpike roads, the cost of which is now, in effect, transferred from the public to the railways. Mr. Harker, the Surveyor and Superintendent of Mail Coaches, gave evidence before the House of Commons, in 1811, that "the toll duties from which the mail coaches were exempted amounted to nearly £50,000 a year," upon the very limited mileage then performed. This evidence was confirmed by Sir Francis Freeling; and, taking all the data that can be obtained upon the subject, no doubt remains that the tolls on turnpike roads in England and Wales averaged, for a coach with four horses, nearly 5d. per mile. From this heavy payment the mail coaches were free; though, of course, the charge had to borne in another shape by the public. Besides this, it is to be remembered, that the mail coach was, in many cases, paid for by the Post Office, at the rate of $1\frac{1}{16}$d. per mile. I will not, however, include that as a distinct item in my computation, but will reckon tolls and coach together as costing 5d. per mile. Beyond this, I may add, that whenever the bags were large and bulky, the Post Office paid extra. They then took the places of the two outside passengers, allowed to be carried on the roof of every mail coach (exclusive of the box seat), and whose fares probably averaged 2d. per mile each. In many cases, also, the Post Office was obliged to employ extra post-chaises and coaches, to carry the mails. The Greyhound Coach, from London to Birmingham, was permanently engaged for the carriage of newspaper-bags between London and Birmingham, at the rate of 1d. per pound, or £9. 6s. 8d. per ton, for the newspapers carried.

The old mails, therefore, cost as follows :—

Payment by Post Office for working	2½d.	per mile.
Exemption from toll, with coach, say ..	5d.	,,
	7½d.	

without occasional extra payments. So that the real sum allowed for mail coaches was nearly as large as the sum allowed to railways.

But the Post Office Report admits that the mails, which were formerly carried by coaches, now leave London "in a concentrated form"—that for example, the North-Western Railway does the work of no less than thirteen of the old mail coaches: *i. e.* the mails to Edinburgh, Leeds Halifax, Holyhead, Liverpool, Manchester, Glasgow, Carlisle, Derby, Birmingham, Hull, Worcester, and Dublin. The cost per mile, therefore, must be multiplied by thirteen, on the North-Western line alone, in order to represent the actual payment the Post Office would have had to make to the old mail coaches, as contrasted with the payment they are now making to the railway. And so as to the other railways, in proportionate degree.

It is to be borne in mind, also, that the Post Office authorities obtain facilities and advantages from the railways which they could not exact from the mail coach proprietors; and for which they pay nothing. Not only have they the power, under Act of Parliament, of ordering the trains at any time, at any speed, and to stop at any place, but they have, also, the power to direct the railway companies to provide all the carriages they require; and the railways actually find carriages for the Post Office, which cost, not the £120 which the old mail coaches cost, but no less than £500 each. In many cases the mail trains are run, under Post Office direction, at such inconvenient hours, that only three, or four ordinary passengers ever travel by them, for any part of their journey; so that the only remuneration received by the railway is the payment made for carrying the mails. It happens, also, on some railways,—such for example, as the line from Shrewsbury to Stafford—that the mail train is the only train run in the night. The consequence

is, that clerks, porters, sidesmen, gate-keepers, telegraph clerks, and nearly all the staff of the railway must be kept at night-work solely for Post Office purposes, for which the railway company has to pay.

"No doubt, says the Report, "this result (*i. e.* high rate of charge on railways) is attributable partly to the necessity for running certain mail trains at hours unsuitable for passenger traffic; but even when the Post Office uses the ordinary trains established by the companies for their own purposes, the rate of charge, especially considering the regularity and extent of custom, is almost always higher, than that made to the public for like services."

What are the "like services" rendered to the public? The public are conveyed as the mails are conveyed; but do the public take the control of the trains into their own hands, choosing where they will stop, and when they will go on, and preventing alteration of times? The public accommodate themselves to the regulations of the railways; but the Post Office takes its own time, and interferes in any way it pleases with the conveyance of the public and their goods. What are the charges made for conveying mails by "the ordinary trains established by the companies for their own purposes?" The Post Office has not furnished a list of these charges; but it appears from the table, which I have before quoted, that there are trains which carry mails in England at as low a rate as one farthing per mile. These are, no doubt, "ordinary trains established by the companies for their own purposes," and if that charge is "almost always higher than the charge made to the public for the like service," all I can say is, that I can hardly conceive how a smaller coin could be substituted for such a service.

"It fortunately happens," says the Report, "that Mr. Stephenson furnishes, in his address, the data for checking his own accuracy on this particular point. He says, that the locomotive expenses on railways do not, on an average, exceed 9½d. per mile, and that the cost of running a train may be assumed, in most cases, to be about 15d. per mile. Compare this with some of the rates actually paid by the Post Office to different companies at various periods

within the last few years, amounting, in one instance, to the enormous price of 4s. 6d. per single mile."

This is not a correct deduction from my observation. Although locomotive expenses do not, on an average, exceed 9½d. per mile, and although the current expenses of running a train may be assumed, in most cases, to be about 15d. per mile, you are all aware that "locomotive expenses" and "the cost of running a train" are not to be taken as representing the cost of supplying the service required by the Post Office. These charges were estimated for different purposes. They are the bare cost of power, &c. They do not include any calculation for establishment charges, wear and tear of road, interest on capital, or payment of expenses of station officers and porters. Of course the estimate does not include any compensation for extra services, such as are required by the Post Office, nor any allowance of any sort for profit.

A somewhat unfair use has been made, by the Post Office, of my statement with regard "to the cost of running a train." That statement was made, as you will see by reference to my Address, for the purpose of enabling you to consider the broad principles which ought to govern railway companies in respect of passenger traffic. It is palpable that I never contemplated, in that estimate, what would be the cost of running a train, put on without reference to the convenience of the public, or to the advantage of the railway company, and yet entailing all the charges of a special engine and night-service. The Post Office has, however, quoted and made use of this expression, as if it was applicable to all cases.

The Report gives a list of railways and branches, twenty-five in number, to which Post Office rates of from 2s. to 4s. 6d. a mile are paid. The list commences with the line from Chester to Birkenhead, and concludes with that of the Limerick Junction to Limerick. Only two of the lines in this list are railways running out of London, and the payments to those lines are made under very special circumstances, one of them being for the Foreign Mail. The rest are all small cross lines, such as the Leeds and Selby, Perth and Dundee, Peterborough and Grimsby, and Dun-

dalk and Castle Blaney, upon many of which the mail train is a special train, put on in the middle of the night, exclusively for the purpose of carrying a small quantity of letters. Wherever there is the least service performed, it is obvious that the proportionate rate of charge must be the highest: and in each of these petty cases, the arbitrators, no doubt, found some good reason why rates above the average should be paid. Upon cross roads, wherever a mail cart had formerly to be used, the Post Office was obliged to pay its whole expenses. And upon cross lines of railway, in the same manner, it is to be expected that the whole expenses of a special train will have to be borne by those who use it.

"The Post Office department," says the Report, "would be well satisfied if the mails, the hours of which are absolutely fixed by notice, were conveyed at rates based on Mr. Stephenson's estimate of the actual running cost, making some allowance, on the one hand, for the benefit derived by the company, from the train, and adding, on the other hand, compensation for any special extra expenses to which the company may be subjected, by the requirements of the Post Office, together with a full allowance for profit."

If by the "benefits derived by the company from a train," the Report means the amount received for passengers and parcels by a mail train, I agree with those who think that the conveyance of passengers and parcels, by such a train, may be of no benefit to a company. If those passengers and parcels did not go by the mail train, they would go by some other train, probably at a more convenient time to the company, and nothing is gained by sending them by the mail. But, apart from this, I should imagine, that the railway companies will, one and all, willingly accept any proposal from the Post Office to convey the mails, based on my "estimate of the actual running cost, with the addition of compensation for any special extra expenses to which the company may be subjected by Post Office requirements, together with a full allowance for profit."

I am informed, that the claims of the Post Office upon the railway companies are continually increasing. The old mail coach

carried only one Post Office officer, the guard, who also assisted in the performance of the duties of the coach. But the Post Office claims of the railway companies, under penalty, to carry, free of charge, all guards, clerks, and officers of the Post Office, "when employed in fetching the bags, or in returning back from carrying the same, and the inspectors of mails and such other officers and servants of the Post Office as the Postmaster-General shall from time to time require." Thus an unlimited number of free passengers may be conveyed at the Postmaster-General's discretion, and however unreasonable the number may be, the company have no redress. It is to be observed also, that instead of assisting the train, these passengers require assistance from the officers of the company. The Post Office insists that the porters of a railway are bound to place their bags in their vans and remove them from their stations.

The nonpayment of fares for these officials is not the only objection to their conveyance. Although deriving no profit from their carriage, the companies, under a recent decision, are delared to be liable to make them compensation for any accident, or injury they may sustain whilst travelling; and recently on the North-Western line, a sum of £1,200 had to be paid to an officer of the Post Office who was accidentally hurt. Was this the case with the old mail coaches?

"It constantly happens," says the Report, "that the department is prevented from increasing postal facilities by the refusal of companies to accept rates equal to, and often exceeding, the charges made to the public for the transmission of a corresponding weight of such ordinary light goods as are frequently sent by passenger trains."

The Report cites no one instance in support of the case which, it is said, so "constantly happens." In the absence of such evidence I may be permitted to doubt whether the Post Office has been well informed. If such cases have occurred, it must be under extraordinary circumstances, for the Post Office itself has power to prevent such occurrences. There is nothing to prevent their send- their mail bags, as a parcel, by any train they like. They may

have them carried, if they please, by a goods train, at 6d. per ton per mile; and that goods train will travel at least as fast as the old mail coach. A mail guard, with his bag of letters, may take his second-class ticket and walk into the railway carriage, with his bag, like any other passenger. On most of the lines on which it is complained that the railway rates are so heavy, the correspondence must be comparatively trifling. For instance, between Dundalk and Castle Blayney, the distance is 18½ miles. The Post Office rate paid, according to the Report, is 3s. 2d. a mile, or £2. 18s. 7d. for the whole distance; but the railway fare is only 2s. 7d. for the distance. If the Post Office insist on a special train and a travelling mail to carry a few letters, it is clear that they must pay in proportion, however minute may be the service rendered.

The Report complains, that whilst the gross weight of passengers conveyed by railway, during a year, is 8 millions of tons, the gross weight of mails (including guards, clerks, &c.), is under 20,000 tons,* so that "the Post Office contributes less than $\frac{1}{400}$ part to the total weight, whilst it contributes $\frac{1}{25}$ part to the total earnings of the railways." But this is a fallacy. The mails are not to be estimated by their weight. The tables in the Report show, that the very cases, in which the Post Office carries the smallest weight, are those in which they are obliged to make the largest mileage payments.

The Report states, "the total payments to the companies for the year 1854, were £392,600, which, it may be observed, exceeds by £83,000 the 5 per cent. passenger tax for the same period."

It would therefore appear, that what the Government really pays for all the postal service of the kingdom, even on this showing of the Postmaster-General, is £83,000 a year. For this they carried Four Hundred and Fifty-six Million of letters, without reckoning newspapers and parcels.

I now come to the second branch of the subject. I ventured to

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* This statement, as regards weight, is completely refuted at pages 85, *et seq.*—C. P. R.

say, and I do not hesitate to repeat, that "without railway facilities the excellent plans of Mr. Rowland Hill for the reduction of the rates of postage could not have been carried out to their full extent." But it is contended, that "not only would the penny postage without railways have been both practicable and remunerative, but that it would have been even more profitable than it now is." Upon that I join issue. Would it have been practicable,—would it have been more profitable than it now is?

1st.—As to Practicability. I argued that question, solely and exclusively, and, I will add, fairly and properly, upon the question of bulk. "The old mail coaches," I said, "were never planned for bulk. Bulk, indeed, would have been fatal to that regularity and speed, upon which the Post Office could alone rely, as the means of securing the monopoly of the letter carriage of the nation." How is this reasoning met in the Post Office Report? The Report argues the question as a question of weight. "The increase," it is said, "which has taken place in the weight of the mails has presented no difficulty to their conveyance by mail coaches." Seventeen times in one page the word weight is reiterated, whilst the word bulk is carefully avoided. The reply to my argument that the bulk would have been fatal is that the weight would have presented no difficulty. Until my argument is met on the question of bulk, I must maintain that my argument is untouched. We all know that letters weigh very little. But unpressed, sent in bags, as they are, by the Post Office, what is the bulk of the mails? I told you in my address, that "On a Friday night, when so many thousands of weekly papers are sent into the country, the Post Office requires, on the London and North-Western Railway, not only the use of the travelling post office, which is provided for its convenience, but of six or eight additional vans." This is not denied in the Report. But it is argued, nevertheless, as if all these letters could have been packed into the old mail coaches. What are the facts? On Saturday week the 1.30 p.m. Dover train carried down the Indian mail. That mail consisted of no less than

170 boxes,* each about 1 foot 9 inches long by 1 foot broad and 1 foot deep. How could these have been carried by a mail coach? I have caused an old Dover mail to be measured, for the purpose of ascertaining the space allotted to bags. The box under the guard's feet was 2 feet 10 inches long by 2 feet 1 inch deep, and 3 feet 5 inches broad; the boot (usually assigned to passengers' carpet-bags and private parcels) was 2 feet 11 inches wide, 2 feet 6 inches deep, and 2 feet 7 inches long. The space on the roof, including the roof seat, was 5 feet long by 4 feet broad. Giving all this space to the Post Office, without reservation, had that mail coach carried last Saturday's mail from London, it would have carried on its top a pyramid of mail boxes 12 feet high from the roof of the mail, or 20 feet from the ground! Yet the Report tells you, that there would have been no difficulty in providing for the conveyance of the present mails by the old mail coaches.

On Friday night (May 16), the mail from the Euston Square Station consisted of one Post Office van and six very large tenders, containing large sacks of letters, newspapers and parcels (many of them as large as sacks of corn). The vans each measured 660 cubic feet; if we say 600, we shall have a total cubic contents of 4,000 feet. This is equal to the displacement of a vessel of more than 1,000 tons burden. I said, in my Address, that it would take fourteen or fifteen mail coaches to carry the Friday night's mail from London to Birmingham: that every coach that ran in 1830 between London and Birmingham would now have been needed for Post Office purposes, if the London and North-Western Railway had not been brought into existence. It turns out that I was much under the mark. 4,000 cubic feet, the extent of accommodation required to be provided by the railway company, could

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* In 1856 the Eastern mails were only forwarded twice a-month, *viâ* Marseilles. They are now forwarded four times a-month, or forty-eight times a-year. From and after the 1st of February, 1868, they will be despatched weekly, or fifty-two times a-year. The average number of boxes despatched on the three nights of each month, when the Australian mail is not forwarded, is 178; on Australian mail night the number is 374.—C. P. R.

not have been afforded by less than fifty of the old mails, even allowing that the two passenger-seats on the roof were devoted to the Post Office service, and the bags were packed to the height of 3 feet above the roof. And yet the Report tells us, that this extent of accommodation could have been afforded by the mail coaches that formerly ran on the North road; thus assuming for each old mail the same capacity as half an ordinary fly canal boat, or as two of our largest London omnibuses.

2nd. I proceed to the next question—the question of Expenditure. The Report states, that Mr. Hill's plan would have been even more profitable under the old coach system than it now is.

"Supposing," says the Report, "that the number of mail coaches, all over the kingdom, had been doubled, the expenditure of the department for mail coach service would, in that case, have been advanced from £155,000 to only £310,000 per annum, whilst the present expenditure for the railway and mail coach service of the department is £443,000, of which sum £400,000 is paid to railway companies alone."

Now, I beg you to mark these figures. £155,000, says the Report, was the sum paid for the entire old mail coach service, whilst £443,000 is the sum now paid for railway and mail coach service, of which £400,000 is paid to railways alone, leaving £43,000 as the charge incurred by the side mails. Now, at page 14 of the Report, you will find it stated, that the branch mail coaches at the present time convey the mails over 31,667 miles per day at an average charge of 2¼d. per mile. 31,667 miles at 2¼d. per mile gives a total of £108,000 a year. Here is a total then of £108,000 a year paid at the present time merely for the conveyance of the side mails by coaches, in place of £43,000 as the Report leaves us to infer.* Now, if £108,000 a year is paid, at the present time, only for the conveyance, by two horse coaches and mail carts, of the side mails where railways do not run, how is it

* The successive Reports of the Postmasters-General, from one to twelve, both inclusive, abound in misstatements similar to the above. They are very discreditable to the department.—C. P. R.

possible that the total cost of all the mail coach transit of England could have been only £155,000 a year?

It is clear there must be some serious error in the Post Office figures, and that error is of such a character as really to invalidate all the calculations of the Report. Either £155,000 could not have represented the cost of carrying the mails formerly, or £108,000 a year, instead of £43,000 a year, must be deducted, for the side mails, from the total sum of £443,000, assumed to be the cost of postal conveyance at the present time.

But, it is also to be remarked, that the payments to mail coach proprietors for working, did not represent anything like the amount borne by the public for the mails. The Post Office treats this question as if the working at 2¼d. a mile is all the expense the public have to bear. They forget the tolls. They forget that a mail coach could not pass over a road without wear and tear, and that the Post Office paid nothing for that wear and tear. The public in another shape bore that expenditure. Under the old system, indeed, as the Postmaster-General's table shows, many of the old coaches were only too glad to "carry a bag" (as it was termed), merely for the sake of obtaining exemption from toll, which cost on the average 5*d.* per mile to the coach proprietor. You must remember that this toll was levied on the public using the turnpike road, for those purposes of repair, which are now defrayed by railway companies, in the shape of reparation of permanent way. The wear and tear of a railway line is solely paid for by the railway company, who can receive nothing in the shape of an equivalent for remission of tolls, except by direct payment.

The Post Office forgets, again, that under the old system, the roads, to some extent, were made at the cost of the public. Nearly a million of money was expended by Government in making and improving the old Holyhead line of road. Why was this expenditure incurred? It was incurred to save six hours in the delivery of the mails between Dublin and London. This, be it recollected, was the measure of the value of time by the State. They spent a million of treasure to save six hours of time. Contrast the time occupied in the transmission of mails now and in the year after

that expenditure was incurred? The Holyhead mail, after a million of public money had been spent in expediting it, still took 26 hours on the road. The same mail by railway only occupies 8½ hours* on its whole journey. Nearly 18 hours have been thus saved on this one line of road; and yet though the Government could spend a million to save 6 hours, they complain of paying £30,000 a-year, or only the interest at 5 per cent. upon £600,000, for a railway service passing over a line of road which they did not expend a farthing to construct, and which is kept in repair by private individuals, who have incurred the enormous expense of spanning the Menai Straits by a railway bridge.

In estimating the comparative cost of conveyance by road and by railway, not only are the Government officers, as I have shown you, wrong in their figures and calculations, but they suppress the great items which entailed expense on the public under the old mail coach system, and which are now saved to the State. Let me mention another saving. Under the old system, the Post Office packets were a source of well ascertained loss to the State. The old Holyhead mail coach could not bring down a sufficient number of passengers to pay the cost of the passage from Holyhead to Dublin. The packet service with Ireland entailed a loss of more than £100,000 a-year. At the present time, the railway saves the Government nearly all this loss. In consequence of the travelling facilities now afforded by the railway, the boats between Holyhead and Dublin contract to perform the service of the Government for a payment of £25,000 a-year.† And yet the department complains that it pays £30,000 a-year, for carrying its mails, to the railway company which has enabled it to effect this enormous annual saving.

This example proves this part of the case. The Report omits to

* Since the 1st of October, 1860, the mail trains run twice a-day in each direction between London and Holyhead, in 6 hours 35 minutes. The distance is 263 miles.—C. P. R.

† In consequence of the service now being performed by the finest steamers in point of speed at present afloat, in 3½ hours, instead of a *minimum* of 4 hours 40 minutes, in 1856, the price paid is £78,000 a year.—C. P. R.

take into account the amount thus saved; or any similar savings, such as £25,000 a-year formerly paid for conveyance of mails by steam packets from London to Rotterdam and Hamburgh, now sent to Dover by the South-Eastern Railway. If I admit that which the Report does not establish, that £400,000 is paid to railway companies for postal service, at any rate I am entitled to have the public savings put against that amount. If I consider the vast total of those savings, I cannot doubt, for a moment, that railways are in reality not getting what they are fairly entitled to, for performing the duties for which the State formerly had to pay so largely. Considering the enormous item of turnpike tolls remitted to the old mail coaches,—the vast saving effected in the maintenance of the roads themselves,—the greatly increased facilities demanded by the new postal system,—the incalculable gain in consequence of the increased speed,—and the diminution of heavy loss upon steam packet and such like traffic, I should really be tempted to say, that if the Government paid to railways double what they paid to the proprietors of old stage coaches, they would still be gainers by the use of railways for the purposes of the Post Office. But when I consider, that according to the showing of this Report itself, they pay no more, if so much to railways, as they paid under the old system, whilst they carry five-and-a-half fold more letters, to say nothing of newspapers and parcels, I am surprised at the assertion that "The penny postage, without railways, would even have been more profitable than it now is."

I stated, in my address, that not only was the Post Office dealing illiberally with the railway companies, but that it was absolutely entering into competition with them, as carriers, by undertaking the conveyance of books and other parcels, at very reduced postal rates. The Post Office authorities open their reply by saying, that they shall not stop to inquire whether railway companies have any legal, or equitable right to the monopoly of parcel traffic.* I

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* The Royal Commissioners upon railways disapprove in their Report, dated 7th May, 1867, of the Post Office becoming parcel carriers. See *ante*, page 122.—C. P. R.

shall not stop to inquire, by what policy a Government department steps in to interfere with the free course of trade. But, argues the Report, the companies sustain no loss, "for the general rates paid by the Post Office to railway companies are largely in excess of those paid by the booksellers for their parcels." The Post Office has never paid one farthing to the railway companies in respect of these parcels. The Post Office pays the companies so much per mile for the whole service. It carries what it pleases. It chooses to carry books. Those books formerly went by the companies' luggage vans, and were paid for to the companies by the public. The Post Office undertakes the carriage of these parcels, puts them into its letter bags, and carries them, under its contract with the railways, without paying the railways a single farthing extra. The railways suffer all the loss: the Post Office obtains all the profit. And then the Report tells you that "the companies, instead of being injured, are benefited by the abstraction."

"By far the larger portion of the book parcels," says the Report, "which the Post Office carries, would not be sent at all, but for the peculiar facilities offered by the extensive organisation of the Post Office." But there is one remarkable fact in the Report which is inconsistent with this theory. Since the stamp duty has been removed from newspapers, the Post Office, on their own showing, has lost the annual delivery of nearly 28,000,000 of newspapers, which formerly passed through the post;* and there is reason to believe, that the number of such transmissions is daily decreasing. Now, if the superior facilities of the Post Office induce the public to get their book parcels by post, how is it that they are gradually relinquishing the use of the post as a means of getting their newspapers? The superior facilities, if there are any, are precisely of the same description both for newspapers and book parcels; yet, nevertheless, the public, who best know how to appreciate superior facilities, are gradually giving up the facilities of the post in respect to newspapers, and employing the facilities afforded by the

* This mis-statement is dealt with at page 80.—C. P. R.

railway. The superior facilities, are, therefore, not estimated by the public as equivalent to 1d. per newspaper parcel.

It would appear, therefore, that the question was rather one of "charge" than of superior facilities. The Post Office chooses to undersell the railways, availing itself of the facilities railways afford it for the purpose of so doing. The public always buy in the cheapest market. They send their books by post, because the post takes them cheaper than the railways took them. And I told you, in my Address, why the Post Office is able to do this. The Post Office insists on the right of travelling over the railways at a fixed cost per mile; and, as I have just observed, without paying anything additional whatever for book parcels. The railways have to pay, not only expenses, but interest on capital; and it is to be expected therefore, that they cannot compete, in respect to this traffic, with a public department which contributes to neither. But how far this use of the railways for the purpose of the Post Office, and to the detriment of the railways is equitable, or proper, is another question.

The Post Office itself seems to feel that it is not quite equitable or proper, for the Postmaster-General, in the body of the Report, treats the question solely on the ground that "a benefit" is conferred on the railway companies by this abstraction of their traffic, and that, even if that is not the case, the companies are compensated by the transference to the luggage vans of the newspapers previously carried by the mails. I think it is in "Gil Blas" that the gentleman who takęs the canon's purse, is made to prove that the abstraction was a "benefit" to his soul's health, and would keep him free from many of the pomps and vanities of this wicked world. Upon the same principle, I suppose it is intended to be argued, that the abstraction of their traffic is a benefit to the railway companies. But, with regard to the second part of the argument, I deny that the railways are "compensated" for their loss by the transference to their vans, of the newspapers which the Post Office used to carry for nothing, and which it is admitted the officers would be "only too glad to see removed from the Post

Office altogether."* The stamp duty, you will remember, never was a postal duty under the old system; it went into the accounts of another branch of the revenue. The Post Office consequently never benefited, but, on the contrary, was only taxed for the performance of its duty as the carrier of newspapers. Latterly, this duty became so onerous, that the Post Office felt itself almost incompetent to its due performance. To save itself the trouble and expense of receiving all the papers, at the last moment, at the Post Office, it was in the habit of sending its own vans to the offices of the great news publishers, and carrying their papers in bulk to Euston Square, where an office was assigned to the Post Office for newspaper purposes. The change effected by the removal of the stamp might have been taken advantage of as a great source of revenue to the Post Office, which failed, however, to work out a system that would have been remunerative to itself, and advantageous to the public; and the consequence has been, that the public have resorted to what I may call, in the words of the Report, the "superior facilities" of the railway. But the railway gets for the carriage of these parcels nothing like the amount that the Post Office would get. The Post Office is bound, under Act of Parliament, to charge 1d. per paper, but the railways take these papers in bulk, several hundreds in a package; and carry them at the rate of so much per ton. To tell us, that an act of their own, by which they threw off an excess of labour which had become not only burdensome, but overpowering to the Post Office, was done out of consideration for the railways, and as a compensation for the abstraction of the book parcels, is not likely to be entirely acquiesced in.

The number of book parcels that passed through the Post Office last year was a million and a-half. Captain Huish, in his evidence

* This is quite true. The Post Office has been unceasing in its efforts to put a stop to the transmission of newspapers through the post, *except with postage stamps* affixed to them. In 1855, the Treasury, at the urgent instance of the Post Office, abolished the transmission of newspapers with the impressed stamp to foreign countries and our colonies, unless, *in addition*, postage stamps were affixed.—C. P. R.

before Parliament in 1854, has shown, that the loss of revenue to railways, by the abstraction of book parcels has, in some cases, borne a large proportion to the sum paid to railway companies for the conveyance of the mails. A stronger proof than this, of the unfair dealing of the Post Office towards the railway companies, could scarcely be afforded. But I own, that I do not look so much to the actual loss as to the bad precedent. It seems to me, that there is no limit to what the Post Office may carry, if this is permitted. There are many lighter articles than books forming the substance of railway packages. Is the Post Office to undertake all the light carrier trade of the kingdom, without extra payment to the railways for the use of the roads?

The Report says, "Mr. Stephenson is unfortunate in putting forward as an illustration the cheap transmission of printed proceedings of Parliament. Under the old postal system, and during the existence of mail coaches, Parliamentary reports and proceedings were conveyed by post free of all charges. On the introduction of a penny postage, a postal charge for their conveyance was imposed, which continues up to the present day."

If I am unfortunate in referring to this charge, the Report, I must say, is doubly so. For if all Parliamentary papers have been subjected to a penny postage, who receives the money? The railways ought to have a share of it; but they get nothing. The public ought to have a share of it; but on the contrary, the Post Office, which has greater facilities for carrying public papers, makes the public pay more for their transmission instead of carrying them for less. Who, then, does get the penny? The only answer is, that it goes to the credit of the Post Office account in reduction of the expenses incurred in carrying out the penny postage system.

[Mr. Stephenson having reviewed the complaints made by the Post Office about irregularities in 1856, and previously, and stated facts to show their injustice, and that they were fully as much attributable to the department as to the companies, proceeded with his address as follows.]

If the Post Office authorities want the highest rates of speed,

with perfect observance of time, they have an easy mode of securing it. Let them contract with the railway company for special trains, exclusively for the purposes of the mails. The companies will be only too glad to provide those trains, at the same, or even a less rate, than that at which they provide special trains for the public. They will, no doubt, enter into any arrangement for the arrival of such trains at their respective destinations, at the hour agreed upon. On the side of the Post Office, all that is requisite to secure this, is an equitable payment for the service, which, considering the great importance of the subject, ought not to be grudged to secure a rapid and punctual delivery of letters.

We are told, indeed, in the Post Office Report, that the railways have no right to be treated on such principles. On the contrary, they are threatened. "The law officers of the Crown," says that document, "have given an opinion that Government can claim exemption from toll on railways." Happily, it is one thing for "the law officers of the Crown to give an opinion," and another for a Government department to succeed in enforcing it.

But who are these, asks the Report, who complain of "illiberal treatment?" The old mail coaches, it says, represented free trade and competition; but these railways are "large monopolies in the hands of a few private companies." A few private companies! What is meant by a "private company"? The railway share and debenture holders of England number more than a quarter of a million. Do these capitalists represent a "private company"? An old mail coach, carrying four insides and three out, and horsed by Mr. Fagg at 2½d. a mile, is called in this Report a public conveyance, "by which the Post Office was protected from undue demands, in the transmission of its mails along the public highways of the United Kingdom," whilst a railway, like the London and North-Western, with nearly eighteen thousand shareholders and a capital exceeding thirty millions, is called "a monopoly in the hands of a private company." A monopoly! Allow me to ask, again, of what has any railway got a monopoly? The old "public highways," as the Report calls them, are still open to everybody. The Post Office authorities may put upon them, once

more, if they think fit, their favourite public conveyances. Except the bulk of their bags, there is nothing to prevent them from loading them once more in the court-yard of St. Martin's-le-Grand, and starting them off for Holyhead, or Aberdeen, with the old guard on his seat behind, and the old driver flourishing his whip.

The railways have no monopoly; Parliament has never allowed them a monopoly. In France, and elsewhere, the Legislative bodies have given railway companies a monopoly for a certain number of years; but with us the practice of Parliament has been precisely the reverse. So far from exercising any monopoly, the railways here are subjected, even among themselves, to a fierce competition. Parliament has sanctioned a second railway to Dover; there are already two lines to Hastings; two are completed to Portsmouth, and a third is making; the Government has insisted upon the South-Western making a second line to Exeter; there are already three lines to Birmingham; there are three lines to Derby, three to Peterborough, three to York, two to Cambridge, two to Oxford, two to Norwich, two to Lincoln, two to Liverpool; I know not how many to Shrewsbury; and many routes to Scotland both by the west coast and the east. Monopoly! Why Parliament on the whole circuit of the country has established, not only the principle, but the practice of free competition; and we have absolutely as much competition amongst railways now as ever existed in the old days of, what the Post Office Report calls, the public highways.

The only monopoly ever accorded by Parliament to the railway companies has been the right of taking land; but that right has been encumbered, both legally and by the opportunity afforded for making claims for exorbitant compensations. Parliament has subjected railway companies to frightful expenses, and to most uncertain and unfair tribunals in its own committees. It has never assisted any work in progress, however useful even for purposes of State. It has given no concession to any company; it has undertaken no share of the work, as has been done by the Governments of other States; it has granted no crown lands for

any line; it has not assisted to make a line; it has guaranteed no interest upon outlay; it has not even lent money (with the exception of about two millions to Irish railways), as it did year after year to the Holyhead Road Commissioners. What, then, is the Government entitled to from the railway companies? No doubt it is entitled to have public services properly performed, at a moderate cost. And all public services are performed by the railways for the Government, at a moderate cost. But it is not entitled—it can establish no claim—to use the property of railway proprietors, without toll, or to have its work done, without paying a fair rate of profit to those who perform it. When the Post Office Report tells you, that railways are monopolies which have destroyed competition, I ask you to consider, on the other hand, whether railways are not in fact too much subject, at the present time, to Government control. This very mail service is performed by the railways under compulsion. Did the Government compel any one to perform the duty of carrying the mails in the days of the old mail coaches? If, in those days, they had advertised for tenders from stage coach proprietors, for the performance of a duty such as they now exact from railway companies, subject to arbitration as to the sum that should be paid for its performance, how many tenders is it likely they would have obtained?

On the other hand, I ask you to look at the treatment the railways are receiving from the Government. I will take the case of their own selection—the case of the Chester and Holyhead Railway—in which they make a merit of paying at least double what would have been awarded by arbitrators. Look at the route to Ireland before the Holyhead Railway was constructed. No less than thirty-six hours were occupied in getting from London to Dublin. But this was regarded as great expedition, and it was most munificently paid for by the Government. They spent, as I have told you, nearly a million of money in making the road. They lost on the Irish steamers more than £100,000 a-year, to say nothing of their contract for the coach, and upwards of £3,000 a-year remitted on the tolls. This was the state of things before railways were established. The work is now done, not in thirty-

six, but in fifteen hours.* The whole mail service now, with this increased expedition, costs the Government no more than £65,000 a-year.† Thus the Government save, upon this route alone, twenty-one hours in every journey, and nearly £40,000 a-year in expenditure.

But in the face of this, what has been the conduct of the Government to the Chester and Holyhead Railway Company? In the first place, it imposed conditions which greatly enhanced the cost of the Britannia Bridge. Then observe how it treated that line with reference to other matters. The Holyhead road runs for about half-a-mile near Conway upon an embankment constructed on the sea-shore. The Holyhead Company proposed to form its railway outside that embankment, thereby, in fact, widening the embankment and affording it protection from the sea. The same state of things occurred in the Isle of Anglesea, at an inlet known as the Stanley Sands. In both cases the railway rested on the slope of the Government embankment, and for this "privilege," as it is called, the Government to this day charges the railway an annual rental!

Such is one illustration (among many) of the treatment of the railway companies by the Government departments. They have aggravated the expenses and difficulties of a line which has helped to save them, as I said before, twenty-one hours in every journey between London and Dublin, and no less than £40,000 a year in money outlay. At the present time, the Post Office Report tells us, that the department is paying double what it ought for conveying the mails over this railway, and that "the law officers of the Crown have given an opinion," that Government can claim the right to pass over it, in common with all others, without paying any toll at all!

In conclusion, I ask, how can the Post Office authorities justify their tone respecting the railways? They admit great advantages from railways, but they say that against those advantages there is

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* Since the 1st of October, 1860, the mails are conveyed between London and Dublin in eleven hours and-a-half. The distance is 335 miles.—C. P. R.

† It now costs £100,000 a-year.—C. P. R.

an important set-off in increased expense. Is there any foundation for this charge? Let us look at the figures. The mails are now conveyed daily by rail and coach over, in round figures, 60,000 miles. The total cost of this conveyance is stated at £443,000. Upwards of £100,000 is saved upon the sea service with Ireland and the continent alone. Now, suppose the mail service of the country was still performed under the old mail coach system, what would it have cost? The net payment to mails, upon their own showing, would have amounted to £310,000; the tolls and coaches, at 5d. per mile, would have been £456,000. Add to this the steamboat saving, and we should have a total cost exceeding £800,000 per annum. But as the present cost is only £443,000, there is a difference in favour of the railway system exceeding £400,000 a year, without taking credit for the increased rapidity of transmission.

If I turn to the Post Office accounts, at page 57 of the Report, I find that the additional work, to the extent of five and a-half times, has been performed at an increased cost of only two and a-half times. By their own showing then, the cost of conveyance has not "increased in a far greater degree," but in a far less degree in proportion to the work performed. I find, also, that the cost of conveying the mails has only increased, in a corresponding ratio, with the increase in the expenses of all the other branches of Post Office expenditure since 1838. I find still further, that the whole cost of conveyance amounts to little more than one-fourth of the whole cost of management, for whilst the whole cost of management in 1855 was £1,651,000, the entire payment for cost of conveyance was only £443,000. I ask, then, with what justice, with what show of propriety, can the Postmaster-General, or his officials, complain of the payments to railways for the postal communication of the nation?

The whole course of this argument has not only confirmed my conviction that without railway facilities the plans of Mr. Rowland Hill, for the reduction of the rates of postage could not have been carried out to their full extent, but it has clearly proved to my mind, that they could not have been carried into effect at all. Space, we have seen, is absolutely essential to the accommodation

of the increased bulk,—speed is absolutely essential to that multiplication of correspondence, which is requisite to sustain the rapidly increasing establishment charges, augmented already from £500,000 to £1,200,000 per annum. If the absence of facilities, both of space and speed, had not proved fatal, by preventing the development of the system, it is clear, that the expense would have broken down that system altogether. I am convinced also, that unless more and more advantage be taken of railway facilities, the postage system will not progress, in proportion to the increase of the population and wealth of the kingdom. What is it that multiplies communication? Speed and facility of transmission. In those the Electric Wire is now a competitor with the Post. Suppose we had the Electric Telegraph in operation, without a railway system, and our correspondence consequently dependent on the old mail coach, I ask what would be the effect upon the penny postage system? If the Post Office authorities desire to increase the correspondence of the nation, through their machinery, they must make more and more use of railway facilities. It is only by more frequent postal communications and accelerated speed of delivery, that the telegraph can be successfully competed with, as regards the large and increasing portion of the correspondence of the nation, which is flashing unceasingly along its wires. To obtain that increased frequency and accelerated speed, the Post Office authorities must deal equitably with the railway companies. It is not only the duty, but it is for the interest, of Government so to do. If the Government and the railway companies went hand in hand, arrangements might be made, by which the whole correspondence of the nation might be carried on, in a much more perfect manner, with advantage to the companies, and without any direct payment by the Government. When the Post Office authorities are prepared to deal with this question in an equitable spirit, I shall be prepared to show them how such an arrangement may be effected.* Meanwhile I leave them, in the hope that

* Unfortunately, Mr. Stephenson died without mentioning his proposed arrangement; but if he had lived until now, he would have seen that the ill-will of the Post Office towards the railways is as great as ever it was.—C. P. R.

these remarks, offered in all good-will and friendliness of spirit, upon the document they have published, may have some influence, in inducing them henceforward to regulate their affairs for their own and the public interests, and to endeavour, in some degree, to keep better pace with the advancing spirit of the time.

APPENDIX, No. 3.

Copy of Letter Addressed to a Member of the Italian Parliament upon the Importance of the Eastern Mails, now despatched *viâ* Marseilles and *viâ* Southampton, being transmitted *viâ* Brindisi.

London,
5th June, 1867.

In consequence of the promise I made when in Florence on the 20th and 21st ultimo, that I should write to you on the subject of postal communication between Great Britain, the East Indies, China, Japan, and Australia, I have the honour to address this letter to you.

I propose to commence it with a short sketch of the history of this communication, which, from being of comparatively trifling importance in 1830, has become, at the present time, one of immense magnitude, as well as of equally great commercial, social, and political importance.

Previous to 1830, the mail communications of Great Britain with the East were maintained solely by the route round the Cape of Good Hope. Letters then were never less than 90 to 120 days on the passage between England and Calcutta, and from 20 to 30 days more between England and China.

In 1830, the then great political and commercial company of England, called the East India Company, first placed a postal steamer in the Indian Seas; but it was not until 1834 that a regular monthly service was organised between Suez and Bombay.

In 1835, steam communication was organised, although in an imperfect and unsatisfactory manner, between England and Alexandria. By degrees this service became improved.

In 1839 the British Government, by convention with that of France, opened the Marseilles route for the conveyance of a

portion of the Indian Mail; as, at that period, the railway system was not in operation in France, it required 108 hours to convey the correspondence despatched by this route, between Calais and Marseilles. It may here be mentioned that in 1845 great efforts were made by Lieutenant Waghorn of the British Navy, a man eminently distinguished in connection with the first attempt to establish postal communication between Great Britain and the East Indies, *viâ* the Isthmus of Suez, to make Trieste the port for the embarkation of the mails. These efforts were, however, not successful, and the attention of Great Britain became thenceforward limited to the routes, *viâ* Marseilles for the more rapid communication, and *viâ* Southampton for the heavier and larger portion of the Indian mails.

Reverting to the year 1840, the British Government entered, at that period into a contract with the Peninsular and Oriental Steam Navigation Company for a service once a month, from Southampton to Alexandria, and from Suez to Calcutta and China; and two services were organised between Marseilles and Alexandria, one in connection at Suez, with the service by the steamers for Calcutta and China, and the other in connection with a service between Suez and Bombay, which was performed by the postal steamers of the East India Company.

In 1849 the services between Southampton and Alexandria became bi-monthly instead of monthly as before.

In 1854 the postal steamers of the East India Company were withdrawn, and the whole of the services in the Indian Seas were transferred to the Peninsular and Oriental Company.

In 1858 the postal service with Australia, *viâ* the Isthmus of Suez, was first commenced. It is a monthly service, but by recent intelligence received from Australia, there is probability of its becoming bi-monthly at an early date. I shall give particulars of the immense magnitude of this mail hereafter.

In 1857, in consequence of the very great increase of correspondence passing between Great Britain and the East, it was found necessary to augment the postal services to four a month in each direction *viâ* Marseilles, and to four in each direction *viâ* Southampton.

The whole of the sea service of the Indian, China, Japan, and Australian postal communications of Great Britain, is performed by the Peninsular and Oriental Steam Navigation Company. This company is the largest in the world. It has a fleet of fifty-three steamers, with an aggregate tonnage of 86,411 tons, and 19,230 horses power. Its largest ship is of 2,800 tons. Its next largest is 2,600 tons, five are between 2,000 and 2,500 tons, and eighteen are between 1,500 and 2,000 tons each. Its routes extend from Southampton and from Marseilles to Alexandria, from Suez to Bombay, from Suez to Point de Galle and Calcutta, from Bombay to Calcutta, from Point de Galle to Singapore, Hong Kong, Shanghai and Yokohama (Japan), and from Point de Galle to Melbourne and Sydney. The total number of knots (sea miles) performed by the postal vessels of the company in 1866 was 1,194,952, equal to 2,290,320 kilometres.

By successive openings of the railways, the length of which between Calais and Marseilles is 1,190 kilometres, the time occupied in the transit of the Eastern mails through France has been diminished from 108 hours to 28 hours.

I have already stated the total contract service of the Peninsular and Oriental Steam Packet Company, 2,290,320 kilometres.

The annual land service of the Eastern mail is as follows; first, as regards Marseilles:—

Route.	Kilos.	Number of Journeys.	Total.
London and Dover.....	150	96	14,400
Calais and Marseilles.....	1,190	96	114,040
Alexandria and Suez	400	96	38,400
			166,840
Vid SOUTHAMPTON.			
London and Southampton ..	135	96	12,960
Alexandria and Suez	400	96	38,400
			218,200

It should be explained that the heavy mails that are conveyed by the steamers of the Peninsular and Oriental Steam Navigation Company, between Southampton and Alexandria, are taken across the Isthmus of Suez by separate trains from those which convey the light mails *viâ* Marseilles; hence, there are ninety-six trips of Eastern mails per annum across the Isthmus for the Marseilles mails, and ninety-six for those *viâ* Southampton. Thus the total annual length of this great postal service is—

	Kilometres.
Water	2,290,320
Land	218,200
	2,508,520

The weight and dimensions of the Eastern mails have increased very greatly during recent years. This is owing partly to the immense expansion of the trade of England in the Indian, Chinese, and Australian oceans, and partly to the British army in India, consisting of at least three times as many Europeans as previous to the Indian mutiny of 1857. England has also a larger fleet in the Indian and Chinese Waters than formerly. In 1865, the trading interests of England, in the Eastern seas, was as follows, in pounds sterling:—

Countries.	Imports.	Exports.	Tonnage of Vessels.	
			Entered.	Cleared.
	£	£	£	£
British India....	37,395,372	18,254,570	664,391	671,856
Singapore	2,169,056	1,442,450	77,835	50,292
Ceylon	3,707,615	685,308	52,197	50,400
Mauritius	1,246,299	596,848	41,029	30,805
China.....	10,673,690	3,609,301	91,606	80,375
Hong Kong	773,068	1,561,851	14,608	42,848
Egypt.....	21,772,250	5,985,087	361,419	488,268
Dutch Possessions	226	928,642	Nil.	29,349
Philippine Island	1,253,904	945,642	23,207	18,055
Japan.....	614,743	1,520,895	9,361	19,602
Australia	10,283,113	13,352,357	156,649	387,239
Total..£	68,117,356	42,897,846	1,492,102	1,869,090

The value of all the imports into the United Kingdom for the year 1865, was £271,131,967 ; so that the value of the imports of the countries above enumerated is very nearly one-fourth of the total value of English imports. British exports, consisting of materials and of articles manufactured in Great Britain in 1865, were £165,862,402, of which nearly one-fourth was exported to the above-enumerated countries. The total tonnage of the vessels cleared inwards in British ports during 1865, was 14,317,866 tons. The total outward tonnage was 14,576,206 tons. The inward tonnage, to the countries enumerated above, was therefore a tenth of the total inward tonnage of the kingdom ; and the outward tonnage was an eighth of the total outward tonnage.

In proof of the immense and rapid extension of England's trade with the East, it may be stated that the figures given above show amounts three times as great as they were five years, and nearly twenty times as great as they were fifty years ago.

The Eastern mails, sent *viâ* Marseilles, are packed in wrought-iron boxes. They weigh about thirteen pounds, and their contents usually weigh about thirty-seven pounds. A box, fully packed, contains about 220 newspapers; the average weight of each of which is 3¼ English ounces. If a box be filled with letters, the number of them is about 1,800. The average weight of each letters is a little more than a quarter of an English ounce, or about 7½ French grammes.

The mails sent *viâ* Southampton are packed in wooden boxes of larger dimensions than those sent *viâ* Marseilles. As the letter postal rate is really double *viâ* Marseilles what it is *viâ* Southampton, and as the great proportion of the official letters passing between the Indian office in London and the three presidencies in India, as well as the official correspondence with the army and navy, is conveyed *viâ* Southampton, the number of letters carried in a box is about the same as in a box *viâ* Marseilles, notwithstanding the difference of dimensions. The number of newspapers sent in a box *viâ* Southampton is about a third more than in a box sent *viâ* Marseilles.

In 1850, when there were only two despatches of mails from England to the East per month, *viâ* Marseilles, and one per month

viâ Southampton, the average number of boxes per despatch was 57 *viâ* Marseilles and 152 *viâ* Southampton.

In 1858, as I have already stated, mails commenced to be despatched between England and Australia by the Overland Route—that is both *viâ* Southampton and *viâ* Marseilles. The service is once a month, and the Australian mail forms a part of the mails despatched from Southampton on the 20th of each month, and from Marseilles on the 26th of each month.

The dates for the three other despatches of each month are *viâ* Southampton the 4th, the 12th, the 27th; *viâ* Marseilles the 3rd, the 10th, and the 17th.

I mentioned in the last paragraph but two the number of boxes of mails depatched per month in 1850.

In 1861 the average number of boxes despatched *viâ* Marseilles, on the three occasions in each month when the Australian are not forwarded, was 89; but on the 26th of each month, when the Australian mail is included, the number of boxes despatched was 232.

The weight of the mails from the East towards England is never so great as from England towards the East; and this is caused from the fact that for every fifty newspapers that are sent from England to the East there is not more than one sent from the East to England; and the average weight of the latter is little more than one half the average weight of the former. For this reason the number of boxes received on each occasion in each month of 1861, when the Australian mail was not received, was twenty-two; but when the Australian mail was received the number was fifty-three.

I regret that I am not able to give the same information for 1861 as regards the Southampton route; but an Appendix to the Report of a Committee of the House of Commons which sat in 1866 upon the postal and telegraph communications of England with the East, enables me to state them with accuracy for the years 1864 and 1865.

In 1850 the total number of boxes despatched by that route was 1824, or an average of 152 each departure—in other words,

each month; for at that time there was only one despatch a month *viâ* Southampton.

In 1864 the total number of boxes despatched during the year had risen to 16,559, an average of 345 per despatch. The actual weight of these 16,559 boxes was 690 tons, an average of nearly 14½ tons per despatch. If we compute these mails according to the rules by which articles are received on board ships—that is by *measurement* or *bulk*—the tonnage was 1,540 tons, or an average per voyage of 32 tons.

The greatest mail carried by any one steamer was by the departure from Southampton of the 20th of April, 1864. There were 1,117 boxes; they weighed 46 tons actual weight, but by measurement they were 99 tons.

In 1865 the total number of boxes despatched was 17,839, being 1,280 more than in 1864. The average per despatch was 372. The actual weight of these 17,839 boxes was 747 tons, an average of a little more than 15½ tons per despatch. Their tonnage by measurement or bulk was 1,660 tons, or an average per voyage of 35 tons. The greatest mail carried by any one steamer was by the departure from Southampton of the 20th of November. There were 1,207 boxes; they weighed 49¾ tons actual weight; but by measurement, 106½ tons. The mail despatched on the 20th of each month is, of course, invariably the heaviest, containing as it does the Australian mail, which mail usually consists of about six times as many boxes as are despatched to Egypt, India, China, and Japan combined. The mail despatched on the 27th of each month is invariably the lightest; the mail despatched on the 12th is the second lightest; next comes in weight the mail despatched on the 4th.

I was favoured last month with official returns, which give the number of boxes despatched outwards, both *viâ* Marseilles and *viâ* Southampton, during the months of January, February and March of this present year, and the same information as regards mails received inwards. As these returns give the latest information respecting the mails conveyed by both routes, I send you the following very full compilation of them.

Number of boxes of Eastern mails despatched from and received at London during the first three months of 1867 :—

Viâ SOUTHAMPTON.

Date of Despatch Outwards.	India, China, and Mediterranean.	Australia.	Date of Arrival Homewards.	India, China, and Mediterranean.	Australia.
Jan. 4	213	..	Jan. 10	23	..
,, 12	169	..	,, 18	30	475
,, 20	233	709	,, 26	20	..
,, 26	80	..	Feb. 2	27	..
Feb. 4	248	..	,, 11	24	..
,, 12	92	..	,, 16	31	448
,, 20	232	762	,, 24	24	..
,, 27	80	..	March 8	27	..
March 4	199	..	,, 13	25	..
,, 12	97	..	,, 21	35	463
,, 20	184	800	,, 28	23	..
,, 27	56	..	..	..	..

Viâ MARSEILLES.

OUTWARDS.		INWARDS.	
Date.	Boxes.	Date.	Boxes.
January 3	125	January 3	38
,, 10	122	,, 10	80
,, 18	114	,, 18	22
,, 26	374	,, 26	25
February 4	114	February 4	45
,, 11	168	,, 11	81
,, 18	99	,, 18	41
,, 26	340	,, 26	50
March 4	93	March 4	34
,, 11	161	,, 11	81
,, 18	96	,, 18	51
,, 26	323	,, 26	22

The returns, *viâ* Marseilles, do not separate the numbers of boxes to and from Australia, from those for the Mediterranean, India, and China, but the great difference between the number of boxes despatched outwards on the 26th of each month, and the number received inwards on the 10th of each month, will show approximately what is the number of boxes attributable to Australia. Outwards, it would be about 240 ; inwards, about 40.

But this is certain, that during the three first months of 1867 no less than 6,288 boxes (or at the rate of 25,152 boxes per annum) were despatched outwards, and 1,675 boxes (or at the rate of 8,980 per annum) were received inwards. Total outwards and inwards for three months, 8,533, or at the rate of 34,132 boxes per annum. Taking each box at the weight of 30 kilogrammes (which is below their weight taken all round) it follows that the gross weight of the Eastern mails per annum is 1,024,000 kilogrammes, or about 1,100 tons. By ship-board measurement it would be about 2,300,000 kilogrammes, or 2,550 tons.

There are two important subjects which it appears to me should at once be impressed upon the minds of the members of the Italian Government. The first is, the probable very early completion of the Mont Cenis Railway on Mr. Fell's system, and the second, the notice given at the end of last year by the British Government to the Peninsular and Oriental Steam Navigation Company, to terminate its existing *Mediterranean* contracts on the 31st of January, 1868, and the advertisement which it has since issued, inviting parties to tender for these services, dating from the 1st day of the ensuing month—that is from the first of February, 1868. This advertisement contains, for the first time, an intimation that the British Post Office is desirous of establishing an ocean contract service between Brindisi and Alexandria, in addition to its existing services between Southampton and Alexandria, and between Marseilles and Alexandria.

As regards the Mont Cenis Railway, the testimony of the various Imperial and Royal Commissioners who were present at the trials on the experimental line above Lanslebourg, made in 1865, is so uniformly in favour of the system, that we have simply to

look forward to its opening as the commencement of a revolution, not only as regards railway construction in mountainous districts, but also as leading to the most important results, in connection with the transport of the Anglo-Eastern mails.

The two kingdoms most deeply interested in the success of the system are, undoubtedly, England and Italy, the former, because, by means of the railway the transport of the fast mails can, according to the testimony of Captain Tyler, of Her Britannic Majesty's Royal Engineers, and the Commissioners of the British Government, at the trials on the Mont Cenis, be effected between London and Alexandria, in thirty-nine hours less time than *viâ* Marseilles. Italy becomes, by means of this railway, a route hitherto undeveloped, and it can be brought into active operation not only for mail transport, but also for that of passengers; and no doubt, eventually, for that of light goods, and of specie also.

The advertisement of the British Government leads to the inference that it desires the conveyance of the fast mails,—that is the mails that now take the route *viâ* Marseilles—by way of Brindisi, as soon as all the arrangements for their transit are completed. It is to be feared, however, that the French Post Office, instigated no doubt by the Paris, Lyons and Mediterranean Railway Company, whose interests are concentrated at Marseilles, *and who has no love whatever for the Mont Cenis Railway*, will offer all the opposition in its power to the divergence from Marseilles to Brindisi taking place. In the first instance the department gave assurances that it would not only not put obstacles in the way of the British Government making the transfer, but would co-operate with it and assist it whenever required to do so. But in December last, the Marquis de Moustier, the French Minister of Foreign Affairs, addressed to Earl Cowley, the British Ambassador at Paris, a despatch which contained a memorandum from the French Post Office, the object of which was to show that the Brindisi route would only save ten hours over that *viâ* Marseilles, for mails from England, and would not effect any saving for mails coming from Egypt towards England. The memorandum contains several

errors of fact, the most conspicuous of which is that the calculations are the same as were brought forward by the department when the *Ferrovia Meridionale* was only opened as far as Ancona, whereas it is now extended to Brindisi, 559 kilometres farther southwards, and therefore that much the nearer to Alexandria.

I have reason also to know that the French Government expressed, in December last, to the British Government, its willingness to reduce its present transit rate for British correspondence to and from India, China, Australia, &c., *one-half*, provided the fast mails continued to be conveyed *viâ* Marseilles, and that they be not deviated to Brindisi.

For these reasons I am sure that the Italian Government will see the necessity and importance of vigorous action; and vigour is all the more necessary, as the officers of the British Post Office have very frequently made the avowal that their leading principle in all their postal arrangements is to make each self supporting. Therefore, unless under compulsion to the contrary, they would probably accept such a proposal,—at all events I am convinced that they would, if they could. At the present time the British Government sustains a loss of about 1,000,000 francs (£40,000), a-year by its Anglo-Eastern mail services.

So far as regards the substitution of Brindisi for Marseilles in the conveyance of what are known in this country as "The Fast Eastern Mails."

I now desire to approach a subject which I consider to be of at least equal interest and importance, both to Italy and to England, and I shall be much gratified if the Italian Government consider the suggestion I have to offer (which I may state is an original idea of my own), in the same light as I do. In order that I may make myself clealy understood, it will be necessary to go into rather lengthy details.

England has two rates of postage for the letter correspondence. Newspapers and printed matter, which are conveyed by her Anglo-Eastern Mails, by the Marseilles route, the letter postage rate for half ounce, or fifteen grammes, is 100 centimes (tenpence);

newspapers thirty centimes (threepence) each. Book post sixty centimes (sixpence), per four ounces, or 120 grammes. By the mails which are conveyed *viâ* Southampton, the letter rate per half-ounce, or fifteen grammes, is sixty centimes (sixpence); newspapers twenty centimes (twopence) each. Book post forty centimes (fourpence) per four ounces or 120 grammes. It follows therefore that a great number of newspapers and all heavy letters are forwarded *viâ* Southampton.

At the commencement of the Overland Indian Mail Service, in consequence of the absence of railways in France, there was scarcely any difference between the time required to convey correspondence *viâ* Southampton and *viâ* Marseilles. But by degrees, as the railway system between Calais and Marseilles came into operation the time by that route diminished, and what, in 1840, was a journey of 120 hours, or five days, between London and Marseilles, has in recent years, for the Eastern mail service, been reduced to thirty-four hours.

The contract speed of the steam vessels that sail between Southampton and Alexandria is ten *knots* an hour, exclusive of the stoppages allowed by the British Post Office, at Malta and Gibraltar. The time, therefore, occupied in the passage between Southampton and Alexandria is fourteen days, and as the vessels are timed to arrive at the latter port, at least one day in advance of the steamer *viâ* Marseilles, the journey may be said to require fifteen days. As the mails conveyed by the steamers *viâ* Marseilles only requires eight days, it follows, in order that the mails *viâ* Southampton and *viâ* Marseilles be carried forward by the same steamer from Suez, that there shall be an interval of from $6\frac{1}{2}$ to $7\frac{1}{2}$ days between the time of posting a letter for the same destination in the east. Thus precisely the same occurs in the reverse direction, that is to say, if the writer of a letter in London wishes to forward it, on account of its comparatively cheap rate of postage, *viâ* Southampton so that it shall arrive in, say, Bombay, at the same time as a letter despatched *viâ* Marseilles on the *evening* of the 10th of the month, he must take care that it is posted in time

for despatch by the *morning* mail of the 3rd; or if the writer of a letter in Bombay forward it for delivery in England *viâ* Southampton, he must be content that his correspondent receive it seven days later than if he sent it *viâ* Marseilles; as the usual time for a letter to be conveyed between London and Bombay *viâ* Marseilles, is twenty-one days, the letter if sent by the other route, is practically one-third longer on its journey. The *comparative* penalty in time is not so great for Calcutta and other places more distant than Bombay, but the absolute penalty is the same in all cases, a delay of six days and a half as a minimum, seven days and a half as a maximum.

When the Brindisi route is available for the mails now taken *viâ* Marseilles, the interval, in consequence of the saving of thirty-nine hours, between the despatch of the mails, *viâ* Brindisi and *viâ* Southampton, must never be less than eight days as a minimum, or more than nine days as a maximum. The consequence is, in my opinion, that arrangements must be made for conveying, by the Brindisi route, the great portion of the "Heavy," or "Southampton Mails," as well as the conveyance of the "Fast," or the "Marseilles Mails."

It can, however, only be accomplised by the countries interested consenting to take a transit rate, very different from that which is the ordinary transit rate for mail correspondence.

As long as the Mont Cenis Railway is the only railway open towards the western extremity of the Alps, France may refuse to agree to such an arrangement. There would then be no alternative but to continue the heavy mail service *viâ* Southampton, until the completion of the Simplon Railway would make both England and Italy independent of France. The reason is, that there would then be two routes between England and Italy, *viâ* the Simplon; one, undoubtedly the shorter, through Paris, Dijon, Pontarlier, and Lausanne, the other through Ostend, Belgium, Rhenish Germany, and Switzerland.

The distance from London to Brindisi, *viâ* Paris, Dijon, &c., would be 2,395 kilometers; *viâ* Ostend, Belgium, and Rhenish

Germany, 2,758 kilometers. At the present time the fast mails are conveyed between London and Alexandria, *viâ* Marseilles, in 193 hours, or eight days one hour.

According to the calculations of Captain Tyler, the fast mails can be conveyed from London to Brindisi, *viâ* Mont Cenis, in sixty-nine hours. That is to say, a letter posted in London on the evening of the 11th of a month would arrive in Brindisi at 5·30 p.m. on the evening of the 14th; allowing two hours for placing the mails on board the steamer, she would start at 7·30 p.m., and at the existing contract rate of ten knots an hour, she would reach Alexandria in eighty-three hours; that is at 6·30 a.m. on the 18th. If the Simplon line were opened, the mails would be conveyed in, at least, three hours less time; making the arrival at Brindisi 3·30 a.m. Thus, the total distance would be accomplished in 151 hours, or six days seven hours; showing a saving over the Marseilles route of forty-two hours.

If the French Government would enter into an agreement for carrying the Heavy Mails, through French territory *by ordinary trains*, they could be conveyed between London and Alexandria in seven days nineteen honrs; or six hours less time than at present, *viâ* Marseilles: in other words, these mails need not be despatched from London until thirty-six hours before the departure of the fast mails.

But if the adoption of the route, *viâ* Ostend, Belgium, and Rhenish Germany, be unavoidable, it will then be necessary to despatch the heavy mails twenty-four hours earlier than if they were transmitted *viâ* France. Still this despatch will only be two days and a half earlier than the despatch of the fast mails, instead of being eight or nine days, which would be the case if the heavy mails still continued to be despatched *viâ* Southampton.

The progress of the heavy mails by ordinary trains *viâ* Ostend, &c., would be as follows:—Despatched from London on the morning of the 9th of a month, they would reach Basle on the evening of the 10th. At present there is no night mail trains on the Swiss railways, but they will be established before the open-

ing of the Simplon Railway. They would thus reach Lausanne very early on the morning of the 11th. The distance from Lausanne to Milan, is 351 kilometres, of which, 77 would constitute the passage across the mountain; allowing five hours for it, and nine for the remaining 234, the train would arrive at Milan two hours before departure of the 9·10 p.m. train southwards; leaving Bologna at 3·40 on the morning of the 12th, the mails would, *at the latest*, arrive at Brindisi at noon on the 13th. Thus, the whole journey from London to Brindisi would be performed in 101 hours, or four days five hours, and the heavy mails would be there 29 hours in advance of the light mails despatched on the evening of the 11th.

The following table will show at one view the distances (given in kilometres) and the times occupied, or to be occupied in the several routes betweeen London and Alexandria.

Viâ	Land.	Water.	Total.	Time.
	Kilos.	Kilos.	Kilos.	D. H.
Southampton	130	5,588	5,718	15 0
Marseilles	1,416	2,835	4,251	8 1
Brindisi*				
Fast mails	2,470	1,629	4,099	6 7
Heavy mails *viâ* France	..	..	..	7 19
Heavy mails *viâ* Belgium	2,833	..	4,462	8 19

It is a well established maxim with all Post Office authorities to prefer land to water service for conveyance of mails; but especially so, when the land service can be effected by railway. There are two reasons for this preference; the first is, the greater certainty of land over water conveyance; and the second is that mails carried by railways, are conveyed at a rate of speed never less than double, and frequently it is three times greater than that of even the quickest water conveyance.

* *Viâ* Mont Cenis.

Viewed in that light, it will be seen by the above table what advantages the Brindisi route to Alexandria affords over all others. The direct route is not only 152 kilometers shorter than that *viâ* Marseilles; but, whereas the sea voyage of the latter route is 2,835 kilometers, that *viâ* Brindisi is only 1,629, showing a difference in favour of Brindisi, of 1,206 kilometers; again, the Marseilles route, has only an advantage of 211 kilometers in point of length over that *viâ* Belgium; but the sea passage is still in favour of the latter by 1,206 kilometers. If the routes *viâ* Southampton and Brindisi be compared, the difference exhibited will be still more striking, and the effect is, that a journey which can be accomplished in six days seven hours, *viâ* Brindisi takes nearly twice and a half as long by the other route.

I therefore consider that great efforts should be made both by Italy and by England, to accomplish the conveyance of the HEAVY EASTERN MAILS *viâ* Brindisi. Even if Italy made apparent sacrifices—that is, if she carried those mails along her railways at the rate charged for merchandise, it would be worth her while to do so. She would thereby not only secure a passenger traffic such as she does not possess at present, nor can she ever possess, unless with such apparent sacrifices, but she will thereby make Brindisi the Great European Terminial Port for all Eastern Postal and Passenger Traffic.

Let but the Government reflect upon the growth and development of Marseilles in the last twenty years. They are due solely to its being the port from which steamers depart, and at which steamers arrive daily from all parts of the Mediterranean. A gigantic commerce centres there from this cause only. Brindisi has, or at all events may have, the same career before it; and it is my firm conviction that, with well-organised arrangements between London and Brindisi, by which passengers would be attracted to the route, we should see a magnificent steamer starting daily for Alexandria, and one arriving from there also daily. Surely this is an anticipation by no means hazardous to make, when we remember that at the present time there are no less than eighteen first-class communications a month from Europe

to Alexandria, and the same number from Alexandria to Europe. They are as follows:—from Southampton four; from Marseilles six; of which four are by the steamers of the English Peninsular and Oriental Steam Navigation Company, and two by those of the *Messageries Imperiales;* four from Trieste, by the Austrian Lloyd's Company, subsidised by the Austrian Government, and four from Brindisi, subsidised by the Government of Italy. In addition, there are two second-class steam communications a month from Liverpool to Alexandria, by the Bengal Steam Packet Company, and one from Marseilles, which belongs to the *Messageries Imperiales.*

I regret to observe that in the advertisements for New Mediterranean Contracts, issued by the British Government, the speed proposed is only ten knots an hour. This was a suitable speed twenty years ago, but does not correspond with modern requirements. No doubt this speed will be exceeded before long, and there is no reason why we should not have, on the Mediterranean, a rate of speed equal to what the steamers of the Atlantic, built in the last five or six years, have accomplished. They frequently run during a considerable portion of the entire voyage from New York to Liverpool at a rate of fifteen knots an hour, but even if there were a speed between Brindisi and Alexandria of twelve knots an hour, the passage of eighty-three hours would be converted into one of seventy-one hours—thus diminishing the time between London and Alexandria to 139 hours, or five days, nineteen hours—at all events, this is certain, that it will be much easier to apply increased speed to vessels which have before them only voyages of the distance between Brindisi and Alexandria, than to those which have to run from Marseilles to Alexandria; and the argument is still stronger when we refer to the vessels between Southampton and Alexandria.

Brindisi will, in my opinion, also become, on the completion of the Alpine Railways, the port for the postal and passenger communication of England and Western Europe, with Greece, the Ionian Islands, Turkey, and the Black Sea. The trade of England with those parts of the world has increased greatly in recent years.

This letter has extended to much beyond what I had originally proposed; but I feel that I shall be pardoned its length, in consequence of the great interest I have for several years taken in the subject, and of my desire to impart to you all the information I possess relating to it.

Probably, the points I have opened for consideration may lead to the desire for further particulars. If so, I shall only say that I am completely at your service for this purpose.

(Signed) CUSACK P. RONEY.

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